The Age of Lead:
Metropolitan Change, Environmental Health, and Inner City Underdevelopment in Baltimore

Leif Michael Fredrickson
Missoula, MT

Bachelor of Arts, Vassar College, 2000
Master of Arts, University of Montana, 2010
Master of Arts, University of Virginia, 2014

A Dissertation presented to the Graduate Faculty of the University of Virginia in Candidacy for the Degree of Doctor of Philosophy

Department of History

University of Virginia
May, 2017

Table of Contents

Introduction – The Age of Lead

"*If you were to put something in a population to keep them down for generations and generations to come, it would be lead*."– Dr. Mona Hanna-Attisha[1]

At the turn of the century, Baltimoreans, like Americans generally, regarded the proliferating industrial landscape with hope and fear. These emotional ambivalences were evident when Baltimoreans considered a material whose use was growing rapidly in industry and among consumers: Lead. "We are wont to speak of this era as the 'age of iron,'" the *Baltimore Afro-American* observed in 1906. "Nevertheless, few people realize how useful, if not absolutely necessary, to modern civilization is that other metal, lead." Lead's properties were complementary to iron's, the paper noted – lead was "soft, yielding, and flexible"– and its uses were myriad: Plumbing, printing type, solder, and paint, among others. "Verily, we live in an age of lead as well as of iron," the article concluded.[2]

For some Baltimoreans, however, the production of lead, and rampant industrialization more generally, was alarming. Standing before his congregation in industrial Locust Point, Baltimore, in 1908, one of the city's best known religious leaders, Reverend W.A. Crawford-Frost, recited a passage from Genesis. "And the Lord God formed man of the dust of the ground, and breathed into his nostrils the breath of life." But, the Reverend admonished, "Man has in the city of Baltimore largely substituted for this pure breath of life a mixture of gasoline, lead fumes, sulphurous acid, sulphuretted hydrogen, carbon monoxide, smoke, soot and fertilizing dust."[3]

Lead was an important material for many new and expanding technologies, and for technological systems, in the late nineteenth and twentieth centuries. Distributors of water and gas used lead pipes, lead fixtures and lead solder to create huge networks that knitted many (but not all) Americans together and radically changed the experience and quality of life for many people. Lead solder also sealed billions of

---

[1] Sara Ganim and Linh Tran, "How Flint, Michigan's Tap Water Became Toxic," *CNN*, accessed January 26, 2016, http://www.cnn.com/2016/01/11/health/toxic-tap-water-flint-michigan/index.html.
[2] "The Age of Lead," *Afro-American*, September 15, 1906, 7.
[3] "Poisoners of the Air," *Sun*, June 1, 1908, 9. The Genesis quote from the article uses the words "found man" rather than "formed man," but I assume this was a misprint.

tins of food and drink as canners helped mediate the industrialization of American's food delivery system. And, along with lead-acid batteries, lead solder played a crucial role in the development of electronics, including electrical networks and electronic components of machines. The automobile was one of the machines whose development depended on lead-acid batteries and lead solder. Automobiles also relied on the lead used to make rubber and eventually on the lead added to gasoline to make engines perform better. Automobiles, and many other vehicles, were even painted with red lead to prevent corrosion. But far more than its use in painting metal components, builders and homeowners used lead paint extensively, often exclusively, to coat the interiors and exteriors of their homes for much of the first part of the twentieth century. Given these uses, it is no wonder that lead consumption increased dramatically in the twentieth century (Figure 1).[4]

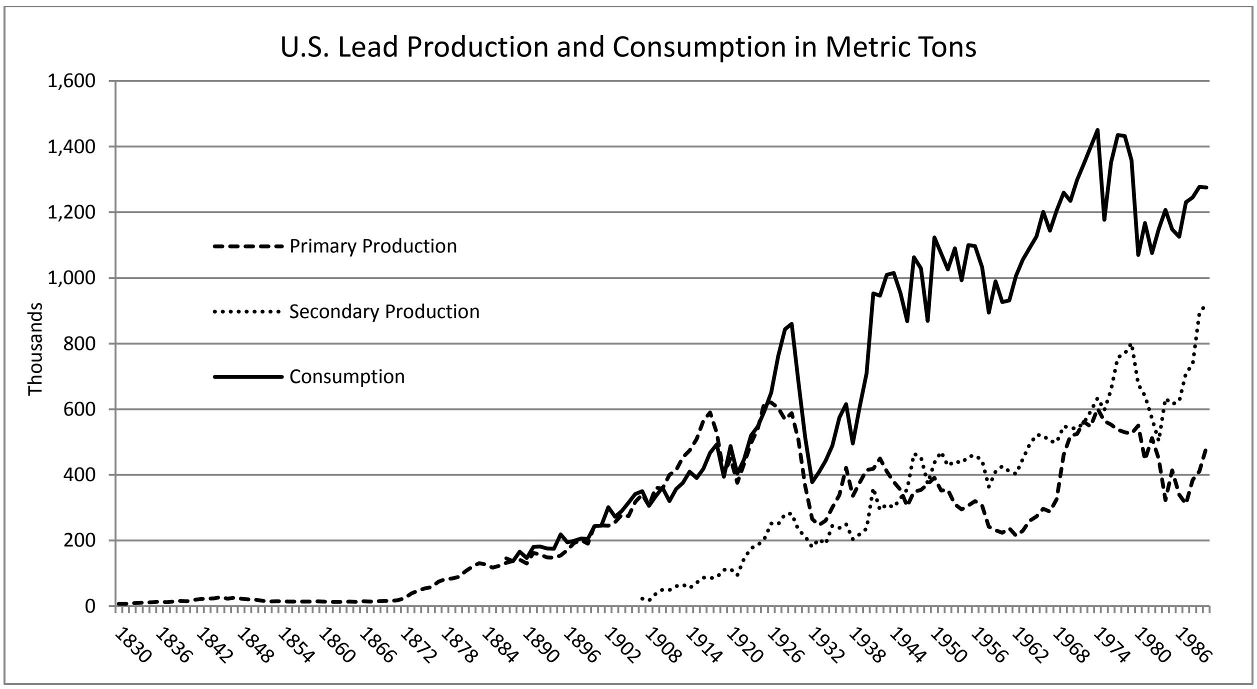


Figure 1: Production and consumption of lead in the United States from 1830 to 1900. Primary production is the production of lead from mining; secondary production is recycled lead. Both the production and consumption of lead increased dramatically in the twentieth century, contributing to increased lead exposure. **Source**: United States Geological Service, "Lead: Statistical Compendium," Table 1: Salient Lead Statistics, at http://minerals.usgs.gov/minerals/pubs/commodity/lead/stat. **Graph**: Leif Fredrickson.

[4] For a dazzling list of products that included lead in the early twentieth century, see Lead Industries Association, *Useful Information about Lead* (Lead Industries Association, 1931). For a brief on the longer history of lead use, see G. G. Gnesin, "Metals and Alloys of Bronze Age: From Middle to Modern Times. II. Gold, Silver, Tin, Lead, Mercury, and Their Alloys," *Powder Metallurgy and Metal Ceramics* 53, no. 11–12 (March 1, 2015): 722–32.

Still, it is an overstatement to imply that lead was as transformational to society as bronze, iron or steel had been, or as transformational as silicon would be. Lead's use in products changed how people interacted with the world. And importantly for this study, its use in many technologies shaped metropolitan development. But there were often alternative materials that could replace or drastically reduce the amount of lead used in products, even if producers had good reason, on technical grounds, to prefer lead to other materials. This was true of lead's use in pipes, paint, gasoline and solder, for example. In some cases, such as battery technology, material alternatives to the use of lead presented a far greater technical challenge.

The *Afro-American* was right that it was an Age of Lead. But it was right for the reasons that Reverend Crawford-Frost had warned about: the health effects of lead. The toxicity and ubiquity of lead made this heavy metal truly exceptional among the chemical hazards of the twentieth century.

No single substance has come close to having the combination of pervasiveness and serious effects on human development as lead in twentieth-century United States. Lead harms many aspects of the body – the kidneys and the cardiovascular system in particular – but it is lead's effect on the brain that makes it particularly troubling. Especially in children, lead impairs cognitive development, leading to learning disabilities and behavioral problems. Even at extremely low levels, studies detect the harmful effects of lead in children with increased exposure to the substance. Yet during most of the twentieth century, virtually every person in the United States would have been exposed to what, by today's standards, are levels of concern. And millions upon millions of children would have been exposed to lead levels that today would spur urgent medical attention. It is no exaggeration to say that exposure to lead changed the brains of most people born in the United States in the twentieth century.

Metropolitan Development, Lead Exposure and Inequality

Lead exposure, however, was not static throughout the twentieth-century. Technological change ushered in novel and expanded uses of lead, while also producing alternatives that sometimes supplanted its use. Affluence, preferences and advertising shaped how consumers used leaded technologies. Regulatory politics established legal frameworks for the use of lead. And, as I emphasize in this dissertation, metropolitan development affected how people used leaded technologies, just as those leaded technologies shaped metropolitan development.

The rise and development of metropolitan areas was one of the most important aspects of American history in the twentieth century. The United States became predominantly urban in 1920. In that same decade, developers created the first automobile suburbs for Americans. After World War II, automobile-based suburbanization increased rapidly. By 1970, the plurality of Americans lived in the suburbs, and by 1990 the majority did.[5]

The way that metropolitanization played out in the United States has had profound effects on crucial issues, such as racial and economic inequality, governance, and environmental sustainability. Separate urban and suburban communities and governments were vehicles for racial and economic exclusion, and, by extension, were vehicles for reserving resources – good schools, parks and so on – for some groups while denying responsibility to nearby communities. Fractured local governance also made transportation, land-use and economic planning difficult in metropolitan areas. This contributed to sprawling suburbs with many environmental problems, such as heavy reliance on automobiles and loss of open space from sprawling, low-density developments.[6]

Metropolitan development, and suburbanization in particular, also affected another key aspect of life: exposure to toxic chemicals. In the nineteenth and twentieth centuries, improvements in sanitation, nutrition and medicine curbed problems with many infectious diseases. At the same time, the circulation

---

[5] Frank Hobbs and Nicole Stoops, "Demographic Trends in the Twentieth Century. Census 2000 Special Reports.," (Bureau of the Census, November 2002).

[6] Peter Dreier, John Mollenkopf, and Todd Swanstrom, *Place Matters: Metropolitics for the Twenty-First Century* (University Press of Kansas, 2014); Thad Williamson, *Sprawl, Justice, and Citizenship: The Civic Costs of the American Way of Life* (Oxford University Press, 2010); Dennis R. Judd and Todd Swanstrom, *City Politics* (Routledge, 2015); David Rusk, *Baltimore Unbound: A Strategy for Regional Renewal* (Johns Hopkins University Press, 1996); Myron Orfield, *American Metropolitics: The New Suburban Reality* (Brookings Institution Press, 2011); Nancy Burns, *The Formation of American Local Governments: Private Values in Public Institutions* (Oxford University Press, 1994); Robert Burchell et al., *Sprawl Costs: Economic Impacts of Unchecked Development* (Island Press, 2005); Michael P. Johnson, "Environmental Impacts of Urban Sprawl: A Survey of the Literature and Proposed Research Agenda," *Environment and Planning A* 33, no. 4 (2001): 717 – 735; Matthew E. Kahn, "The Environmental Impact of Suburbanization," *Journal of Policy Analysis and Management* 19, no. 4 (2000): 569–86; Christopher Jones and Daniel M. Kammen, "Spatial Distribution of US Household Carbon Footprints Reveals Suburbanization Undermines Greenhouse Gas Benefits of Urban Population Density," *Environmental Science & Technology* 48, no. 2 (2014): 895–902.

of chemical pollutants in the environment began to increase. The relative decline of infectious diseases combined with the rise of chemical pollution brought the latter to the fore in the twentieth century, eventually solidifying it as a major area of state action and a part of the way people understood their lives and the world.

Businesses, governments, citizens and consumers shaped metropolitan development and in doing so created environments that differentially affected the health and experience of metropolitan residents. Metropolitan environments themselves were a factor in metropolitan change, as people responded to the amenities, disamenities and risks in their environment by changing or leaving that environment. In addition, the environmental effects on the health of people could, if disproportionate, contribute to social inequality. If disproportionate exposures resulted from social inequality in the first place, these environmental health effects would compound social inequality.

In the *Age of Lead*, I use lead hazards as a case study to explore the relationship between metropolitan development, environmental health and social inequality. I argue that lead-related technologies helped drive metropolitan development, and that metropolitan development affected the size and distribution of lead hazards. Suburbanites and suburban development benefited from lead-related technologies, such as lead piping, lead-solder, lead-acid batteries and leaded gasoline. These benefits were often not shared by those in the inner city. Moreover, many of the pollution externalities of these technologies were foisted onto the residents of the inner city. This was particularly true of leaded gasoline used by suburban commuters. But the production and recycling of other lead products, such as lead-acid batteries, was also concentrated in the inner city, and so was the pollution from these products. In addition, suburbanization increased lead hazards in the inner city by accelerating housing deterioration, which exacerbated lead paint hazards. Some suburbanites even benefited more directly from this housing deterioration through their profitable ownership of slum housing in the inner city. Suburbanites, meanwhile, were able to carve out more environmentally healthy environments on the metropolitan periphery. These dynamics were self-reinforcing. For example, automobile pollution concentrated in the inner city pushed more people to move to the suburbs, which created more automobile pollution in the inner city when those suburbanites commuted.

Because racial discrimination, housing affordability, transportation affordability and other factors concentrated African Americans and low-income people in the inner city, these groups bore lead hazards disproportionately. The disproportionate lead hazards were not only a tragedy for the individuals and families affected, they contributed to long term inequality by narrowing people's educational and occupational chances . Thus metropolitan development deepened health and wealth differences and deepened social divides across spatial, racial and class lines.

More broadly, the *Age of Lead* explores how people made decisions about the costs and benefits of metropolitan development and technological change. It is about who had the power to make or influence these decisions and who benefited from those decisions and who was hurt by them. It is also about what people knew about lead hazards and lead poisoning. It is about the social production of knowledge – how people, technologies and institutions came together shape and create knowledge. And it is also about the loss and lack of knowledge. Understanding the environmental disparities in the past is also about understanding how people in the past considered those disparities – how they weighed the costs and benefits of metropolitan development, and what, if anything, people tried to mitigate the unfair distribution of costs and benefits.

I use lead as a case study of the relationship between metropolitan development and environmental health problems for several reasons. Because lead hazards came from a variety of sources, a focus on lead allows an exploration of several key aspects of metropolitan development, including industrialization, gas and electric infrastructures, housing, and transportation. Lead allows us to move from the macro to the micro and ultimately to the molecular – and back. National housing policy shaped housing investment and development at the metropolitan level, which in turn shaped maintenance decisions about individual houses. Lack of maintenance in some houses exposed residents to more lead paint. Ultimately, lead molecules from paint made their way into the bodies of children where they combined with lead molecules from other sources, such as leaded gasoline. Molecules from leaded gasoline, in turn, can be traced out of the bodies of children, back to the traffic rumbling through neighborhoods, which in turn was shaped by policy decisions about interstates and mass transit. While several historians have written sweeping accounts of lead in terms of public health science and high-level corporate regulation, these historians have not usually emphasized metropolitan development. While historians of lead have discussed aspects of lead exposure in cities, there are no histories that look at the interactions of multiple sources of lead in one environment.[7]

Lead is also useful as a case study because it can serve as a proxy for other environmental health problems. The burdens from other automobile pollutants, including noise, would have been distributed in the urban environment in a similar way to lead. And environmental health problems from poor quality housing would have been exacerbated by many of the same processes that created lead paint problems. But to reiterate my earlier point, lead is an incredibly important pollutant in its own right. No other toxic chemical had the combined level of pervasiveness and potency that lead had. Lead is singular in its significance in that respect.

Revising and Reversing: Metropolitanism, Material Consequences and the Spatial Flow of Environmental Harms

In addition to its contribution to the history of lead noted above, the *Age of Lead* makes three, inter-related contributions to environmental history and the "metropolitan synthesis" in urban history.

First, I develop an explicitly metropolitan environmental history. Urban environmental historians have rarely put the dynamic interaction of the urban core and suburbs at the center of their analysis.[8] This in part reflects a heavy focus in many urban environmental histories on the time period before World War II and mass suburbanization. Some environmental historians have ventured into the metropolitan fringe, showing how post-war suburban development created housing that was inefficient and shaped landscapes in ways that threatened water quality, open space and wildlife. Concerns about these environmental issues

---

[7] Many historians of lead have carried out research or written books while serving as expert witnesses in toxic tort litigation cases. At the very least, this has shaped the historiography of lead poisoning by focusing on what the lead industry knew and did – an absolutely critical part of the history of lead poisoning, but not the only one worth pursuing.

[8] For a recent argument that urban environmental history needs to become more metropolitan, see Robert Gioielli, "The City and American Environmentalism," *Journal of Urban History* 41, no. 3 (2015): 526–533.

were one of the key drivers of post-war environmental consciousness.[9] But these suburban environmental histories have had little to say about the relationship between suburbanization and the older urban core.[10]

A partial exception to this is the environmental justice literature that shows how people sought to escape urban environmental problems by moving to the suburbs. Since only some people were affluent or white enough to escape to the suburbs, the search for a better environment produced disparities in exposure to industrial pollution.[11] My work adds to this, in part by showing that the flight to the suburbs and the subsequent disparities in exposure to industrial pollution began happening very early in the twentieth century. Even more significantly, these histories of escape to the healthier suburbs do not examine how that escape affected environmental health in the city. As I show, the *metropolitan* story of suburbanization and environmental health did not end when people alighted on the suburbs. Many inner city slum properties were owned by suburbanites who profited off these homes while their tenants suffered increased lead paint hazards. And an even larger number of suburbanites drove through the city on an almost daily basis as commuters, leaving behind pollution from leaded gasoline. In general, many lead-related technologies helped expand the suburbs, but the waste from the production and use of these technologies was often borne disproportionately by those in the inner city. Not only did this pollution harm inner city residents, but the problems it created there spurred even more suburbanization. This

---

[9] The Hays discuss the suburbs in Samuel P. Hays and Barbara D. Hays, *Beauty, Health, and Permanence: Environmental Politics in the United States, 1955-1985* (Cambridge University Press, 1989). Full length treatments are Adam Rome, *The Bulldozer in the Countryside: Suburban Sprawl and the Rise of American Environmentalism* (Cambridge University Press, 2001); Christopher C. Sellers, *Crabgrass Crucible: Suburban Nature and the Rise of Environmentalism in Twentieth-Century America* (University of North Carolina Press, 2012).

[10] In Martin V. Melosi, *The Sanitary City: Environmental Services in Urban America from Colonial Times to the Present*, Abridged (University of Pittsburgh Press, 2008), Melosi discusses tensions between cities and suburbs with regard to sanitary infrastructure. It is not an organizing theme of the book, but it does come up a number of times. This is an aspect of metropolitan environmental history I do not discuss, although there are some similarities between access to quality sanitary infrastructure and access to energy infrastructure that I discuss in Chapter Two.

[11] Andrew Hurley, *Environmental Inequalities: Class, Race, and Industrial Pollution in Gary, Indiana, 1945-1980* (University of North Carolina Press, 2009); Matthew W. Klingle, *Emerald City: An Environmental History of Seattle* (Yale University Press, 2008); Laura Pulido, "Rethinking Environmental Racism: White Privilege and Urban Development in Southern California," *Annals of the Association of American Geographers* 90, no. 1 (2000): 12–40. The foregoing authors all focus on the way "white privilege" and affluence allowed some people to move to the suburbs after World War II. However, as I discuss in Chapter One, the self-sorting of more affluent, white people to healthier suburban areas began around 1900 in Baltimore.

feedback loop and other connections between heavy traffic, pollution, housing deterioration and residential change compounded environmental inequality.

If environmental history has been slow to embrace metropolitan dynamics, historians of metropolitan America have been slow to embrace the environment. Again, many of these histories make passing reference to the role of the environment in providing push and pull factors for suburbanization.[12] For the most part, the environment has been the backdrop of urban history and environmental problems have been a symbol of inequality rather than a cause. In Thomas Sugrue's classic book on Detroit, for example, scenes of environmental degradation serve to symbolize the city's decline, but they do not help explain metropolitan inequality and the urban crisis. Urban historians have primarily focused on two causes of inequality. The first has been the exclusion or marginalization of black people from social and political institutions – "white supremacy." Following from this was the unequal (and unjust) distribution of benefits – what one historian has called "affirmative action for whites," and Sugrue has referred to as race-based "resource hoarding." [13] The paramount example has been housing, where policies and social institutions allowed white people to buy new homes in the suburbs but excluded black people. More recently, an emerging literature has gone beyond distributional inequality to look at exploitative and predatory housing practices in the inner city.[14] In addition to housing, historians of metropolitan America have shown the way that metropolitan governance and suburban power have produced disparities in tax

[12] For studies that delve deeper into environmental push and pull factors, see John R. Stilgoe, *Borderland: Origins of the American Suburb, 1820-1939* (Yale University Press, 1990); Robert M. Fogelson, *Bourgeois Nightmares: Suburbia, 1870-1930* (Yale University Press, 2007).
[13] Ira Katznelson, *When Affirmative Action Was White: An Untold History of Racial Inequality in Twentieth-Century America* (W. W. Norton & Company, 2006). Sugrue gets the concept of "resource hoarding" from the sociologist Charles Tilly. Thomas J. Sugrue, *The Origins of the Urban Crisis: Race and Inequality in Postwar Detroit*, Revised edition (Princeton: Princeton University Press, 2005), xviii.
[14] N. D. B. Connolly, *A World More Concrete: Real Estate and the Remaking of Jim Crow South Florida* (University of Chicago Press, 2014), 7–11. Beryl Satter, *Family Properties: Race, Real Estate, and the Exploitation of Black Urban America* (Macmillan, 2010); Keeanga-Yamahtta Taylor, "Back Story to the Neoliberal Moment: Race Taxes and the Political Economy of Black Urban Housing in the 1960s," *Souls* 14, no. 3–4 (2012): 185–206; Connolly, *A World More Concrete*; Andrew W. Kahrl, "Capitalizing on the Urban Fiscal Crisis: Predatory Tax Buyers in 1970s Chicago," *Journal of Urban History*, May 28, 2015, 1–20.

revenue, services, schools, and employment. And they have followed the material consequences of these disparities to show how they have both produced, and hidden, long-term inequality.[15]

But the emphasis on material consequences has not extended to the environment among metropolitan historians. Put another way, the story of "resource hoarding" has failed to include the waste and pollution externalities of that hoarding. But the health disparities created by poor housing and poor environments are a cause of long-term inequality.[16] No environmental health problem illustrates this better than child lead exposure, which can have profound, long-term effects on cognitive development – and hence on learning, earning, and wealth. And as with housing, schooling and other phenomena that metropolitan historians have explored, lead's role in producing long-term inequality has been hidden, feeding the American penchant to naturalize and justify inequality rooted in the past.

My second contribution, related to the foregoing, is to explore the material *consequences* of environmental inequality, not just the causes. Analysts of environmental justice have been excellent at establishing the existence and origins of many disparities in environmental exposure.[17] But they have not usually detailed the material impact of these disparities in terms of their social or historical significance. In this sense, histories of environmental justice have been similar to metropolitan histories in employing

[15] Kenneth T. Jackson, *Crabgrass Frontier: The Suburbanization of the United States* (Oxford University Press, 1985); David M. P. Freund, *Colored Property: State Policy and White Racial Politics in Suburban America* (University of Chicago Press, 2010); Arnold R. Hirsch, *Making the Second Ghetto: Race and Housing in Chicago, 1940-1960* (Cambridge University Press, 1983); Connolly, *A World More Concrete*; Kevin M. Kruse, *White Flight: Atlanta and the Making of Modern Conservatism* (Princeton University Press, 2013); Matthew D. Lassiter, *The Silent Majority: Suburban Politics in the Sunbelt South: Suburban Politics in the Sunbelt South* (Princeton University Press, 2013); Robert O. Self, *American Babylon: Race and the Struggle for Postwar Oakland: Race and the Struggle for Postwar Oakland* (Princeton University Press, 2005); Andrew R. Highsmith, *Demolition Means Progress: Flint, Michigan, and the Fate of the American Metropolis* (University of Chicago Press, 2015); Ansley T. Erickson, *Making the Unequal Metropolis: School Desegregation and Its Limits* (University of Chicago Press, 2016); Elizabeth Hinton, *From the War on Poverty to the War on Crime* (Harvard University Press, 2016).

[16] A growing body of literature points to place (or "neighborhoods") as a way that inequality is produced and reproduced. One of the most important mediators of this effect is environmental health. For a recent review, see George Galster, "How Neighborhoods Affect Health, Well-Being, and Young People's Futures," *Policy Research Brief* (Macarthur Foundation, March 2014). A leading researcher on neighborhood effects, Robert Sampson, has recently embarked on studying lead poisoning due to its profound capacity to limit life chances. Sampson, *Great American City*; Robert J. Sampson and Alix S. Winter, "The Racial Ecology of Lead Poisoning: Toxic Inequality in Chicago Neighborhoods, 1995-2013," *Du Bois Review: Social Science Research on Race* 13, no. 2 (October 2016): 261–83.

[17] Hurley, *Environmental Inequalities*; Julie Sze, *Noxious New York: The Racial Politics of Urban Health and Environmental Justice* (MIT Press, 2006). Similarly, historians of lead have not focused on the historical role of lead exposure in contributing to social inequality.

environmental inequality as an indicator of inequality, but not a producer of inequality. This is in stark contrast to the robust literature on infectious diseases, most notably Alfred Crosby's *Ecological Imperialism*, which makes a powerful argument for the role of disease (and more broadly the environment) as a historical force that propelled European colonialism.[18]

Although the patchiness of historical data and the complicated aspects of lead exposure make it impossible to provide a precise estimate of the effects of lead on people and places over time, the data are rich enough to be useful for historical interpretation. The objective is not to construct an exact rendering of the past, but to get a sort of "order of magnitude" sense of lead hazards and effects.[19] While my analysis of the effects of lead over time in Baltimore is imprecise and preliminary, it suggests that lead exposure would have had significant effects on Baltimoreans, especially the groups who were disproportionately exposed to it. On the other hand, my analysis also suggests that we should reject a recent hypothesis that lead exposure explains the rise and fall of crime rates in the United States in the twentieth century.[20]

---

[18] Alfred W. Crosby, *Ecological Imperialism: The Biological Expansion of Europe, 900-1900*, (Cambridge University Press, 2004).

[19] It is possible some historians reading this will be wary of the attempt to reconstruct the effects of lead, either because it seems prone to error or because, more fundamentally, it makes use of "science." I think it is better to try to reconstruct as comprehensive a picture of the past as possible, rather than to pursue a conservative historical method that excludes important effects because our sources are incomplete and our interpretations are uncertain. For a discussion of these issues, see Paul Sutter and J.R. McNeill's comments on the roundtable for McNeill's *Mosquito Empires*, at networks.h-net.org/system/files/contributed-files/env-roundtable-1-1_0.pdf. The approach I am taking here is similar to some other historical projects, including: the use of ecological science to make inference about the past in environmental history (e.g. Dan Flores, "Bison Ecology and Bison Diplomacy: The Southern Plains from 1800 to 1850," *The Journal of American History*, 1991, 465–485; J.E. Taylor, *Making Salmon: An Environmental History of the Northwest Fisheries Crisis* (University of Washington, 2001)); the use of epidemiological science to make inferences about the history of disease (e.g., William H. McNeill, *Plagues and Peoples* (Anchor, 1976); Randall M. Packard, *The Making of a Tropical Disease: A Short History of Malaria* (Johns Hopkins Press, 2007)); and the use of ethnography to make inferences about societies with little or no written record (e.g., John Thornton, *Africa and Africans in the Making of the Atlantic World, 1400-1800* (Cambridge University Press, 1998); Pekka Hamalainen, *The Comanche Empire* (Yale University Press, 2009).

[20] Rick Nevin, "How Lead Exposure Relates to Temporal Changes in IQ, Violent Crime, and Unwed Pregnancy," *Environmental Research* 83, no. 1 (May 2000): 1–22; Rick Nevin, "Understanding International Crime Trends: The Legacy of Preschool Lead Exposure," *Environmental Research* 104, no. 3 (2007): 315–336; Jessica Wolpaw Reyes, "Environmental Policy as Social Policy? The Impact of Childhood Lead Exposure on Crime," *The B.E. Journal of Economic Analysis & Policy* 7, no. 1 (October 17, 2007): 51; Howard W. Mielke and Sammy Zahran, "The Urban Rise and Fall of Air Lead (Pb) and the Latent Surge and Retreat of Societal Violence," *Environment International* 43 (August 2012): 48–55.

Finally, my third contribution stems from examining the flow of causes and consequences in the metropolitan history of lead. One approach to cities and the environment in environmental history has leaped over the metropolitan scale to examine the relationship between cities and the regional economies they were embedded in. These histories examine the mutual economic and environmental transformations between a "core" (the city) and the "periphery" – the surrounding region, or "hinterland," that produced resources to be bought and sold or transformed by the core. While the economic and environmental relationships between core and periphery could be beneficial and benign, the narrative is often one in which capitalists in the urban core exploited the resource-rich periphery. Profits flowed to the urban core, where they helped to build the city, while the exploited periphery was left with environmental problems, if not devastation.[21] A similar story is one in which the urban core dumped its pollution on the periphery. Cities have used rivers, for example, to rid themselves of waste, and have used land on the periphery of the city as dumping grounds for toxic materials. In this narrative, the urban core externalized the costs of pollution onto the periphery. In both narratives, economic goods flowed to the center, while environmental burdens flowed to the periphery.[22]

The *Age of Lead* turns that narrative inside out. An examination of lead exposure in the context of metropolitan development shows how economic benefits flowed to the periphery (the suburbs) – in the form of profits to absentee landowners and general health and wealth benefits garnered from suburban living – while environmental problems accumulated in the core (the inner city), in the form of commuter air pollution and deteriorating lead paint (among other problems).

---

[21] The classic is William Cronon, *Nature's Metropolis: Chicago and the Great West* (W. W. Norton, 1991). See also, Kathleen A. Brosnan, *Uniting Mountain & Plain: Cities, Law, and Environmental Change Along the Front Range* (University of New Mexico Press, 2002); Gray A. Brechin, *Imperial San Francisco: Urban Power, Earthly Ruin* (University of California Press, 2001). Andrew Needham's recent book updates the core-periphery narrative for the twentieth century, with Phoenix drawing in resources and benefits from the Navajo Reservation. The Navajo remain poor and are left with environmental resource and health problems. Andrew Needham, *Power Lines: Phoenix and the Making of the Modern Southwest* (Princeton University Press, 2014).

[22] Joel Tarr, *The Search for the Ultimate Sink: Urban Pollution in Historical Perspective* (University of Akron Press, 1996); Craig E. Colten, "Chicago's Waste Lands: Refuse Disposal and Urban Growth, 1840-1990," *Journal of Historical Geography* 20, no. 2 (1994): 124–142.

Organization

For the most part, this dissertation focuses on one source of lead exposure in each chapter, moving roughly from the nineteenth century to the late twentieth century. I often toggle back to earlier dates to start with the full story of the source (at least the full story in the twentieth century).

In Chapter One, I examine the changing geography of lead-related industries from the 1860s to the 1930s. I focus on changes in the business and technology of smelting and soldering. I chart the increasing concern about occupational lead poisoning. And then I focus on the way that the changing industrial and social geography affected the exposure of different communities to the lead belching out of smelters and other polluting sources. I argue that over time, African Americans and ethnic white working class residents were disproportionately more likely to live near lead polluting industries. I argue that this was more an effect of wealthier people moving away to the cleaner, healthier residences on the periphery of the city than it was an outcome of the siting of industry.

In Chapter Two, I examine the emergence of the first recognized child lead poisoning epidemic in the United States. This occurred in Baltimore during the 1930s when poor people, desperate for fuel, burned discarded wooden casings from lead-acid batteries in their homes, producing poisonous indoor air. I show the importance of non-expert community members in identifying this epidemic. And I argue that while utility regulation expanded electrical and gas access for many people, the poorest in the city were not able to partake of these newer, cleaner energy sources. The result was widening energy inequality that produced environmental health inequality.

In Chapter Three, I examine the rise of child lead paint poisoning. The Chapter begins with a mystery: Why were there so few documented child lead paint poisonings in the early twentieth century when there was so much lead paint being produced and used? To answer this question, I first look at the way child lead poisoning became a distinct concern from adult lead poisoning, and the way that physicians diagnosed, and often misdiagnosed, child lead poisoning. After looking at how medical knowledge shaped reporting on child poisoning, I turn to the material changes in the environment. I show that while in theory lead paint could be a very long lasting paint, many common factors and environments caused lead paint deterioration. I argue that lead paint deterioration was driven in party by systematic factors, including suburbanization and war-time materials restrictions. Finally, I argue that child lead poisoning was under-diagnosed in this period in part because physicians did not take seriously the concerns of female social workers, who flagged problems of lead paint in deteriorating housing.

Chapters Four and Five analyze the post-World War II housing market and its relationship to lead paint hazards. Child lead poisoning cases spiked in the 1950s. I argue that mass, race-based suburbanization accelerated housing deterioration in the inner city. As housing values plummeted, much of the rental market came under the management of slumlords. Slum housing had little equity, which meant that slumlords profited by heavily exploiting their tenants and neglecting housing maintenance. Since most of those slumlords lived in the suburbs, profits flowed out of the city while hazardous lead particles accumulated in the inner city. Attempts to roll back the problems of housing deterioration through housing code enforcement and a variety of programs aimed at “renewing” and “conserving” and “rehabilitating” housing were rarely successful in the big picture. One program that might have provided a real alternative to deteriorating, slum housing was public housing. But opposition from white residents and the real estate industry kept public housing from having much impact. Thus, hazardous lead paint continued to be a serious problems and slumlord management produced spirals of housing disinvestment that ended in housing abandonment.

Chapters Six, Seven and Eight chart the rise of the automobile-centric city and the pollution externalities created by automobiles, particularly leaded gasoline. Baltimore was one of the earliest cities to use leaded gasoline in large quantities due to its hilly terrain in the 1920s. Tetraethyl lead helped suburbanites climb the hills of Roland Park and Druid Hill. Automobile-based suburbanization was based in part in a desire to escape the environmental disamenities of the city. But this was a self-reinforcing process, since automobiles became one of the major contributors to environmental disamenities in the city. The very escape from the city exacerbated problems there. And not everyone could escape. Residents of the city, especially the inner city where traffic from the periphery converged, were disproportionately burdened by automobile pollution, despite being much less likely to own cars.

After World War II, the scale of automobile-based suburbanization increased. Suburbanites were still heavily dependent on jobs in the city, which translated into immense flows of traffic and heavy traffic congestion. Using detailed traffic data, models of vehicular lead dispersion, and digitized data on 8,020 census blocks, I estimate the exposure of black and white residents to lead in the city circa 1960. I find considerable variability in lead exposure, but when weighted by population density and percentage children, African Americans were clearly disproportionately exposed to lead emissions from vehicles. Virtually all inner city residents, however, were exposed to a lot of lead from automobiles.

As Baltimoreans struggled with traffic congestion and other traffic disamenities, including vehicular pollution, they looked for solutions. The failure of mass transit and traffic control to adequately bring traffic problems to heel left planners looking to build more and bigger roads – expressways. With the help of massive federal funding in the 1950s, Baltimore and other cities embarked on an era of interstate building. But it soon became an era of interstate protest as well, as residents fought against displacement and the disamenities they believed interstates would bring. Interstate proponents argued that expressways would reduce vehicular pollution. But interstates did not bring great reductions in automobile pollution, especially lead pollution, which was emitted in greater volumes when cars drove at high speeds. Ultimately, battles around interstates, vehicular pollution and lead pollution in particular shifted conversations toward what we would now call "environmental justice," and nudged the federal government toward placing a ban on leaded gasoline.

The final two chapters, Chapters Nine and Ten, take a step back to look at trends in lead exposure from various lead sources. In addition to looking at paint and leaded gasoline trends, Chapter Nine discusses lead exposure from food, as well as lead exposure from lead-tainted dirt and dust blasted into the air by winds. I argue that, overall, the overlapping sources of lead exposure suggest the period from 1945 to 1975 was very hazardous, with the 1950s possibly being a decade in which overall lead hazards peaked. An examination in Chapter Ten of trends in lead poisoning cases and blood lead levels tends to corroborate this interpretation.

In addition to suggesting patterns of lead exposure, I use blood lead levels to make some preliminary estimates of the effect of lead on earnings, via its effect on decrements in intelligence. Looking at a cohort of black and white children born in the late 1950s and early 1960s, I conclude that lead exposure had significant effects on later earnings. And since the effects were disproportionate, they contributed to income inequality between black and white people in the city. I also consider how the effects of lead exposure on education interacted with deindustrialization and the spatial mismatch of jobs between the work force in the inner city and the work force in the suburbs. Finally, I examine theories regarding the putative role of lead exposure in driving crime rates in the twentieth century. Using estimates of lead exposure from leaded gasoline, I find no evidence to support this theory in Baltimore. In addition, drawing on the trends in exposure and blood lead levels discussed in Chapter Nine and Ten, I argue that there are some serious flaws with some aspects of the hypothesis that lead exposure drove crime rates.

Its apparent lack of importance for overall crime rates aside, my conclusion is that lead exposure was a pervasive aspect of the environment for most of the twentieth century and that virtually everyone in the city would have been affected by it. Some groups, particularly African Americans, the poor, and residents of the inner city in general, were disproportionately burdened by various lead exposures, however. Those disparities, including but not limited the estimated effects on earnings, in turn helped reproduce social inequality. But like many other factors contributing to long-term social inequality, the effects have often not been recognized, and their connection to past causes has been lost.

Methodological Issues

In order to trace the complex relationships involving policies, social groups, markets, the built environment, the broader physical environment and so on, it has been necessary to focus on one metropolitan area. Because the complexity of this task precludes the possibility of multiple case studies, choosing a case study engenders two questions. 1) Which metropolitan area should be the focus? and 2) How generalizable is the chosen metropolitan area to other metropolitan areas?

I chose the Baltimore metropolitan area as a case study for two reasons. One reason is that it has the best historical records on lead poisoning, with continuous tracking of some aspects of lead poisoning (such as cases and deaths) going back to the mid-1930s, and some other more intermittent data that also allows for a relatively long-term picture of lead.

The other reason is that Baltimore City has long been a leader in dealing with lead poisoning problems. That is one of the reasons it has relatively good historical records. The other reason is that Johns Hopkins and the University of Maryland carried out a lot of early research on lead poisoning, often using populations in the city for research. Baltimore had a lead poisoning program long before other major cities did, and it banned lead paint in housing before any other city. The city was also a leader in some other ways – health code modernization, code enforcement, and urban renewal – that were relevant to lead poisoning.

Of course, these aspects of Baltimore's history immediately beg another question: If it is unique, how generalizable is it to other cities or metropolitan areas? One answer to this is that there simply are not any "representative" cities or metropolitan areas so it would be pointless to search for one. But that said, there was also a tremendous amount of similarity between cities because cities were often driven by national policies and broader economic, social and technological trends. In some cases, I have tried to compare Baltimore to other cities to answer this question of generalizability. In general, my conclusion is that what was true for Baltimore as far as the negative impact of lead is concerned was probably true for most other relatively large metropolises. This is not necessarily the case when it came to addressing these problems, due to Baltimore's "first mover" position in this field.

Lead Primer

As will become evident, lead poisoning was and is a complicated matter. I will return to, and expand on, some of these points throughout the dissertation, but I think it is useful to provide a basic grounding in the science at the start.

Lead is an element normally present in minute quantities in the environment. Human use of lead in industry and consumer goods has greatly increased the amount of lead in the environment. Moreover, this use also changed lead's chemical forms and bulk forms making it more "bioavailable," or easily absorbed into the body. Not only are chemical formulations of lead in paint (lead carbonate and chromate, for example) more bioavailable than common lead ore (e.g., lead-sulfide, also known as galena), but lead ore is usually encapsulated in other rock such as quartz. Lead paint is not encapsulated in anything, and it becomes increasing bioavailable as it breaks down into finer particles until it becomes highly hazardous lead-tainted dust.[23]

The body burden of lead is usually measured by the amount of lead in the blood, which is measured in micrograms (μ) per deciliter of blood. (A microgram is one millionth of a gram and a deciliter is one tenth of liter, or about half a cup.) Because the human body has no use for lead, and because lead was not usually abundant in the human environment, the "natural" level of lead in human blood is about .001-.002 micrograms/dL.[24]

Lead causes a number of health issues, including significant renal problems, but it is lead's effect on the developing nervous systems of children that has garnered the most attention, including lead's status as the greatest environmental threat to child health in the United States. While there is considerably variability in how individuals respond to lead absorption, increasing blood lead levels (BLLs) are associated with increasingly severe symptoms. BLLs above 125 micrograms/dL are associated with acute encephalopathy (swelling of the brain) and death. BLLs above 80 micrograms/dL are associated with encephalopathy and renal toxicity. BLLs over 60 micrograms/dL are associated with lead colic (excruciating abdominal spasms). BLLs over 20 micrograms/dL are associated with anemia and peripheral neuropathy (loss of nervous functioning in the limbs). What are often called "low blood lead levels," levels below 10 micrograms/dL are still associated with problems. High levels BLLs within this range from about zero to 10 are associated with decrements in intelligence of up to 9 or 10 IQ points. Other psychological changes associated with relatively high BLLs in this range include irritability and

[23] M. V. Ruby et al., "Advances in Evaluating the Oral Bioavailability of Inorganics in Soil for Use in Human Health Risk Assessment," *Environmental Science & Technology* 33, no. 21 (1999): 3697–3705.
[24] David C. Bellinger, "Very Low Lead Exposures and Children's Neurodevelopment," *Current Opinion in Pediatrics* 20, no. 2 (2008): 172–177.

problems with “executive functioning” (the ability to plan and control impulses). The neurobiological mechanisms involved in the effects of lead on psychological functioning include reductions in gray matter (neurons), demyelination (interference with the connections between neurons), and reduced hippocampal development (a brain region involved in memory, among other things).[25]

Until 2012, the Centers for Disease Control considered 10 micrograms/dL or more in children a “level of concern.” But as a result of studies showing negative effects of lead below 10 micrograms/dL, and below even 5 micrograms/dL, the CDC stopped identifying any level at which lead in the blood was not a concern. This endpoint – zero lead as the only “safe” level of lead – was the culmination of over a century of progressive lowering of the level of concern by the federal government, from 60 micrograms/dL in 1960, to 30 micrograms in 1975, to 10 micrograms/dL in 1991 (and several adjustments in between). The lack of any safe level of lead, along with the continuum of symptoms and the variability of individual responses, makes it awkward to discuss the effects of lead. “Lead poisoning” is not categorical state. And it has not been used in the same way over time. Before the 1960s, children were often not considered “lead poisoned” until they had symptoms that were so severe the child’s life was in danger. Later in the twentieth century, “lead poisoning” could simply mean having a blood lead above a critical value. To avoid confusion, I have tried to employ the term “lead poisoning” in the same way that people of the period I am discussing thought about it. More generally, I have simply referred to variable lead exposure or absorption.

[25] Donald T. Wigle, *Child Health and the Environment* (Oxford University Press, USA, 2003); T. I. Lidsky and J. S. Schneider, “Adverse Effects of Childhood Lead Poisoning: The Clinical Neuropsychological Perspective,” *Environmental Research* 100, no. 2 (2006): 284–293; Bellinger, “Very Low Lead Exposures and Children’s Neurodevelopment.”

Chapter 1 – Lead and Industrialization in the Monumental City

Since President John Quincy Adams toasted the "Monumental City" on a visit to Baltimore in 1827, residents of the city have embraced the nickname. At the time, the reference was to the Washington Monument in the upscale Baltimore neighborhood of Mount Vernon.[1] Built between 1815 and 1829, the statue atop a tower was the first major monument to celebrate the founding president. One hundred years later, however, a different tower vied for monumental status in the minds of Baltimoreans: the Phoenix shot tower built in 1828. At 215 feet, the Phoenix shot tower was the tallest building in the United States at the time and remained so until 1846. The shot tower method of making ammunition originated in 1782 in England. Workers poured molten lead through a sieve at the top of the tower, and the drops of lead cooled on their way to the bottom. Manufacturers used shot towers into the early twentieth century, but new methods employing wind made the tall Phoenix tower obsolete. It closed in 1892, but continued to loom silently over the city, impossible to ignore.[2]

As the city grew, developers looked to demolish the tower. It was an unproductive use of space and was in the way of efficient traffic flow. The city issued a tear down permit in 1921, but a group of Baltimoreans banded together to raise funds for its preservation. They bought it in 1924 and donated it the city. Baltimoreans who wanted to preserve the tower saw in it a monument that held up in beauty and significance compared to military monuments, parks and churches. Sure it might be "in the way" of some street developments, but the same was said of St. Paul's Cathedral, one resident wrote. Some advocates saw it as more important than the Battle Monument – another downtown feature in the way of traffic. Some placed it alongside the beauty of the Washington Monument, its tower possessing the "accidental charm" of sturdy, utilitarian structures, according to one architect. To some the shot tower represented important aspects of national and local development (Figure 2). A perhaps apocryphal story had Western wholesale grocers visiting Baltimore and gazing upon the tower as the producer of "the shot and bullets

---

[1] Lance Humphries, "Who Dubbed Baltimore the 'The Monumental City'?" *Sun*, August 15, 2015, www.baltimoresun.com/news/opinion/oped/bs-ed-monument-city-20150815-story.html.

[2] "Carroll Museums: Making History Yours," www.carrollmuseums.org/history/towerhistory.html.

with which our ancestors killed Indians and buffalo and… prairie chickens." For many Baltimoreans, it signified the growth of manufacturing in the city, as both a participant in that industrialization and a "sentinel" watching over the industrial growth of Baltimore.[3]

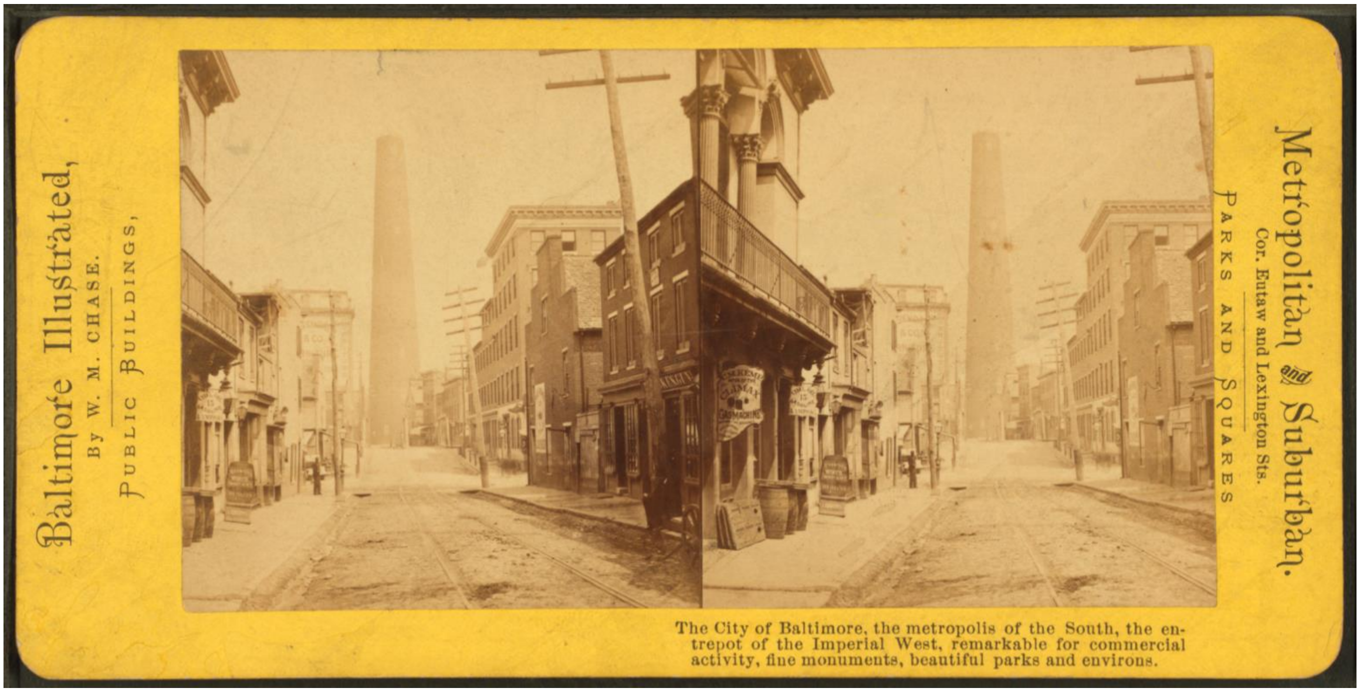


Figure 2: A stereoscopic photo of one of Baltimore's shot towers from the mid-1880s. As the inclusion of the photo in the booklet indicates, Baltimore's shot towers were already a source of interest for visitors and city boosters. The accompanying text implicitly connects shot towers to Baltimore's "imperial" and "commercial" and "metropolitan" dominance. **Source:** W.M. Chase, *Baltimore Illustrated* (ca. 1880), in The Miriam and Ira D. Wallach Division of Art, Prints and Photographs: Photography Collection, The New York Public Library. "Looking down, Fayette St. Shot Tower. 220 feet high." New York Public Library Digital Collections, digitalcollections.nypl.org/items/510d47e0-66ba-a3d9-e040-e00a18064a99.

The shot towers' dominance of Baltimore's nineteenth-century skyline – the city had a total of five at various times – exaggerated their commercial importance, but shot towers were an important part of the city's early manufacturing base. Shot production was one of the city's earliest notable industries, and while making lead shot was not complicated , Baltimore's shot towers reputedly produced the most

[3] Well before the 1920s, boosters had celebrated the tower in monumental terms. The tower was an "immense piece of masonry," one wrote in 1873, said to be "the finest specimen of brick work on this continent and perhaps in the world." George Washington Howard, *The Monumental City: Its Past History and Present Resources* (J. D. Ehlers, 1873), 103. Also, "Save the Landmarks," *Sun*, August 6, 1901, 6. George Worthington, "Letter," *Sun*, February 20, 1921, ES1; L., "The Shot Tower," *Sun*, February 7, 1921, 6; Henry Angelken, "The Seven Wonders of Baltimore As seen by Visitors," *Sun*, August 30, 1923, 12; Henry Shepherd, "The Shot Tower," *Sun*, August 20, 1924, 8; Old Residenter, "Letter," *Sun*, November 28, 1925, 8; "Old Shot Tower is Hoary Landmark of Industry, Sentinel of Front Street," *Sun*, May 1, 1921, M2; "Three Shot Towers Baltimore Has Boasted: They Brought City Fame for Manufacture of 'The Most Perfect Shot' In This Country," *Sun*, August 3, 1924, RS6. The Phoenix Shot tower was placed on the National Register of Historic Landmarks in 1973 and remains in the city today as a museum. "Carroll Museums: Making History Yours."

perfect shot in the world. And they produced a lot of it. The Phoenix shot tower pumped out 2.5 million pounds of shot a year.[4] Shot towers were also a bridge between nineteenth-century lead manufacturing and twentieth-century lead manufacturing in the city. Lead manufacturers built or bought shot towers in the late nineteenth century and profited off them before moving on to different products or methods of producing shot in the early 1900s.

In Baltimore, in short, lead production was both symbolically and economically important to industrialization. But the manufacture of items that were made entirely or mostly of lead was only the tip of the iceberg in respect to the weaving of lead into the fabric of industrial production and everyday life. As the world became more human built in the industrial age it also increasingly became an alloy of lead. That was true in both the strict metallurgical sense – many metals products used some amount of lead – as well as the more general sense, for a surprising variety of products were an admixture of lead and other substances, including cosmetics, medicines, silk, glass and rubber. And, of course, paints and varnishes and thus, by extension, a plethora of products that workers painted and varnished with lead pigments.

While lead was important to many aspects of industrialization, it also produced many hazards. In this chapter, I examine the relationship between industrialization and lead hazards in Baltimore in two contexts, the work environment and the community environment. This dissertation focuses on child lead poisoning because it is the exposure of vulnerable, developing children that is likely to have the most impact on communities, cities and society at large. However, the history of child lead poisoning is incomplete without a discussion of occupational lead poisoning for two reasons. First, well into the early twentieth century, children commonly worked in industries where they could suffer acute lead poisoning,

---

[4] Comparing Charleston's sluggish growth to Baltimore, one writer laid it to industrialization, pointing out that on visiting the latter one would see "thousands of mechanics at their forges, furnaces, in their shot towers, marble and stone yards, shops and machine shops." James Orr, "American Industry – Variety of Pursuits," *The Plough, the Loom and the Anvil*, June 1855, 706. Entrepreneurs built the tower to compete with shot manufacturing coming out of Missouri. Robert B. Gordon and Patrick M. Malone, *The Texture of Industry: An Archaeological View of the Industrialization of North America* (Oxford University Press, 1997), 179. There were only about 34 shot towers in the United States, and Baltimore had four of them. Mary Ellen Hayward and Frank R. Shivers Jr, *The Architecture of Baltimore: An Illustrated History* (Johns Hopkins University Press, 2004), 153. On shot towers and their place in early industry: Victor Selden Clark, *History of Manufactures in the United States* (Carnegie Institution of Washington, 1916), 344; Albert Bolles, *Industrial History of the United States, from the Earliest Settlements to the Present Time* (H. Bill Publishing Company, 1879), 360. On the quality and quantity of shot, see "Carroll Museums: Making History Yours"; Howard, *The Monumental City*, 103.

including death, not to mention suffer the chronic effects of long-term lead exposure. Second, industrial production also exposed communities, including children, to lead through the pollution of air, land and water.

As the scale of lead use increased, so did the nature of the industrial supply chain. Larger businesses specializing in lead consolidated smaller businesses and drew work away from foundries that did not specialize in lead. But the increasing use of lead also spawned a multitude of small businesses that recovered scrap lead to return to the supply chain. Eventually, business people also consolidated these secondary lead scroungers and smelters. These secondary smelters could also be a significant source of community exposure.

Lead industries and lead-related technologies also affected where people lived. As part of the broader industrialization of the city, the lead industry drew huge numbers of immigrants to the city. But lead-related technologies also formed important components of infrastructures and transportation – water pipes, gas and electric networks, streetcars and automobiles – that facilitated the spread of the metropolitan area.

These networks and transportation technologies not only contributed to the general dispersion of people, they changed where social groups lived in relation to each other and in relation to industrial pollution. Up until the late nineteenth century, Baltimoreans of different races, ethnicities and classes lived close to each other, frequently on the same block. All groups were likely to live near industry and commercial districts because the extent of the city was small, limited by transportation technology (foot and horse for the most part). Streetcars, automobiles, water supply and energy supply extended the distance people could live from the city center, extended the scale of the suburban fringe that is, and still remain connected to it. People that moved to these new peripheral parts of the metropolis were primarily wealthy. These new residential developments did not integrate low-income housing into middle class or affluent housing developments, as had been the case in the old part of the city. And many of these new areas explicitly excluded African Americans as well as some other ethnic white groups, such as Jews. The result was increasing social differentiation at the neighborhood scale and a general movement of the affluent and white to the periphery of the city. Meanwhile, industrial production increased, and in some cases concentrated, in the older urban core. The groups that increasingly remained there, African Americans and working class whites, were thus increasingly disproportionately exposed to industrial pollution in the late nineteenth and early twentieth century.

Industrialization

Baltimore was a mercantile city from its beginnings in the eighteenth century through most of the nineteenth century, but in the late nineteenth and early twentieth century, capitalists and city leaders shifted toward investing in manufacturing. It was a slow, if sometimes saltatory, process. The drive for economic survival forced the city's hand in some ways, but some investors also avidly pursued manufacturing as a route to prosperity. The city was a leading commercial port in the early 1800s, but it began to lose ground to New York after the completion of the Erie Canal in 1825. As it turns out, John Quincy Adams was not the first person to dub Baltimore the Monumental City. The first mention came in 1823 from Joseph Gales, the editor of Washington D.C.'s major newspaper, the *Daily National Intelligencer*. The nickname was sarcastic, since Gales criticized Baltimore's lack of support for the Chesapeake and Ohio Canal – a major public works project – despite the city's apparent love of public monuments.[5] Baltimore had turned its back on the canal, which would connect Ohio to D.C. The city looked instead to a project that could allow it to remain competitive with New York: the Baltimore and Ohio Railroad, the United States' first common carrier railroad. Workers, mostly Irish immigrants, completed the first sections in the 1830s, and the railroad network expanded for decades after that.[6] It was successful in many ways, but it did not allow Baltimore to recapture its prominence relative to New York. By that point, New York, among other northeastern cities, was increasing its manufacturing base. And by the 1880s Baltimore's city leaders also sought to attract industry.[7]

---

[5] Humphries, "Who Dubbed Baltimore."
[6] James D. Dilts, *The Great Road: The Building of the Baltimore and Ohio, the Nation's First Railroad, 1828-1853* (Stanford University Press, 1996), 132.
[7] Joseph L. Arnold, "Baltimore Southern Culture and A Northern Economy," *Snowbelt Cities, Metropolitan Politics in the Northeast and Midwest since World War II*, 1990, 27.

Baltimore did shift increasingly toward an industrial base, although it was not until the 1900s that in both image and economy it became an industrial city. Baltimore's industrialization piggybacked on its commercial roots. Its maritime and railroad connections were a great boon to manufacturers in need of supplies and distribution. And much of its manufacturing was geared toward building and repairing the transportation technology – ships, railroad cars, and so on – that had been crucial to its commercial success. Textile manufacturing became a cornerstone of the city's industrial base, but the city also developed strengths in meatpacking, seafood, baked goods and in the canning and preservation of foods. These manufacturing pursuits drew in the city's long-standing role as a mercantile center for the surrounding agricultural and seafood producers.[8] Glass, chemicals (e.g., fertilizers and paint) and printing were other important industries. It was the metals industry, though, that the state of Maryland eyed in the 1890s as the key to industrial prosperity. "Of all the industries, there are none that are more conducive to the general prosperity and wealth of a city than the diversified and extensive enterprises that utilize different metals," the Bureau of Industrial Statistics wrote in 1893. Already, according to the newly founded bureau, Baltimore was "fortunate" in having respected and well-known foundries and machine shops, making pipe fittings, stoves and bells among other products.[9] The city did do well with metals production from 1880 to 1920, with machine and foundry products tripling in value and copper, tin and sheet iron products quintupling. Over the following two decades, all of these industries remained important to Baltimore, with the addition of electrical and automobile-related industries becoming increasingly important.[10]

Occupational Lead Poisoning

Many of the industries that formed Baltimore's manufacturing base entailed the use or handling lead. Clothing, meat packing, baking and fertilizer production generally did not.[11] But lead was commonly

[8] Robert J. Brugger, *Maryland, A Middle Temperament: 1634-1980* (Johns Hopkins University Press, 1996), 152.
[9] Maryland Bureau of Industrial Statistics, *Annual Report*, 1893, 76–77.
[10] *Tenth* through *Sixteenth Census of Manufactures, Reports by State*.
[11] But lead was so pervasive that there were always exceptions. Some clothing manufacture used lead in metal buttons, for example, and lead was incorporated into silk cloth. Workers also used lead blocks to cut cloth. Even bakers occasionally used lead foil for packaging or lead pigments for coloring.

used in many of Baltimore's most significant industries, including canning, sheet metal production, foundry and machine products, printing and shipbuilding (Figure 3). Later industries, especially electrical and automobile manufacturing, also use considerable amounts of lead. These industries infused the city with capital and jobs, but industrialization also brought occupational and community health hazards from lead. Although the problem of occupational lead poisoning was not new, it gained more attention as the workplaces became increasingly industrial. Local and national concern about lead hazards in the workplace ultimately prompted changes in regulation, compensation, insurance, and public health administration in the early 1900s. And concerns about lead in the workplace fueled and shaped concerns about lead hazards in the community and the home, especially as these affected children.

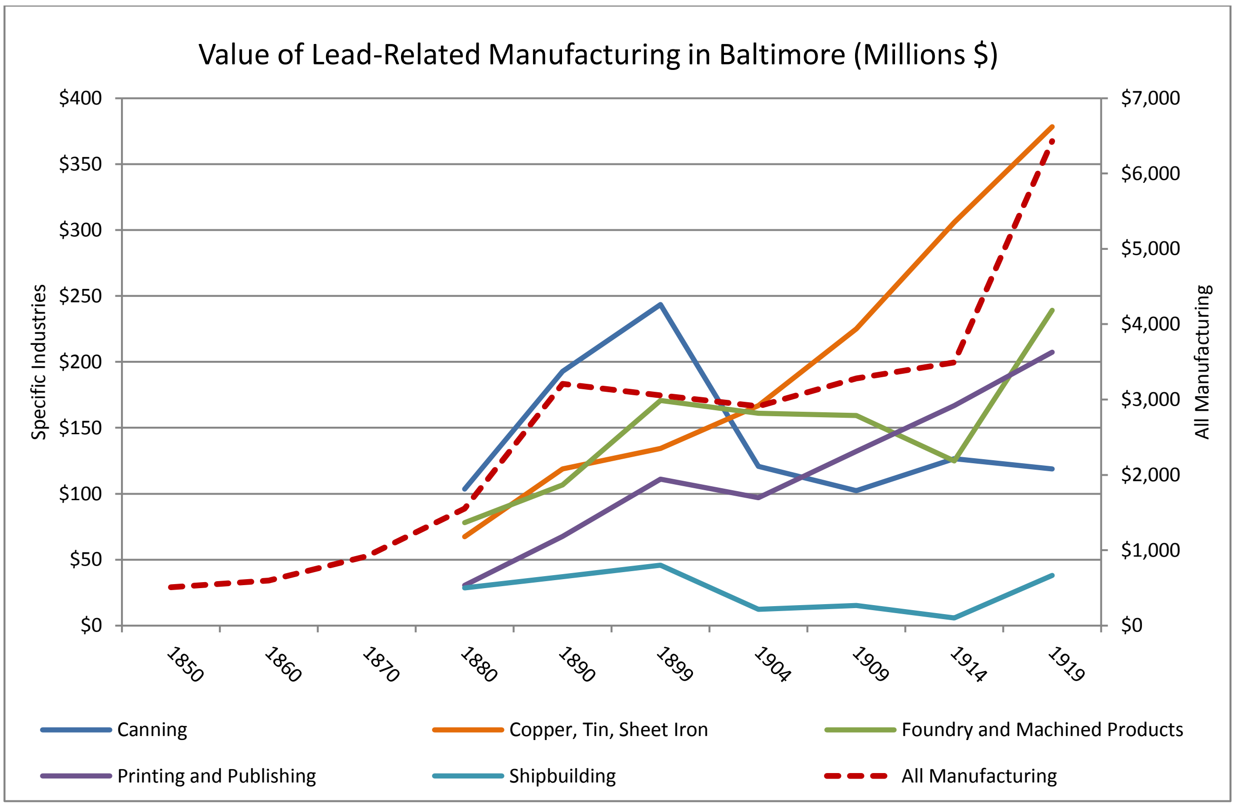


Figure 3: Value of select lead-related manufactured products (in thousands, left axis) and all manufacturing (in thousands, right axis) in Baltimore. As the graph shows, Baltimore industrial economy grew rapidly in this period. Lead-related industries contributed to this industrial growth, but different industries rose and fell in importance. Figures are "values of products," tabulated as consistently as possible across census years with some changing manufacturing categories. The values have been converted to 2009 values using the GDP deflator from Measuring Worth, www.measuringworth.org/usgdp/. After the 1919 census, tracking these general categories of industry no longer makes sense given the diversification of industry and the related changes in census categories. **Source**: *U.S. Census of Manufactures*, various years. **Graph**: Leif Fredrickson.

Since at least early Greek and Roman civilizations, where lead was mined and smelted, people had understood that the metal could pose a health risk. By the end of the eighteenth century, lead poisoning was a well-known problem in painters, such that lead poisoning was often simply referred to as "painter's colic." In the nineteenth century, it was common for painters to grind dry white lead and mix it themselves, but as paint production became increasingly industrialized, ready-mixed paints became more available. Painters were still at very high risk of lead poisoning, but so too were the increasing numbers of workers who manufactured paints, varnishes and enamels that contained lead.[12]

Baltimore industries had a relatively long history of producing lead products for the paint and varnish industry, all of which were increasing in production in America generally in the late nineteenth and early twentieth century. Red lead and litharge were lead oxides used as inputs to various production processes and also, in the case of red lead, used as paint for metal structures like bridges. Baltimore had a few businesses that specifically manufactured litharge and red lead (the latter made by heating the former), but much of litharge and red lead production was made in factories that focused on white lead production. The one area of lead production where Baltimore was truly at the center was lead chrome production. The wealthy Tyson family of Baltimore developed the area's first chromite (chrome iron) mine after discovering it on and near their property near the city in the 1820s and 1830s. Initially, they shipped the ore to Glasgow, Scotland but eventually established the Baltimore Chrome Works in 1844, an endeavor that lasted until 1895. The Chrome Works did not itself make lead chrome, but its location allowed considerable lead chrome production at nearby white lead manufacturers.[13]

White lead production was far and away the most important lead paint product on the national level and in Baltimore. In America, the preservative power of paint was not as valuable as in Europe given abundant and cheap timber. Thus, colonial American homes did not use paint on the inside or the outside. That began to change in the nineteenth century in urban areas where residents began using more paint for ornamental reasons. In 1810, Americans produced 369 tons of white lead; by 1850 they were

---

[12] J. Lewis Smith, "Original Communications," *The American Journal of Obstetrics and Diseases of Women and Children* 17 (1884): 548.

[13] Clayton Hall, *Baltimore: Its History and Its People* (Lewis Historical Publishing Company, 1912), 523–24. The Litharge Paint Company operated in the city beginning in 1901; Maryland Bureau of Industrial Statistics, *Annual Report*, 1901, 205. Anne Arundel and Worcester Counties both had a red lead manufacturer in 1898. Maryland Bureau of Industrial Statistics, *Annual Report*, 1898, 80, 142.

producing 9,000 and by 1860 15,000. After the Civil War production shot up to 35,000 tons, but the initial profitability of white lead led to overproduction and overbuilding of factories, making the business less profitable. Consolidation was one outcome of this; another was the formation of associations and trusts and ultimately, in 1891, the National Lead Company, which controlled a number of large white lead businesses in the country. By this point, white lead production had reached 75,000 tons. As the director of the National Lead Company puffed in 1895, “With practically the same methods as those employed by the ancients” – mixing vinegar with lead to make white lead – “the industry has risen, through the sheer executive intelligence of the present age.”[14]

White lead production in Baltimore increased over the nineteenth century before declining in the late nineteenth and early twentieth century. The French General Reubel was apparently the first to make a foray into white lead production in Baltimore in the early 1800s, going into business with an “accomplished Professor Chemistry.” This operation, however, was not big or long lasting.[15] By 1849, Baltimore had four, meagerly capitalized paint “establishments,” with a total of eight workers.[16] In 1867, as part of a raft of white lead factory building in many cities in Northeast and Midwest, the Maryland White Lead Company built an “extensive plant” in the Locust Point area of Baltimore, inaugurating a new scale of lead paint production in the city.[17] Several other companies also established paint production businesses in the city after the Civil War, such as the Adams White Lead Company, although these were not as large. In the 1890s, the Maryland White Lead Company was absorbed into the large National Lead Company, which was then liquidated in 1896. By the time of a 1915 industrial survey of the city, white lead was listed as a product with local demand but which was “entirely unrepresented” as an industry in

---

[14] William P. Thompson, “The Lead Industry,” in *One Hundred Years of American Commerce ... a History of American Commerce by One Hundred Americans, with a Chronological Table of the Important Events of American Commerce and Invention Within the Past One Hundred Years* (D. O. Haynes & Company, 1895), 436–41.
[15] Mary Barney, *A Biographical Memoir of the Late Commodore Joshua Barney: From Autographical Notes and Journals in Possession of His Family, and Other Authentic Sources* (Gray and Bowen, 1832), 242.
[16] John Leander Bishop, Edwin Troxell Freedley, and Edward Young, *A History of American Manufactures from 1608 to 1860...: Comprising Annals of the Industry of the United States in Machinery, Manufactures and Useful Arts, with a Notice of the Important Inventions, Tariffs, and the Results of Each Decennial Census* (E. Young, 1864), 114.
[17] *Notes for a History of Lead: And an Inquiry into the Development of the Manufacture of White Lead and Lead Oxides* (D. Van Nostrand, 1888), 331.

Baltimore. A major distributor of bulk white lead, Eagle White Lead (later Eagle-Picher), remained in the city as a distributor for the company's factory in Cincinnati. Despite continued manufacture of other types of lead paint, varnish and enamel, the heyday of Baltimore's white lead production was over. Nationally, white lead production continued to increase, peaking in the 1920s (Figure 4).[18]

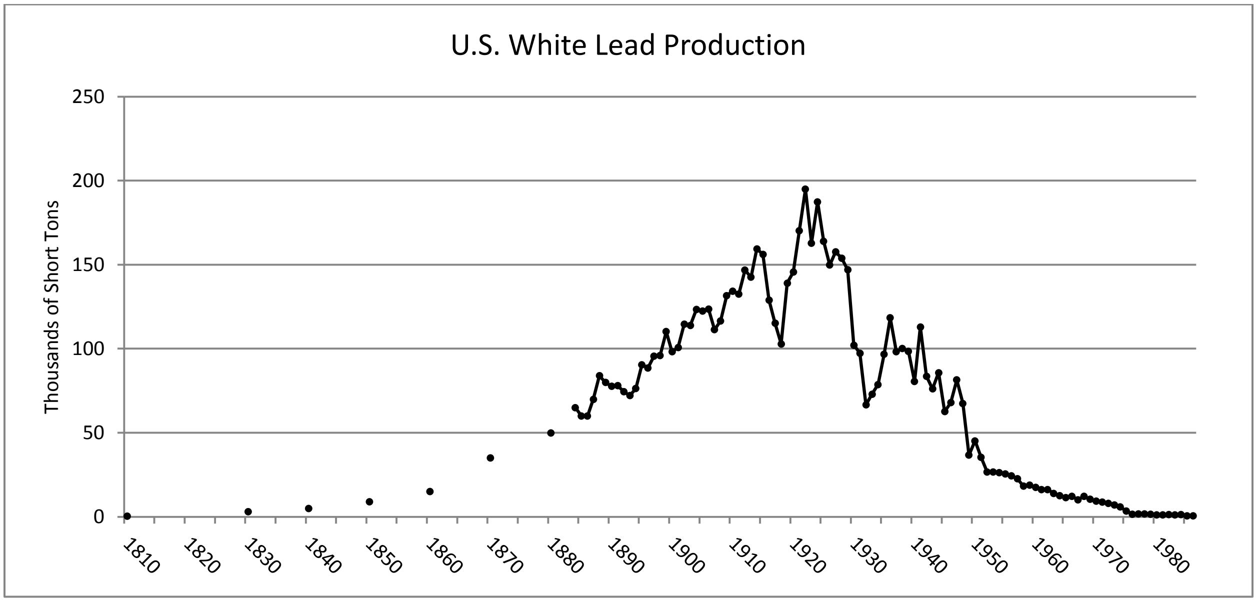


Figure 4: White lead production in the United States increased in the late nineteenth century, peaked in the mid-1920s, and declined again. As white lead production increased, occupational poisoning from this source became a greater concern. **Source**: Chauncey Depew, *One Hundred Years of American Commerce* (D.O. Haynes & Company, 1895) for 1810-1880; Bureau of Mines, United States Geological Survey *Mineral Resources of the United States* and *Mineral Yearbooks* various years. **Graph**: Leif Fredrickson.

Although Baltimore's nineteenth century involvement in lead paint production was extensive, there was virtually no systematic study of industrial work hazards in the city in the nineteenth century, making it difficult to say how many workers in these early paint industries were poisoned. Concern at the local level in nineteenth century was not entirely absent. The Baltimore *Sun* carried stories on lead poisoning from various sources as early as the 1840s, and as early as 1878, the paper mentioned that there had been "public discussion" of the sanitary problems of "noxious vapors arising in certain industries"

[18] J. Edward Aldred and Ernest Illmer, *Industrial Survey of Baltimore: Report of the Industries Located within the Baltimore Metropolitan District* (Baltimore, 1915), vii, Pullen Collection, Langsdale Library Special Collections, University of Baltimore (hereafter, LLSC). Polk's *Baltimore City Directory* lists Eagle White under the ambiguous heading of "white lead manufacturer and dealer," but this report suggests it was just a distributor: "Baltimore," *The Metal Industry*, December 1913, 540. The Sanborn Fire Insurance Map for 1914 also identifies the building as a small one with the description "whole white lead," suggesting it was not a factory.

such as zinc, lead, arsenic and paint.[19] Late in the nineteenth century, there was a growing national and international call by public health and labor leaders for lead paint prohibition due to its occupational hazards. By the early twentieth century many European countries did ban lead paint entirely.

As a result of growing concern, a better picture of occupational lead poisoning began to emerge on both the local and national level in the early 1900s. European studies of industrial health hazards filtered in to the United States and newspapers like the Baltimore *Sun* began carrying articles about lead poisoning.[20] In 1907, the pioneering researcher of chemical hazards, Dr. Alice Hamilton, initiated a series of influential studies of U.S. industries. Lead was a major focus for Hamilton, and some of her studies included Baltimore. Locally, doctors at Johns Hopkins also began investigating occupational lead poisoning. In 1902, a Hopkins doctor noted that an unusually high number of gout patients (10 of 32) worked in trades involving lead.[21] Two years later another Hopkins doctor, Henry Thomas, reviewed the hospital's records of lead poisoned patients up to that point after his curiosity was piqued by dealing with an unusual case of lead poisoning in which the patient became totally paralyzed. Of the 54 patients with lead poisoning that presented to the hospital for care since its founding in 1889, six got lead poisoning from food or medicine, four were undetermined, and the rest of the 44 patients got lead poisoning from their jobs. Of those workers, 28 worked in the paint industry and three worked as enamellers. These numbers suggest that the greatest risk for lead poisoning came from the paint industry.[22]

While jobs that involved producing or applying lead paint were classically associated with lead poisoning, many other jobs entailed hazardous contact with lead.[23] These type of jobs increased in the

---

[19] "Caution," *Sun*, August 5, 1840; "Philadelphia Affairs: The Lead Poisoning Case – Cooperation Among File Workers," *Sun*, July 9, 1887; "Our Paris Letter – Sanitary Subjects," *Sun*, August 28, 1878.

[20] "The Dangerous Trades," *Sun*, October 22, 1902; Hamilton, "Lead Poisoning in 28 Trades," *Sun*, March 19, 1911.

[21] Dr. Futcher, "A Case Showing the Deformities of Chronic Gout," *Bulletin of the Johns Hopkins Hospital*, 13, no. 134, (1902), 116. The association between lead poisoning and gout in fact went back to the early 1800s and continues to be an association that is noted if not fully understood. David S. Newcombe and Dwight R. Robinson, *Gout: Basic Science and Clinical Practice* (Springer, 2012), 142.

[22] Henry Thomas, "A Case of Generalized Lead Paralysis, With a Review of the Cases of Lead Palsy Seen in the Hospital," *Bulletin of the Johns Hopkins Hospital* 15, no. 159 (June 1904): 212. Thomas' article does not give specific numbers on race, sex or age, but it does specify only one case of child lead poisoning and all of the cases that specify sex refer to males (except the child, who was female). It makes no mention of race.

[23] Another classic occupation susceptible to lead poisoning was file cutting. File cutters certainly existed in Baltimore in the late nineteenth century, but only appear to have served the local market and so were not a very

early twentieth century along with the vast expansion of industrial production. A bewildering assortment of occupations yielded lead poisoning cases. For example, between 1911 and 1913, the state of New York counted 284 deaths from occupational lead poisoning. One of those deaths was a woman who worked in the artificial flower business. It is not clear how she contracted fatal lead poisoning, although flower makers used lead blocks to cut and stamp flowers, and they may have used lead pigments. This apparently hazardous trade, which relied on low wage, domestic work of recent immigrants, was no small business in the early 1900s.[24] Baltimore had its share. In 1912, 140 artificial flower makers worked in Baltimore. Ninety nine were women and 24 were girls.[25] That this apparently innocuous trade could be deadly is just one indication of the permeation of lead in the workplace. Many other diverse jobs were also at risk. The use of lead in various aspects of metals processing – for parts, solder, tempering, polishing and buffing – resulted in lead poisoning in the manufacture of coffins, explosives, scientific instruments, musical instruments and cutlery according to one report from Ohio. The saturation of the world with lead pigment in paints and varnishes also resulted in poisoning related to the manufacture of bicycles, carriages, cabinets, vaults, flags and regalia.[26]

But there were some industries that struggled with lead poisoning more than others. These included those who labored primarily with lead, or with products where lead was a conspicuous component. The poster children – and unfortunately some were children – for lead poisoning remained

---

large labor force. Mechanization helped end this kind of occupational exposure, though molten lead was still used to temper files and workers in this capacity sometimes endured poisoning. Baltimore capitalists facilitated the mechanization of file making in America by buying the patent rights from a French inventor in 1860. They built their factories in Rhode Island instead of Baltimore and the hand cutting trade died out slowly. The *Baltimore Directory* (Baltimore: John Murphy, 1845), lists a "file smith,"60; *Wood's Baltimore City Directory* (John Woods, 1860), 24, 69, 380 for file cutters listed in the city; "Wanted," *Sun*, February 18, 1868, 3, seeks file cutter; and *Polk's Baltimore City Business Directory* (Baltimore: R.L. Polk and Company, 1890), 146, lists the Atlantic File Works – a manufacturer that was probably not using traditional file cutting workers. Henry Disston & Sons, Inc, *The File; Its History, Making and Uses: A Description of the Development of the File from the Earliest Times to the Present Day; a Brief Statement of the Modern Methods of File Making; a Description of the Great Variety of Files and the Numerous Uses to Which the Tool Is Adapted* (Henry Disston & Sons, Inc., 1921), 25–26. Apparently, the Baltimore capitalists initially intended to build a factory in Baltimore but for unknown reasons decided New England would be a better site, and so sited their company, the American File Company, in Rhode Island. Bishop, Freedley, and Young, *A History of American Manufactures from 1608 to 1860...*, 731.

[24] Frederick Hoffman, "Industrial Accident Statistics," *Bulletin of the U.S. Bureau of Labor Statistics*, March 1915, 48. Mary Van Kleeck, *Artificial Flower Makers* (Russell Sage Foundation, 1913), 155.

[25] Maryland Bureau of Industrial Statistics, *Annual Report,* 1912.

[26] Ohio State Board of Health, *Annual Report*, 1916, 795–96.

painters and manufacturers of paint. Workers who smelted and shaped lead into pigs, sheets, balls, solder and babbitt (a metal alloy used to make bearings) were also at very high risk of lead poisoning, as were those worked with metallic lead that was a key component of type metal, batteries and many plumbing pipes and fixtures. Other trades not explicitly associated with lead became associated with lead poisoning because they used a large amount of lead. Brass alloys, for example, were ¼ to 7% lead, and brass foundries often had separate rooms and kettles for melting lead to make brass.[27] Lead was also a key ingredient in many rubber products.[28] The pervasive need for soldering in metal manufacturing – it was the most used alloy in the mechanical arts[29] – was hazardous. Can makers, for example, who soldered lids on were at high risk. The budding electrical industry also used copious amounts of solder (as well as lead-acid batteries). While countless industries used lead pigment in some fashion, workers in pottery and glass manufacturing used a lot of it. Glass was also made with lead itself and, perhaps even more importantly, workers used lead putty to place glass. Ornamental glass production in employed leaded glass, lead glazes and to require a lot of glass cutting (and thus lead putty use). Two other industries had high amounts of lead poisoning as a result of a combination of lead sources: ship building and automobile manufacture. These used solder, babbitt bearings, lead paint and varnish, lead-acid batteries (in automobiles), and various other metallic lead components.[30] Baltimore had workers in all of these jobs in the early 1900s. Most of these occupations increased over the first decade of the twentieth century, and some were either newly created (such as automobile and rubber manufacture) or became significant enough to be counted separately in the census (as in type, solder and lead production) (Figure 5).

[27] George Webster, *Report of Commission on Occupational Diseases To His Excellency Governor Charles S. Deneen.* (Warner Printing Co., 1911), 81.
[28] Alice Hamilton and Royal Meeker, *Industrial Poisons Used in the Rubber Industry* (U.S. Government Printing Office, 1915).
[29] “A Practical Treatise,” *Sun*, June 28, 1908, 19.
[30] For examples of breakdowns of occupational lead poisoning from Ohio, Massachusetts and New York, see: Ohio State Board of Health, *Annual Report 1914*, 794–794; John Bertram Andrews, *Lead Poisoning in New York*, 1912, 265. U.S. BLS *Monthly Review*, March 1915, 47-48 and December 1917, 189.

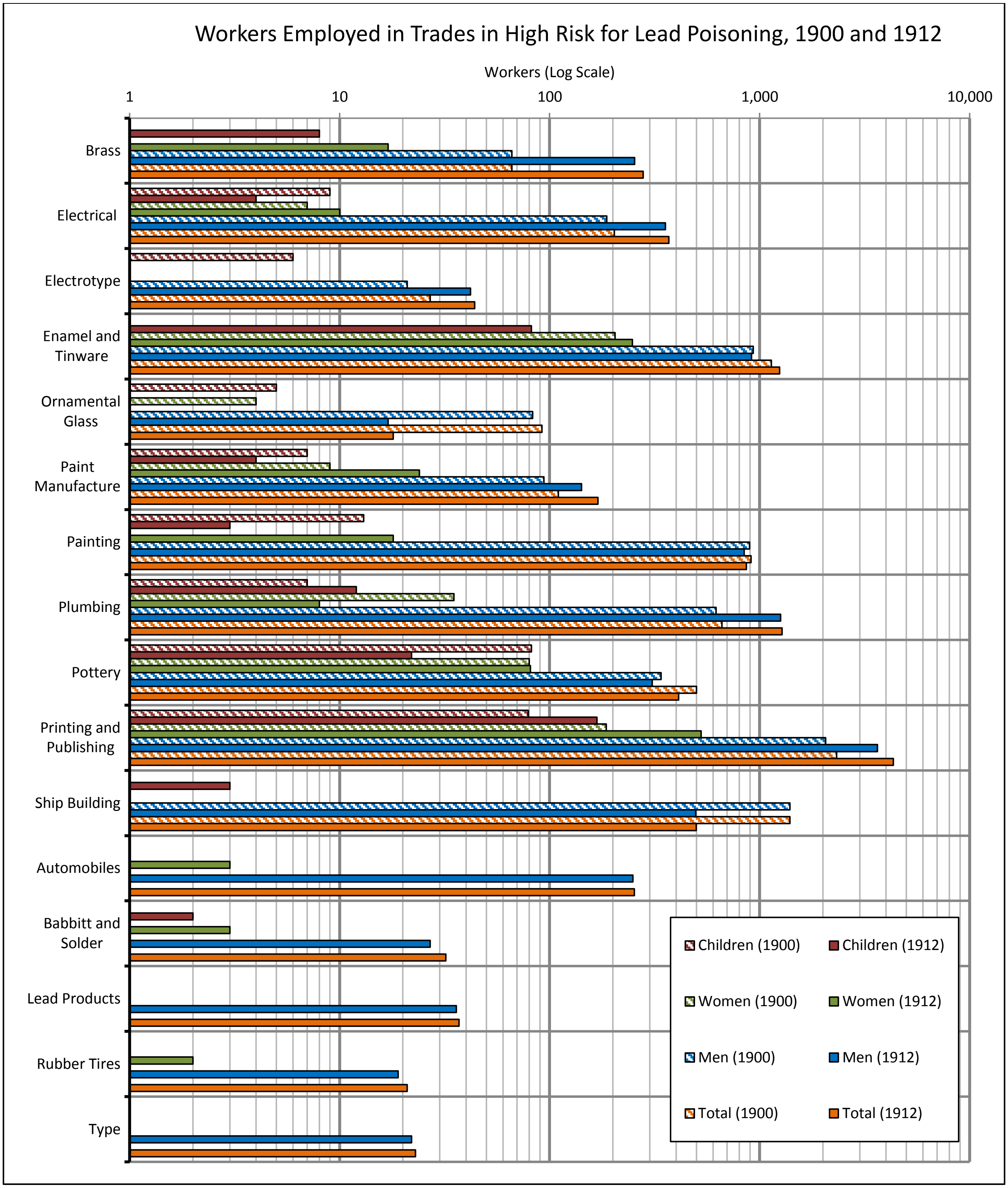


Figure 5: Workers employed in trades at high risk for lead poisoning in Baltimore, 1909 and 1912. As the graph shows, thousands of workers in the city worked in these trades, including women and children. In general, employment in these trades increased from 1900 to 1912, although some occupations such as ornamental glass and shipbuilding declined in number. Other occupations became significant enough to be enumerated separately on the census in 1912, including babbitt and solder, lead products and type. Automobile and rubber workers were new occupations. **Source**: *U.S. Census of Manufactures*, 1900 and 1912. **Graph**: Leif Fredrickson.

In addition to lead paint, the type/printing business and metals production seem to have been particularly hazardous to Baltimore workers in the first two decades of the twentieth century. Most or all of the metal used as type in printing in the nineteenth and early twentieth century was lead. In the main forms of printing that dominated this period (linotype, monotype, stereotype and electrotype) lead was cast as type used in printing, and then the type was re-melted to be used again.[31] Although type metal was re-used, a significant amount was lost in the process. That lead went somewhere – as fumes and particulate that arose from smelting or as solids that fell off in process of casting, moving and using the type. In 1850, for example, about 20% of the type metal was lost with each cycle of re-use.[32] In terms of occupational lead poisoning, the greatest hazard came from the creation of lead dust that resulted from type being used and moved around or from the crumbly slag and powdery lead oxide that were byproducts of the smelting process. But fumes from melting lead could also be hazardous.[33]

Baltimore was not the center of printing that New York, Boston and (later) Chicago were in the nineteenth century, but as a large city it had a substantial printing business and many newspapers. Initially, foundry work had been part of a printing business, but as printing operations grew in the nineteenth century, type foundries were often run as a separate business. Into the twentieth century, however, some printers still had their own foundries as did newspapers. Samuel Lower and Company built Baltimore's first type foundry in 1805. 1850, the city still had only one (out of twenty in the country), casting about 220 pounds of type per day with type metal that was 75% lead. By 1873, the city had a second type foundry. By 1893 there were at least four in the city. These were listed as foundries to be incorporated into the American Type Founders' Company, a corporation that sought to buy up most of

[31] One the technical processes and use of lead, see *The Encyclopedia of Founding and Dictionary of Foundry Terms Used in the Practice of Moulding* (Wiley, 1894); Alice Hamilton and Charles Henry Verrill, *Hygiene of the Printing Trades* (U.S. Government Printing Office, 1917).
[32] James Willcox, "Type Founding," *Annual Report of the Commissioner of Patents*, 1851, 403.
[33] Hamilton and Verrill, *Hygiene of the Printing Trades*. Heating lead to 500 degrees Celsius or more is particularly dangerous in terms of the production of fumes (small particles). According to Hamilton's study, type casters heated lead up to about 450 degrees Celsius, so fumes were probably not as hazardous as dust. See page 44 of Hamilton and Perinne Hoet, "Speciation of Lead in Occupational Exposure and Clinical Health Aspects," in *Handbook of Elemental Speciation II-Species in the Environment, Food, Medicine and Occupational Health*, 2005, 252–276.

the type foundries in the nation. Baltimore also had many smaller printing companies and dozens of newspapers, including several dailies.[34]

In 1915, Alice Hamilton studied 130 printing plants in seven cities, including Baltimore, considered to have "typical industrial conditions." Hamilton's study found ample evidence of lead contamination of the workplace in type foundries, printing presses, and newspaper rooms. To save space, some Baltimore newspapers had consolidated their composing room and type setting room. That meant that re-melting and casting of type went on alongside the formation of type into pages, and so a much larger group of workers was exposed to lead. One of these rooms had 33 casting devices, none of them ventilated. But some Baltimore establishments did use fans to keep fumes away from workers and oiled floors to keep down dust. These precautions were probably the result of agitation by the Baltimore branch of the International Typographical Union, which Hamilton noted had been active in inspecting shops and offering suggestions for better practices.[35]

Type casting was a specialized form of metal production, and in general, all types of metal production – and metals were one of Baltimore's industrial specialties – held lead hazards. Even relatively "clean" processing methods that were not geared toward the production of lead had lead hazards. For example, Baltimore was home to large copper refining factories that used the relatively clean electrolytic (i.e., chemical) method of refining copper. Still, this production method relied on some smelting with heat, and it used lead to help remove impurities from the copper.[36] Brass and other non-ferrous metal production also employed a lot of lead. Canning factories and tin can producers also used lead in solder to seal cans and the manufacturers of solder in the city, which grew up in tandem with the canning business also would have been hazardous work places. Both solder and babbitt manufacturing were also important auxiliaries of the transportation manufacturing business (railroad cars, ships and automobile). There was

---

[34] Scott E. Casper et al., *A History of the Book in America: Volume 3: The Industrial Book, 1840-1880* (University of North Carolina Press, 2009), 44. Howard, *The Monumental City*, 202. Willcox, "Type Founding," 403. This report suggests a different foundry was built in Baltimore around 1818, but one or perhaps both of these went out of business, as did many in the nation as a result of too rapid expansion of the printing business. In 1850, Baltimore had five dailies.

[35] Hamilton and Verrill, *Hygiene of the Printing Trades*.

[36] Stirling Graham, "A Marvel of the Metallurgists' Art," *Sun*, November 26, 1933, MS6.

no systematic examination of metal and lead manufacturing in the early 1900s for lead poisoning. But metal workers did become poisoned enough with lead to be hospitalized and in some cases they died. Johns Hopkins recorded tinners, can makers and brass workers with serious cases of lead poisoning around the turn-of-the-century.[37] In 1913, as the state began collecting more information on occupational hazards, it recorded a lead and copper worker with lead poisoning, along with two painters and one worker in a cement factory.[38]

Workers compensation laws shined more light on the nature and extent of occupational lead poisoning in Baltimore. Maryland's first attempt at such a law in 1902 – the first in the nation – was declared unconstitutional by the Supreme Court in 1904, but the state passed a viable law in 1914. Initially, however, lead poisoning was not covered by the law. Around 1915 a Baltimore painter contracted lead poisoning, becoming "incapacitated," but the State Accident Commission determined that his case was not covered by the law. Although the point of worker's compensation was to do away with determining who was at fault, another distinction remained: Whether lead poisoning was an "occupational disease" or an "accident." This distinction was a common, though disputed, aspect of worker's compensation law at the time, and the Commission ruled that lead poisoning was a disease and disallowed the claim.[39] This distinction held until the late 1920s when the state began ruling that on the job poisonings did constitute an "accident" or "injury" that could be covered by worker's compensation.[40]

Although the state government began receiving and granting claims related to lead poisoning in the nineteen teens and twenties, insurance companies that dealt in worker's compensation (among other insurance fields), sought better information and helped reveal the extent and nature of lead poisoning. In 1913, Prudential's famous statistician, Frederick Hoffman, carried out an analysis of the Johns Hopkins

[37] Thomas, "Generalized Lead Paralysis," 211–12.
[38] Maryland Bureau of Industrial Statistics, *Annual Report 1913*, 162,
[39] Although determining fault was no longer the issue, the Commission nevertheless made it clear that the painter was at fault for failing to wash his hands before eating lunch. Maryland State Accident Commission and Maryland Court of Appeals, *Reports of Cases under the Workmen's Compensation Act Decided by the State Industrial Accident Commission and the Court of Appeals of Maryland* (George W. King Printing Co., 1916), 141.
[40] Mark L. Matulef, "On-The-Job Lead Poisoning: Early Judicial Treatment of Claims for Recovery from Exposure to Workplace Lead," *University of Baltimore Journal of Environmental Law* 10 (2002): 1.

Hospital that revealed 41 cases of lead poisoning that had led to admission to the hospital between 1902 and 1911. Almost all of these were white males – three were black males and one was a white female. These demographics did not necessarily reflect the lead poisoning risks to Baltimore's city as a whole. Although Johns Hopkins Hospital explicitly accepted patients without regard to sex, race, age or ability to pay, it was not particularly popular among African Americans. In addition to these demographic characteristics, Hoffman's study also suggests a slight increase in annual lead poisoning cases to Hopkins in the first decade of the twentieth century over the end of the nineteenth century.[41]

While men were the most conspicuous victims of lead poisoning in the early twentieth century, women were also afflicted. That cases of women with lead poisoning were recorded less often was in part a matter of fewer of them working in these trades, but it was also because, as Hamilton found, women workers had less steady work and did not have the help of labor organization to track and record lead poisoning cases.[42] Increasingly, more women did work in these trades, however.[43] Even in 1900, a substantial number of women worked in some of the most dangerous trades for lead poisoning, including the type/print business, tinware, enamelware and pottery. In general, women workers increased in numbers in these occupations over the next decade and sometimes entered occupations that they had been completely absent from (Figure 5).

This trend continued over time, so that some of the most notable cases of occupational lead poisoning in Baltimore occurred in women. Glass work, for example, was dangerous work for lead poisoning. Glass cutters who ground and polished glass – particularly cut glass or crystal – could get lead

---

[41] Hoffman's study, unlike Thomas's, did not include lead poisoning victims who went to outpatient services but were not admitted, so the comparison between the two studies for admitted lead poisoning cases is: 33 from 1892 to 1903, and 41 from 1902 to 1911. Frederick Ludwig Hoffman, *The Statistical Experience Data of the Johns Hopkins Hospital: Baltimore, Md., 1892-1911* (Johns Hopkins Press, 1913); Thomas, "Generalized Lead Paralysis." On Johns Hopkins Hospital's policy with regard to patient and how black Baltimoreans viewed the hospital, see Samuel Roberts, *Infectious Fear: Politics, Disease, and the Health Effects of Segregation* (University of North Carolina Press, 2009), 188.

[42] Alice Hamilton, *Lead Poisoning in Potteries, Tile Works, and Porcelain Enameled Sanitary Ware Factories* (U.S. Government Printing Office, 1912), 45–47.

[43] Alice Hamilton, *Women in the Lead Industries* (U.S. Government Printing Office, 1919), 5.

poisoning by inhaling the rouge or putty powder.[44] By 1904, at least one male glass worker had absorbed enough lead to send him to the hospital.[45] Another source of lead in this work was color pigment used in some types of decorative glass work. In Baltimore, only a few women worked in decorative glass in 1900 and none did in 1912. But in 1930, six young women workers in a glass factory got lead poisoning after the east Baltimore factory introduced new glass decorating methods. After the women complained about getting sick from dry paint fumes, the company provided masks but these were not adequate and the workwomen still became sick. One 23 year old woman was hospitalized while the others were "not regarded as serious," according the *Sun*, and were recovering at home.[46]

As with women, African Americans increasingly showed up on lists of lead poisoned workers (as I discuss in the next section) probably for the same reason as women: They increasingly worked in industries where lead was a hazard, and the better tracking of occupational diseases meant that lead poisoned African Americans were now counted.

Children, on the other hand, were increasingly less likely to found among those with occupational lead poisoning. Child labor was common in the nineteenth and early twentieth century, and many of these child laborers worked around lead hazards. In 1868, for example, job postings for a file cutter's apprentice in Baltimore sought workers between the ages of 14 and 16.[47] In 1900, there were a number of children employed in dangerous trades similar to those that employed a lot of women – enamel, pottery and printing (Figure 5). A state survey in 1906 of child labor found six girls employed in soldering; two of them were younger that fourteen and others employed in ornamental glass, canning, type, brass, tin and several other metal trades.[48] Although child labor in many trades declined in the first decade of the twentieth century, child laborers were still at risk of lead poisoning. In 1911, two boys, around 15 years old, worked in babbitt and solder manufacture, and four other children of the same age worked in paint

[44] George Martin Kober and William Clinton Hanson, *Diseases of Occupation and Vocational Hygiene* (P. Blakiston's Son & Company, 1916), 637.
[45] Thomas, "Generalized Lead Paralysis," 212.
[46] "Sixth Woman Made Ill from Lead Poisoning," *Sun*, January 8, 1930, 26.
[47] "Wanted," *Sun*, February 18, 1868, 3.
[48] Maryland Bureau of Industrial Statistics, *Annual Report 1907*, 46-47.

manufacturing. Smelters specifically advertised for "boys."[49] In 1912, however, Maryland and several other states had passed legislation banning children under age sixteen from jobs in the manufacture or packing of lead paint (white and red lead), as well as banning them from soldering.[50] These laws were not always enforced.[51] And children continued working in many industries that still presented the risk of lead exposure. When Hamilton studied the type and printing business in Baltimore around 1915, for example, she observed boys working on their hands and knees to sweep up lead scrap and, in one case, having the task of picking out usable lead and other metals. In another print shop in the city, a boy had the job of blowing the dust out of type cases, a job well-recognized as highly hazardous.[52] But over time child workers in these occupations did decrease.

In the first half of the twentieth century, occupational lead poisoning cases and deaths fluctuated. Incomplete data make it hard to see trends, but it does seem that deaths from occupational lead poisoning increased in the first two decades of the twentieth century, peaking during World War I when industrialization when into high gear. Given the relatively high death rates, it is likely that non-fatal cases were also very high. However, not only were cases not officially recorded (by the BCHD in any case) but many were probably undiagnosed. After detailing the frightening exposures of workers to health hazards during the production of explosives, Dr. David Edsall, one of the leading experts on lead poisoning wrote, there are "so many ways in which our old friend lead is used that there are many more people exposed to it than to all the poisons used in explosives… There are many more cases than we usually recognized…" Massachusetts General Hospital, for example, recorded 146 cases of lead poisoning over a five year period before 1916. In that year, the hospital set up a special program to have workers in lead industries sent to the hospital. It then recorded 146 cases in one year alone. There was a good deal of lead poisoning

[49] Classified ad for Brooks Solder and Metal Works, *Sun*, June 9, 1912, 3.

[50] Code of Maryland 1912, Article 100, Chapter 731, "Child Labor – Work, Hours Of, in Factories, Employment of Minors," in BSI, Annual Report 1912, Appendix, 2. Illinois seems to have been the first state to ban child labor in the lead paint industry in 1903. National Consumers League, *Child Labor Legislation*, 1905, 37. Other states passed similar legislation by 1912. Charles Lionel Chute, *Child Labor Laws in All States* (National Child Labor Committee, 1912).

[51] In 1913, a boy in Maryland got "solder poison from fumes of solder." This was probably lead poisoning, but in any case it was a violation of the prohibition against children working in soldering. Maryland Bureau of Industrial Statistics, *Annual Report*, 1913, 47,

[52] Hamilton and Verrill, *Hygiene of the Printing Trades*, 58.

to find when a trained person looked for it, Edsall concluded, and a good deal that was usually overlooked.[53] Concern about monitoring occupational lead poisoning before and during the war, however, helped sparked new initiatives in the following decades, in Baltimore and beyond.

The Rise of Municipal Industrial Hygiene, 1910s-1930s

In the wake of increasing attention and legislation about workers health, the Baltimore City Health Department (BCHD) moved to bring industrial hygiene into its administrative orbit in the 1920s and 1930s. Industrial hygiene was a relatively new aspect of public health, and the BCHD was eager to become involved with this new field as its importance rose and as the importance of other aspects of public health declined. In 1931, Wilmer Schulze, the Chief of the BCHD's Chemical Technology for the Bureau of Chemistry and Food, defined industrial hygiene as "all factors influencing the health of industrial workers, such as occupational disease, industrial accident prevention and environmental conditions." These were important to think about, Schulze noted, because such a large proportion of the workforce was engaged in industrial work. He noted that most states had passed worker's compensation laws and employers were taking precautions to prevent health problems. The health department, he stated, would be targeting work environments that contained poisonous chemicals and harmful dusts, noting that the constant innovation in chemical processing made public health monitoring a necessity. Of the many known industrial diseases, Schulze listed a few that showed the importance of industrial hygiene: carbon monoxide poisoning, benzol poisoning, silicosis and lead poisoning.[54]

Although the city health department's capacity was extremely limited in the early 1900s with regard to industrial disease, it was helped along by the decline in communicable diseases and its use of Maryland state law and capacity. Although many communicable diseases remained serious health problems in Baltimore in the first half of the twentieth century, morbidity and mortality of many communicable diseases declined. Reductions in these diseases helped free the BCHD to concentrate on other aspects of health, shifting more funding and personnel to industrial hygiene.

---

[53] David Edsall, "Medical-Industrial Relations of the War," *Bulletin of the Johns Hopkins Hospital*, September, 1918, 197-99.
[54] BCHD, *Health News*, February, 1931, 102-103.

The Health Department's move to industrial hygiene was also facilitated by state law and capacity. Beginning in 1912, Maryland law required physicians to report industrial diseases to the State Board of Health. The city health department, which often reminded physicians of this fact in its publications, was not a direct recipient of these reports initially.[55] But by the 1930s, the state had "deputized" the Baltimore Health Department to receive reports of these diseases. The Department was eager to collect this information, writing letters to hospitals and physicians and publicizing the new arrangement in its newsletter. While the reporting requirements and the BCHD's deputation did yield important information for the department, these industrial diseases were chronically underreported. In 1932, the Department noted that there had been "some response" from physicians and hospitals.[56] The following year it was more candid, noting that there was a "laxity in compliance" with reporting legislation, a "negligence" the BCHD attributed in part to "the fact that compensation for occupational disease is not provided for in Maryland."[57] And while the BCHD could receive reports from the State Accident Commission these were "incidental," as Schulze put it, because they were only those cases that involved workmen's compensation claims. Thus Schulze lamented in 1932 that the BCHD still did not know the extent of lead poisoning in industries in Baltimore.[58]

While there was little the BCHD could do to force physicians and hospitals into better reporting of industrial disease, the department could produce its own knowledge about the industrial environments in which people worked. Doing so, however, would require administrative reorganization and help from the state. Administrative restructuring had been going on continuously in some ways for years, but it proceeded rapidly in the 1930s, especially under Huntington Williams who became the Commissioner of Health in 1932. By 1933, the BCHD had consolidating activities relating to sanitation, gas and water

---

[55] "Physicians Columns," *Baltimore Health News,* September 1925, 58. All *Baltimore Health News* in Maryland Room (hereafter, MR), Enoch Pratt Library (hereafter, Pratt). Other reportable industrial diseases included poisonings from phosphorus, arsenic, mercury, other compounds, anthrax, or "compressed air illness" or "from any other ailment or disease contracted as a result of the nature of the patient's employment." From *Annotated Code, 1924, Sec. 14, 1912, Ch. 165*.
[56] Baltimore City Health Department (BCHD), *Annual* 1932, 220. All BCHD *Annuals* in MR, Pratt.
[57] BCHD *Annual* 1933, 286-288.
[58] Memo Schulze to Jones, March 18, 1932, in Folder Lead Poisoning by Burning Battery Cases 1932-1934, Box 3.3-3.4, George Huntington Williams Papers (hereafter GHW Papers), Alan Mason Chesney Medical Archives (hereafter AMCM Archives).

services, and industry into a Bureau of Environmental Hygiene in the hopes of increasing the profile of public health in these arenas. It pushed hard into industrial health, creating a training class for inspectors and assigning three of its inspectors to industrial health. It also began carrying out systematic surveys of industries. A smaller survey in 1932 targeted plants deemed to be the most hazardous including laundries, paint and enamel manufactories, and clothing producers. The cases brought to the attention of the BCHD included one or two cases each for poisonings related to dust, hydrogen sulphide, arsinine, mercury, volatile solvents, and acid fumes, and 14 cases of skin infections. The most prevalent problem was lead poisoning, with 16 total cases – six from scrapping ships, three from scrapping storage batteries, one from lead smelting, and six from "miscellaneous" industries.[59]

In 1933, together with the State Commission of Labor, the BCHD carried out a larger study of 2938 establishments employing about 50,000 people. The study found 36 hazardous substances in use in various industries, including chromium, carbon monoxide, dusts, lacquer and paint fumes, and lead. A few others hazardous chemicals, such as mercury and arsenic, were also found but only in a few industries. The study also examined the work environment and safety and sanitation measures, including lighting, ventilation, washing facilities and so on. In terms of occupational diseases, the BCHD identified 38 cases. Twenty eight of these were some form of dermatitis. Additionally, there was one case each of benzol, carbon monoxide, and nitrous gas poisoning. The remaining seven cases were lead poisoning cases.[60] Most of the lead cases again came from the scrapping of old ships – a burgeoning industry that Baltimore was at the center of[61] – that had been painted with lead paint and which workers cut into pieces using acetylene torches and little protection.[62]

---

[59] BCHD *Annual* 1932, 220-221.

[60] The BCHD did not state the percentage of industries studied. BCHD *Annual* 1933, 286. BCHD *Annual* 1934, 201, clarifies that the survey was begun in 1933 and completed in early 1934, so was not a continuation of earlier surveys including the preliminary one carried out in 1932.

[61] "New Metals for Old: Aged Ships, Cars and Junk Are Base of Huge Industry," *Sun* July 12, 1936, SM6. Curtis Bay was a "leading center for scrapping ships," including ocean liners and obsolete military ships from World War I.

[62] BCHD *Annual* 1933, 286-288. The BCHD also made special studies of dermatitis in the vegetable packing industry and carbon monoxide in poisoning in storage garages.

The surveys still did not fix the problem of underreporting because the BCHD remained at the mercy of what diseases physicians reported or what problems made their way to the Accident Commission. In addition, the surveys of industries took place during the depths of the Great Depression when industry was at a "low ebb" of activity.[63] Nevertheless, the conditions were bad enough and there were enough cases of health problems to catalyze action. In the end, the surveys proved to the BCHD what it had expected – that work environments were a health problem – and provided a justification for its involvement as a monitor, educator, and regulator of these environments.

Despite asserting the need for regulation, the BCHD did not have the power to enforce state occupational regulations and so focused on educating industrialists about better working conditions. The department was encouraged that better ventilation and better sanitary facilities for workers had been accomplished through education without legal action.[64] For example, in 1932, the BCHD had begun investigating an insecticide factory where an employee had become sick after being exposed to lead dust. The company had a history of lead poisoning, and this was the second case in a year, but the company was, according to Schulze, "very cooperative," and had provided filter masks, hygiene education, and time to for workers to change clothes and shower. It had also forbidden eating during work hours and had moved the worker who became sick to another position.[65] Schulze likewise managed to eliminate (for a time) the lead poisoning cases from cutting old ships up by providing masks and education to workers. In other cases, like one lead smelting factory the BCHD met with, employers were less responsive and did little to improve conditions.

Eventually, the push for reform resulted in a new state occupational disease law that gave the city greater authority and ultimately helped to curb occupational lead poisoning. Legislators introduced several reform bills in the second half of the 1930s, but it was not until 1939 that one of these finally passed. The new Occupational Disease Law of 1939 provided for an independent state medical board and

[63] BCHD *Annual* 1933, 286.
[64] BCHD *Annual* 1932, 221.
[65] Memo Schulze to Jones, March 18, 1932, Folder Lead Poisoning by Burning Battery Cases 1932-1934, Box 3.3-3.4, GHW Papers, AMCM Archives.

made BCHD an official co-investigator of occupational diseases as well as an official entity for notifiable disease reporting. Perhaps most importantly, it gave the BCHD the power to enforce state regulations. The state beefed up those regulations, including those for lead, effective in 1941. Although the frenzied industrial output of World War II increased occupational hazards and hindered investigations, in the long run the new law helped reduce occupational diseases in the city. Occupational lead poisoning cases and deaths fell in absolute numbers and as a percentage of all occupational diseases reported (Figure 6).[66]

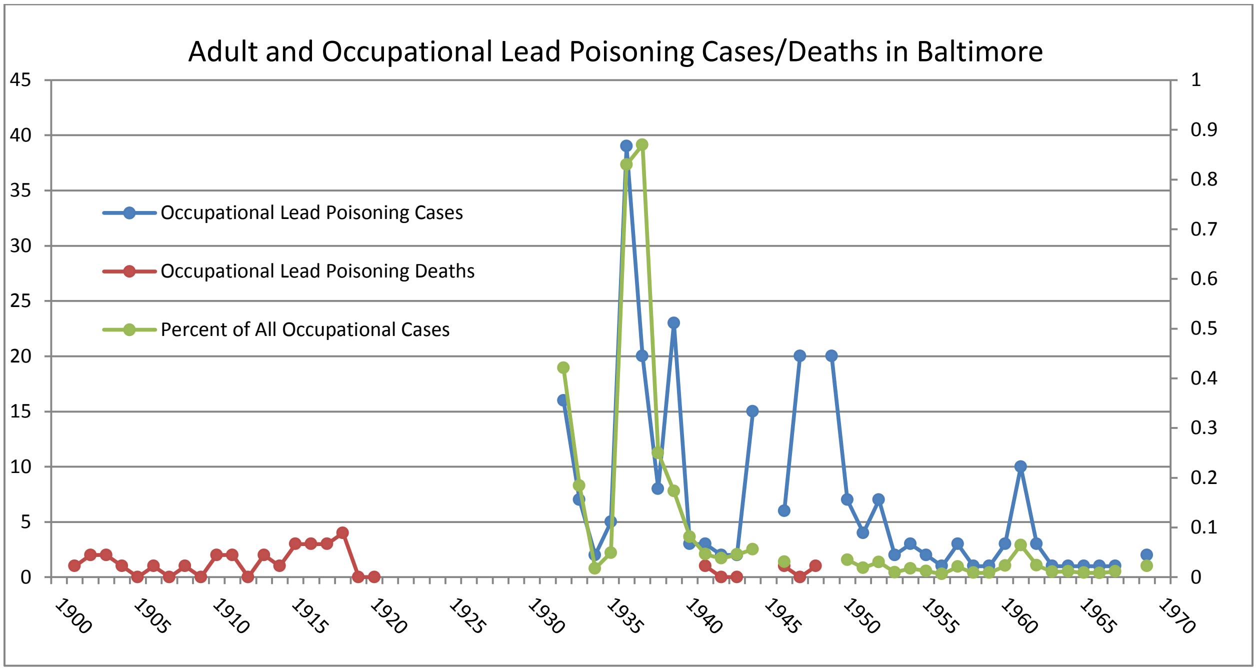


Figure 6: Occupational/adult lead poisoning deaths and cases, with cases as a percentage of all occupational disease cases. The graph shows that lead poisoning cases and deaths increased in the early twentieth century, and then fell around mid-century (though there was considerably variability). It also shows while lead poisoning cases once constituted a very large proportion of reported occupational diseases, close to half at one point, lead poisoning cases fell to just a few percent of all occupational diseases by mid-century. Note on data: adult lead poisoning cases were almost always occupational poisonings, so I have combined these to get a more complete data set. **Sources**: BCHD, *Annuals*, various years. **Graph**: Leif Fredrickson

Industrial Processes and Pollution

Beyond the work environment, the industrialization of Baltimore created lead hazards for the city's communities. There were several routes by which lead from industry could end up in the bodies of those living in surrounding communities. One route was the air pollution from vapors (gaseous particles) and smoke or fumes (solid particles suspended in the air) created directly from processing lead. People

[66] BCHD, *Annual 1939*, 11-12, 321-332; "New State-Wide Regulations to Control Occupational Diseases," *Baltimore Health News*, November 1940, 81-82. The state set lead concentration limits at .15 milligrams per cubic meter.

could absorb lead by inhaling this polluted air. Lead also found its way into people's bodies via the pollution of land and water. Many types of lead processing and many steps within each process could produce small particles – dust – that were composed of or contaminated with lead. These were, as mentioned, a serious hazard for lead workers. But these particles could also make their way into the surrounding land and water. From there, they could get on people's hands or into their food or water supply. Other types of lead and lead processing also contributed to land and water pollution. Bigger pieces of lead left in soil or water can deteriorate over time, contaminating those media. Liquids containing lead, such as leaded gasoline, could spill. And the emissions of vapors and smoke from processing lead eventually settled out of the air, adding to the lead on the land and in the water. The final route was the re-suspension of lead from soil when wind or other processes (such as automobile traffic) kick up small particles containing lead. Like the direct pollution of air from lead processing, this re-suspended lead could be inhaled or it could re-settle in such a way as to be ingested.

The lead hazards created for communities depended on a few different factors. One was the total amount of lead processed. But also important was the "emissions factor" – the amount of lead vapor, smoke or dust created per pound of lead processed.[67] Some types of processing produce little smoke, vapors or dust and some produce a relatively large amount. The smelting temperature and the purity of the substances being smelted affected air emissions, for example.[68] Finally, emissions controls could moderate the amount of lead emitted. However, outside of smoke stacks, which just dispersed lead farther rather than reducing emissions, there were virtually no controls on lead smelting or processing in this period. In the surrounding community, lead pollution was further modified by microclimates, particularly wind and moisture. And, once it reached the bodies of people, absorption was affected by the size of the particles and the type of lead. Small particles were much more easily absorbed. Some lead compounds,

---

[67] Environmental scientists refer to the amount of lead emitted as smoke or vapor per pound as the "emissions factor."

[68] "Smelting" can be narrowly defined to mean extracting metals by melting it out of ore, but it is also commonly used to mean any process of melting to either extract metals (as in the secondary metals market) or re-use metal (as in type casting). Since "smelting" and "smelter" were commonly used in names and descriptions in the broader sense with the industries I am examining, I have adopted this broader meaning.

such as lead oxide (litharge) and carbonate of lead (white lead) were more easily absorbed than elemental lead.

Determining all of these details about various lead industries in the past is not possible, but the historical record has left some evidence and impressions that can give us a sense of scale and the nature of pollution emanating from sources. Most concretely, we can identify the location of sources and the type of business as well as a general sense of who lived nearby. In the following sections, I trace the geography of lead-related industries. I focus on those industries most likely produced community lead hazards. These included industries that produced lead-related metal products by smelting, refining or casting lead or lead alloys. These products included lead pipe, sheet lead, lead shot, solder and babbitt, as well as bars of elemental lead (pig lead or bar lead). It also included type foundries that cast lead alloys for printing. And it included manufacturers of white lead, red lead, litharge and other lead pigments. Finally, it included scrap metal dealers who handled lead and in some cases smelted lead.[69]

Industrial Geography

In the period from 1860 to 1879, the geography of lead in Baltimore was characterized by a few businesses clustered around railroads and the harbor, with a socially intermixed community living nearby. During these years, Baltimore had about 20 businesses that processed lead in ways that could have led to community pollution. Most of these were white lead paint producers, with at least seven different white lead production sites in use in this period. Probably there were more sites than this, but directories and advertisements were often ambiguous about whether a company produced or merely distributed white lead.[70] There were also more businesses than sites, as some manufacturers were taken over by new businesses (John Lear and Company, for example, operated the same site in 1870s that was run by the

[69] This is not an exhaustive list of industries that could have created lead hazards for the community for several reasons. First, it is not an exhaustive list of the types of businesses that could create hazards. I did not generally include print shops, canning businesses and steel smelters. These and other businesses might have created hazards, but they were either small or ambiguous. Second, some businesses were not clearly listed as manufacturers (rather than distributors) or it was not clear if they used lead (e.g., some paint manufacturers). Finally, some businesses that would have fit my criteria probably did not make it into directories or trade magazines. But the major industries – the larger smelters, refineries and foundries – have probably all been located.

[70] Directories for example usually listed businesses under a heading such as “white lead manufacturers and retailers.” Advertisements often detailed a list of products sold by the company, with some manufactured and some distributed but no distinction made.

Baltimore Chemical Paint and Varnish Company in the 1860s). While white lead dominated the lead production landscape in this period, two lead smelters producing shot were also in operation: the Baltimore Shot Works, operated by John Robertson, and the Merchant's Shot Tower. Shot towers and white lead works hugged tightly to railroads and ports to ease the transportation of heavy goods like lead (Figure 7).

Lead production probably created minimal community hazards in this period. While white lead production was highly hazardous to workers, it was less of an issue for community pollution. The corroding process did not entail any smelting and it was done inside factories. Thus little air pollution resulted. Some land pollution happened as a result of paint manufacturing, however, as evidenced by measurable lead contamination in the soil a hundred years later at the Maryland White Lead Works.[71] Lead shot production was relatively clean – using pure pig lead and not requiring high temperatures – and lead solder manufacturing took place on a relatively small scale at this point. This period did see the creation of Baltimore's first company devoted to a variety of lead products. Called the Baltimore Lead Works or the James Robertson Manufacturing Company at the time, it seems to have started around 1873 as an offshoot of a Montreal-based company.[72] The company produced sheet, shot, bar and pipe lead. In 1877, it erected yet another shot tower in the city, on its premises.[73] Although this company would eventually be quite big, it is mostly absent in the 1870s from newspapers, directories, city atlases and trade magazines, suggesting it was relatively small at this point. But it could have been a source of community lead hazards. Type foundries may also have been a significant source of community lead hazards for the period, but overall these hazards were relatively small.

[71] Maryland DEP, "Fort Avenue Property," May 5, 2004, www.mde.state.md.us/assets/document/brownfields/Fort_Avenue_Property.pdf.
[72] The earliest mention is in 1873 in Howard, *The Monumental City*, 879. But the company is not listed in *Wood's City Directory* for 1873 or 1875.
[73] "Another Shot Tower in Baltimore," *Sun*, September 19, 1877, 1.

Figure 7: Lead industries with the potential to pollute the surrounding air, land and water of communities in Baltimore City, 1860-1879. As the map shows, lead paint and lead shot industries predominated in the city and these industries were located close the harbors. In the map, the city wards are noted in black; the red numbers refer to plates in the atlas. **Sources**: Map from George Bromley, Index Map in *Atlas of the City of Baltimore, Maryland: From Actual Surveys and Official Plans* (1906), Map and Atlas Collection (hereafter, MA Collection), Milton Eisenhower Special Collections, Johns Hopkins (hereafter, MESC), https://jscholarship.library.jhu.edu/handle/1774.2/35301. Addresses from various years of: *Baltimore City Directory* (various publishers); Maryland Bureau of Industrial Statistics, *Annual Report;* Baltimore Chamber of Commerce *Annual Report; Directory of Maryland Manufacturers;* Howard, *Monumental City* (1873); *Waste Trade Journal; Metal Finishing; American Printer and Lithographer*; Schulze to Williams, October 29, 1932, Folder Lead Poisoning Cases 1932, Box 3.3-3.4, Series III, George Huntington Williams Papers, Alan Mason Chesney Medical Archives. **Map**: Leif Fredrickson.

Industrial manufacturing mushroomed in Baltimore in the decades after 1880. The manufacture of white lead and other lead pigments continued to expand in the 1880s and 1890s, but then waned. Manufacturing of lead-related metals, on the other hand, increased strongly throughout the late nineteenth and early twentieth centuries.

The canning business was one of the cornerstones of Baltimore's early industrial economy, and it helped foster metal manufacturing, including not only can making but the manufacture of solder to seal cans. There were many types of solder used and developed over the years, but the vast majority of solder used was an alloy of lead and tin (called "soft solder" or "tinner's solder"). Some manufacturers who used solder, such as canners, manufactured it themselves, but the huge demand for solder that emerged during industrialized cultivated manufacturers who specialized in manufacturing solder.[74] As Figure 8 shows, Baltimore hosted a number of solder manufacturers between 1880 and 1909. Some of these were quite big, including the Baltimore Solder Company. This company began in 1881 as the Schultz Company. Employing 130 people, it was one of the biggest of the 350 or so companies started in the city that year. Only a few companies that manufactured clothing, cigars, gas and a printing press were bigger.[75] The founder, Frederick Schultz, patented new wire soldering machines and literally wrote the book on soldering. Canning used an enormous amount of solder. At the time he wrote his book, Schultz estimated that canners made about 1.5 billion cans annually, a process that consumed two-fifths of the solder made in the country, or about 24 to 28 million pounds.[76] Schultz's company probably produced hundreds of thousands, if not millions of pounds, of solder a year. One contract with a large canner provided for the daily supply of up to 1,200 pounds of solder.[77] But manufacturers like Schultz were persnickety about using high quality, pure metals and maintaining precise melting temperatures, between 675 and 775

---

[74] Because canning companies use and sometimes made solder, they could also pollute the surrounding land with lead. The Maryland DEP found this to be the case with one of the former cannery sites it investigated, see "American National Can Company Site," August 8, 2000 www.mde.state.md.us/assets/document/brownfields/AmericanNationalCan.pdf.

[75] "Baltimore Industries," *Sun*, February 8, 1881, 5. The company was sometimes referred to as A. Schultz or A. Schultze Company.

[76] "One Week's Patents," *Sun*, October 3, 1895, 2; Frederick Schultz, *Solder: Its Production and Application with a Brief History of Tin and Lead* (Baltimore: MacNeal Printing Company, 1908), Chapter 14 (unpaginated).

[77] "Suit About Solder," *Sun*, September 9, 1899, 7. The contract was for 25 to 30 tons of solder for the William Numsen and Sons Co.

degrees Fahrenheit.[78] These characteristics would have greatly reduced vapor and smoke hazards from solder manufacturing.

The city also saw the expansion of other types of smelting, refining and casting related to lead. One was type casting, a process that was dirtier than the production of shot or solder since the re-use of lead type resulted in the introduction of impurities. Type foundries were one of the businesses St. Louis, a pioneer in pollution control, identified as a source of smoke pollution in the city in 1910.[79] As concern arose about occupational lead poisoning, some type and printing businesses used fans and suction to remove fumes from work areas and to some extent this would have displaced these pollutants onto the nearby community.[80]

Lead-metals specialists increased little in this period. Shot towers continued to operate, but these were mostly abandoned by the early 1900s. In southwest Baltimore's Fells Point, John Hubert operated a foundry that made lead pipe and sheet lead among other products.[81] Most important, however, was the expansion of the James Robertson Company (JRC). The company's shot tower burned in 1886, and eventually it jettisoned its shot making in towers.[82] Focusing on other lead products, the company increased its output, moved to a new location, and expanded its facilities.[83] In addition to supplying lead products to various businesses and lead shot to consumers, JRC was a major supplier for the city as it expanded water supply infrastructure, much of which entailed the use of lead.[84] The James Robertson Company's larger facilities would have produced more community lead hazards.

As before 1880, producers of lead products clustered around railroads and the harbor. Canning businesses were usually located on the harbor and solder supplies often located very near to them. But

[78] Schultz, *Solder*, Chapter 16.
[79] "Plenty of Smoke Found by Post-Dispatch Reporters," *St. Louis Dispatch*, September 9, 1910, 1.
[80] Hamilton and Verrill, *Hygiene of the Printing Trades*, 36.
[81] Advertisements in back of *The Harland and Hollingsworth Co.* (Philadelphia: Armstrong and Pears, 1898).
[82] JRC had also acquired the Merchant's Shot Tower. "Lead Works Burned," *Sun*, August 12, 1886, 4.
[83] JRC moved sometime before 1890. It also expanded its facilities at least once in 1922. "Industrial Developments," *Chemical and Metallurgical Engineering*, August 9, 1922, 286.
[84] Among city contracts see: City contracted with JRC and Clendenin Brothers for 50 tons of pig lead in 1904, presumably for water pipe. "Makes Two Paving Awards," *Sun*, September 1, 1904, 7. Contract for pig lead in 1905, "Board Awards Contracts," *Sun*, December 30, 1905, 8. It contracted with the city in 1919 for $13,600 worth of pig lead for the Water Department. "Paving Contracts Let," *Sun*, April 10, 1919, 8. It again supplied the city in 1923. "Pig Lead to Cost City More," *Sun*, March 1, 1923, 9.

some were located further ashore, perhaps supplying other types of businesses. Type foundries, which re-used their lead and thus were not as dependent on shipments, were more spread out. The James Roberts Lead Works located itself next to Camden Yards, the city's large industrial railroad hub (Figure 8).

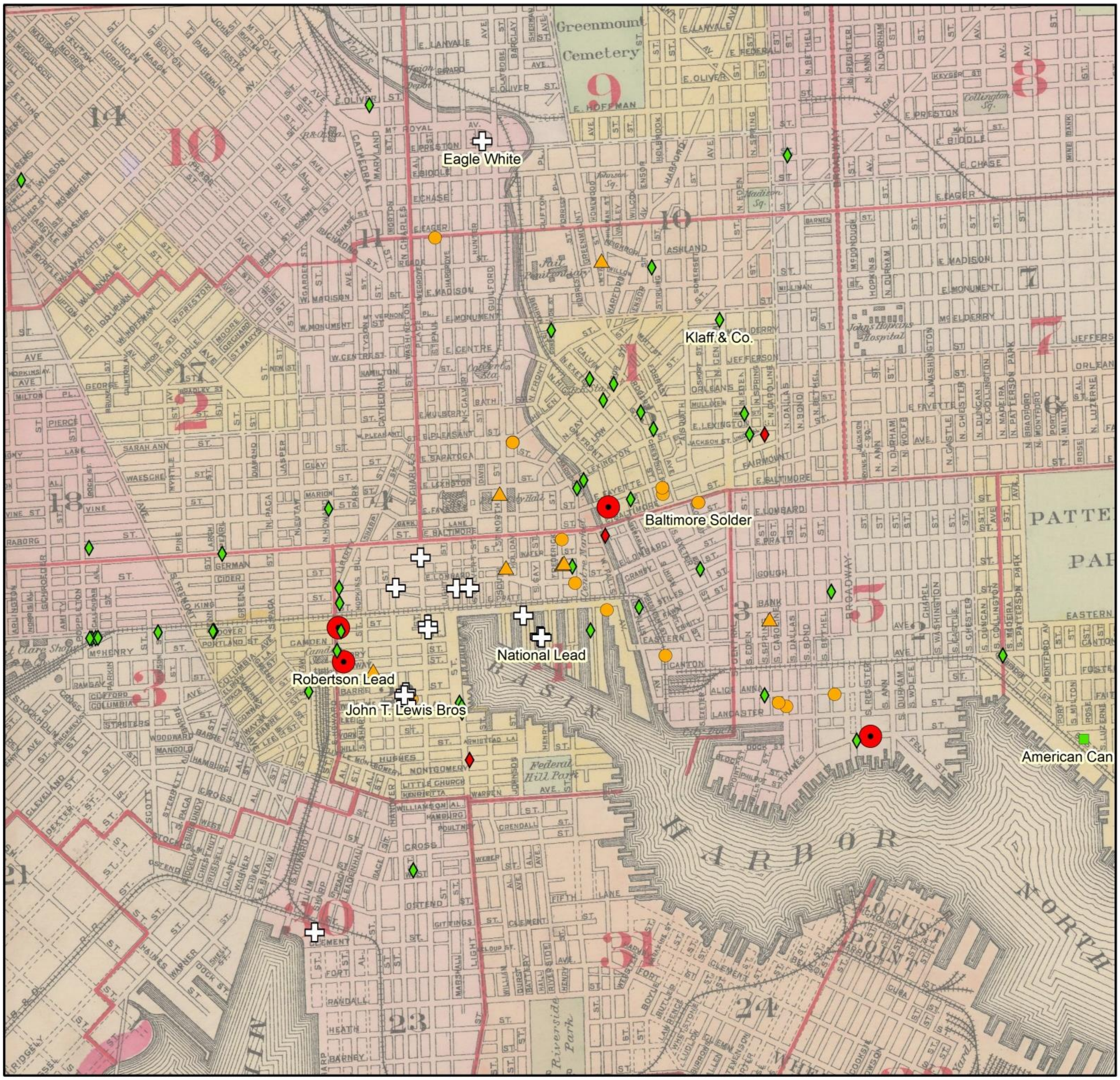


Figure 8: Lead industries with the potential to pollute the surrounding air, land and water of communities in Baltimore City, 1880-1909. As the map shows, lead industries increased in this period, and lead-related metals businesses became more important. Scrap dealers also proliferated. **Source**: See Figure 7 above. **Map**: Leif Fredrickson.

One of the major developments in the lead metals business in this period was the enormous proliferation of scrap metal dealers. Junk dealing and scrap recycling were businesses that could exist at very small scales and it is likely that they were even more prevalent than listings in directories indicated. In addition, directories and advertisements were often ambiguous as to whether junk peddlers dealt in metal, and if they dealt in metal, whether they dealt in lead. (Although it is rare to see any evidence that those who dealt in metal did not deal in lead). In any case, mapping dealers known to work with metal and lead gives some indication of how these businesses expanded over time and place (Figure 7, Figure 8Figure 11).

There is a long history of metals recycling in the United States, especially for lead and tin because the low melting point of these metals meant they could be melted easily, even over a wood fire.[85] Even in 1860, scrap dealers took out large advertisement in the city directory to pull in rags, paper and scrap metal, including lead. Early scrap dealers were virtually always located within a block or two of the port or a railroad, where scrap could be easily hauled by foot or horse. As the scale of metals use increased, both in terms of consumption and production, scrap dealers had more access to used metals and more outlets to sell to. By 1896, the Bureau of Industrial Statistics reported on several major foundries in Baltimore that were using scrap tin and iron.[86] While there were seven different scrap metal dealers listed in Baltimore in the twenty year period from 1860 to 1879 and thirteen listed between 1880 and 1899, there were thirty six listed in just the ten year period between 1900 and 1909. Nationally, trade in junk and metals also increased in this period. By 1905, junk peddlers, including many from Baltimore, could advertise and discuss the state of the industry in their own trade publication, the *Waste Trade Journal*.

Despite the trappings of professionalism granted by a trade journal, junk peddling and scrap dealing were looked down upon by native, middle class Americans. This work often fell to immigrants, especially Jews, and much of the hardest, most hazardous labor, fell to African Americans. Excluded from many “respectable” professions, Jews found other lines of work, and junk peddling became a

[85] Carl A. Zimring, *Cash for Your Trash: Scrap Recycling in America* (Rutgers University Press, 2009), 15.
[86] Maryland Bureau of Industrial Statistics, *Annual Report*, 1897, 22-24.

specialty. Many who started as collectors of rags and bones eventually built bigger, more permanent businesses.[87] Morris Schapiro, for example, was a Jewish immigrant to the United States from Latvia. He arrived in Boston as a sixteen year old in 1902. He made his way through various jobs and cities before ending up in Baltimore in 1904 where, with several relatives, he pooled money to start a metal scrapping business called the Boston Iron and Metals Company. The name was an homage to his first landing. Eighteen years later, Schapiro bought the boat he had sailed to the United States on, the S.S. Pennsylvania, and scrapped it.[88] The Boston and Iron Metals Company subsequently became one of the major scrappers of ships.[89]

Scrappers also capitalized on the fact that Baltimore was one of the few cities in the South that was highly industrialized, let alone specialized in the metals business. Baltimore dealers sucked in metals from the surrounding area to be reused. *The Waste Trade Journal* noted that "it would be well for southern dealers to take note" that they could market their "accumulations of metals, rubber and iron by getting in touch with H. Klaff and Company" of Baltimore.[90] Other scrap dealers in the city also advertised to the surrounding southern states. In fact, according to their advertisements, Baltimore was home to both of the "largest cash buyers" of metals in the South.[91]

Together, the increasing supply of scrap metal, including lead, as well as the increasing demand for lead meant that scrap, or "secondary" lead became an increasingly important part of the supply chain for lead producers. Production of scrap lead doubled between 1909 and 1915 (Figure 9). By the time Alice Hamilton investigated smelters in 1914, she concluded that scrap was "almost invariably" a part of the smelting process and "in almost all refineries scrap is a very important element." Some refineries made a "specialty" of using lead scrap.[92] Although there were few hard numbers, small lead refineries

---

[87] Gilbert Sandler, *Jewish Baltimore: A Family Album* (Johns Hopkins University Press, 2000), 76–83. Some of the prominent Jewish names associated with the business were: Schapiro, Shapiro, Klaff, Schloss, Plant, Lazinsky, Landsman, Hettleman, Zuckerman, Barth, Liebowitz, Kahan, Epstein and Cohen.
[88] Ibid., 77–78.
[89] "Will Scrap 19 Destroyers," *Sun*, January 15, 1931, 11.
[90] "H. Klaff and Company," *The Waste Trade Journal*, May 13, 1916, 12.
[91] Nathan Frank and Sons; A Bronstein and Sons advertisements, *Waste Trade Journal*, February 29, 1908, 28.
[92] Alice Hamilton, *Lead Poisoning in the Smelting and Refining of Lead* (U.S. Department of Labor, Bureau of Labor Statistics, 1914), 17–18.

"working up lead and scrap could be found in practically every city in the country."[93] After World War I, metal scrap was increasingly treated as a commodity.[94] By the end of the teens, secondary lead producers cranked out amounts equal to 28% of the lead that came from mines. The role of secondary lead continued to increase, pulling about even with primary lead by mid-century (Figure 9).[95]

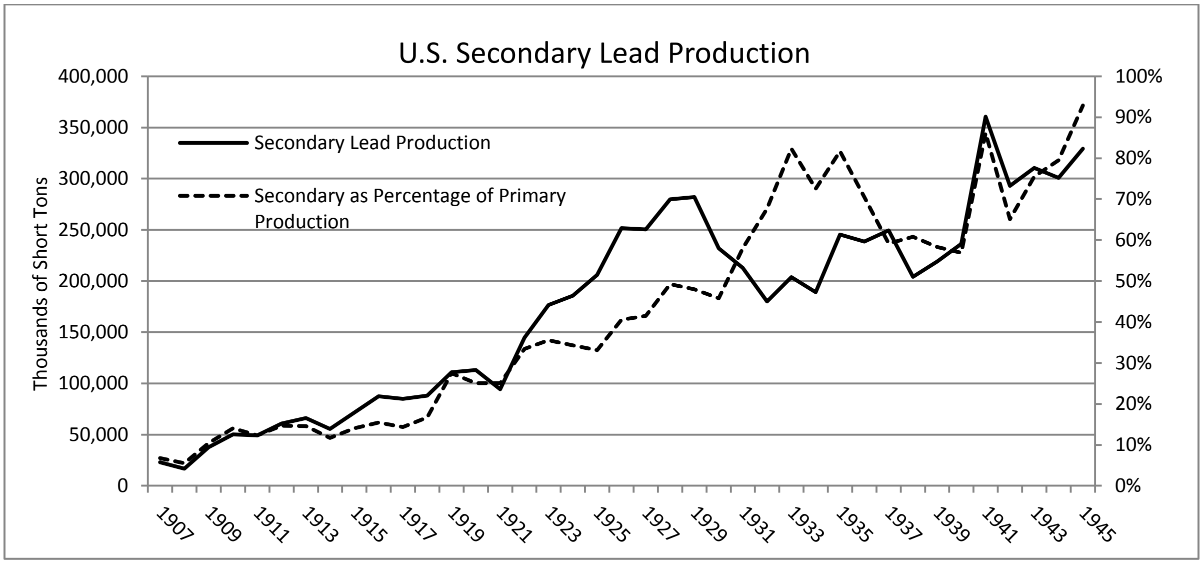


Figure 9: Secondary lead production as total and as percentage of primary production. Secondary lead production was a small contributor to lead production in the early 1900s, but by 1945, it was almost equal to primary production. After 1945, it exceeded primary production. Since most secondary lead production was carried out in small, urban scrapyards and smelters that were not well-regulated, community lead exposure increased in the first half of the twentieth century. **Source**: U.S. Geological Service, minerals.usgs.gov/minerals/pubs/commodity/lead/stat/tbl1.txt. **Graph**: Leif Fredrickson.

As both the demand for lead and the demand for secondary lead increased, businesses grew and consolidated at both the national and local level. In Baltimore, the John T. Lewis Company (JTL) emerged as a competitor to the Robertson Lead Company in 1911. A venerable white lead company from Philadelphia, JTL opened a paint shop in Baltimore around 1905 and then, after buying Baltimore Solder's old building, got into the lead metals business in 1911. But by 1914, the huge National Lead Corporation had absorbed both of them as part of a country-wide consolidation of lead metal and paint companies.[96]

---

[93] Alice Hamilton, "Lead Poisoning in American Industry," *The Journal of Industrial Hygiene*, May 1919, 10.
[94] Sandler, *Jewish Baltimore*, 81.
[95] "Secondary Lead in the U.S.," *Waste Trade Journal*, 11. The numbers from this article are drawn from the USGS report "Lead in 1915."
[96] "A Trust in Fact and Act?" *Waste Trade Journal*, March 7, 1914, 3.

The mid-nineteen teens also saw growth and investment in secondary smelters – smelters that specialized, as Hamilton noted, in recycling scrap lead. The first major operation of this kind in Baltimore was Brooks Solder and Metal Works, begun in 1912 in Fells Point. The business specialized in collecting scrap lead and producing solder for nearby canning operations. It was quickly snapped up by a company out of New York City, Union Smelting and Refining. The *Waste Trade Journal* predicted it would continue to serve as an excellent accumulator of scrap and would expand.[97] Union did expand. It advertised widely, developed specialized metals for industries and was, according to one type journal, "one of the established and best known concerns in the general metal industry of the United States."[98]

In addition to consolidation, the rise of the automobile affected the geography of lead hazards in the city. Lead production was critical to the rise of the automobile, especially the personal car, as lead-acid batteries allowed automobiles to be started easily. As automobile users increased, they pushed for better roads. States and municipalities complied. In Baltimore, the city went on a paving binge from 1911 to 1915, reducing the cobblestone roads from 341 miles to 144 and more than tripling the number of asphalted roads.[99] Maryland began building a thicker web of state highways. Particularly important for the secondary metals industry was the Key Highway, which ran down from central Baltimore, through Locust Point, and eventually on to south Glenn Burnie (completed in 1911) and then to Annapolis. Secondary smelters took advantage of trucks and new and improved roads to expand their businesses (Figure 11).

Automobile transportation allowed both the geographic expansion of smelters in the city as well as consolidation, since scrappers could bring in metals from a bigger area more easily. Union Smelting moved from the old Brooks Solder factory to another location and then was sold in 1922. [100] But other secondary smelters emerged across Baltimore's landscape, including Southern, Chesapeake and Industrial

[97] "Brooks Solder and Metal Works of Baltimore, Acquired by Union Smelting and Refining of New York," *Waste Trade Journal*, October 2, 1915, 11.
[98] Advertisement, *Chemical Engineering Catalog Sixth Annual Edition* (1921), 905. Advertisements and editors notes, *International Stereotypers and Electrotypers Journal*, January 1921, 3, 12.
[99] Alan D. Anderson, *The Origin and Resolution of an Urban Crisis: Baltimore, 1890-1930* (Johns Hopkins University Press, 1977), 93.
[100] "Baltimore," *Metal Finishing*, February 1922, 85.

Metal Melting. Thus community lead hazards increased and spread in Baltimore's landscape in this period (Figure 11).

Figure 10: Union Smelting and Refining was one of the largest smelters in the city the focused on secondary lead for use in production of "white metals" (alloys that included lead). Growing from a small business, the smelter was eventually bought by New York businessmen and expanded both in terms of its collection (with Mack trucks) and smelting with more smelters. **Source**: *The Metal Industry*, Index of Vol. 18, 102.

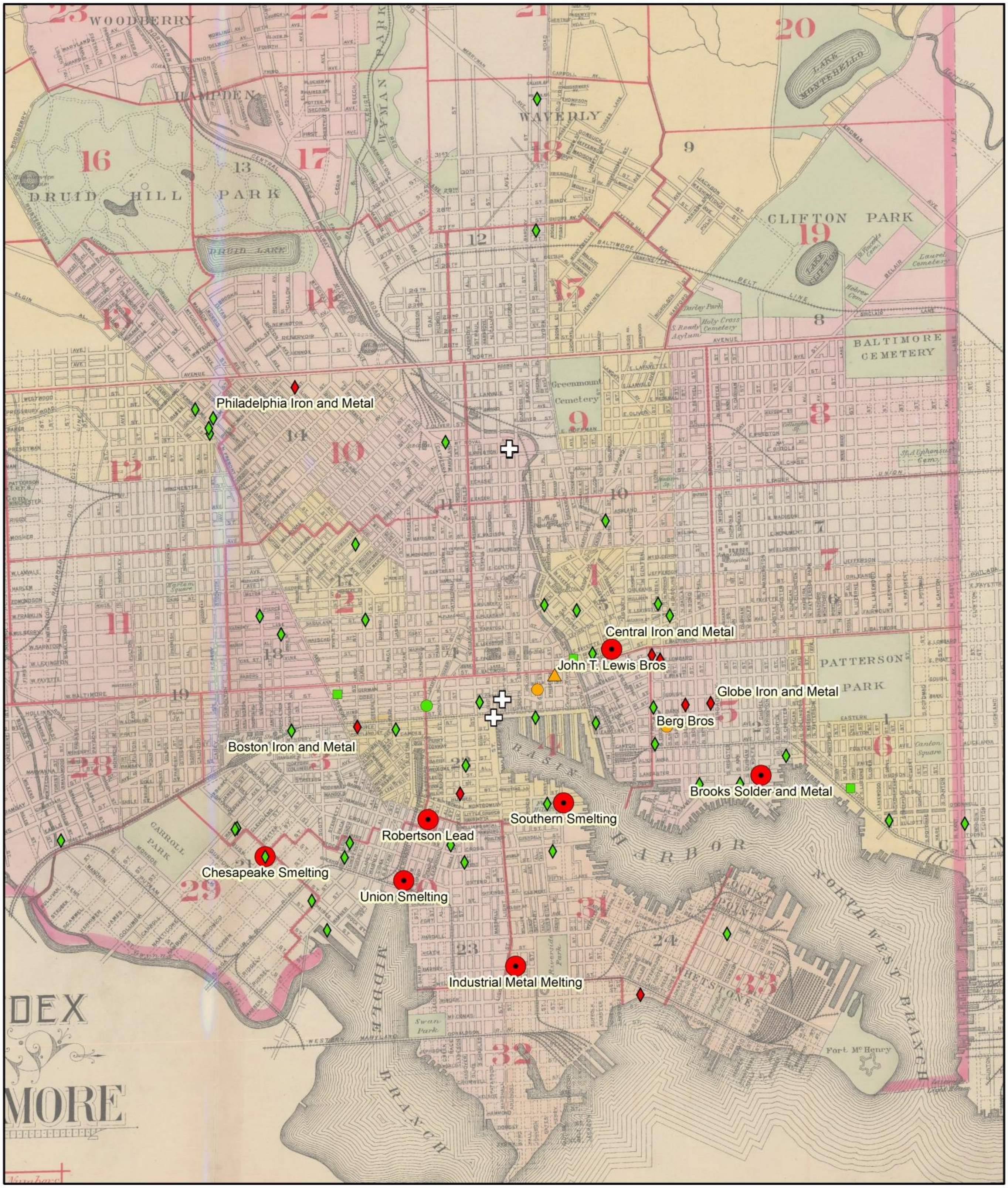


Figure 11: Lead industries with the potential to pollute the surrounding air, land and water of communities in Baltimore City, 1911-1939. As the maps shows, lead smelters increased in this period and were more geographically disbursed than earlier periods. Smaller solder and babbitt manufacturers were consolidated into bigger metals and smelting businesses. Scrap dealers continued to be prominent. **Source**: See Figure 7 above. **Map**: Leif Fredrickson.

Writing in 1926, the Boston physician Joseph Aub reported that two large smelters he studied had installed improvements, but he believed that refineries had made less progress because "all over our country there are cheaply constructed and cheaply managed refineries, practically junk shops, where no effort is made to control dust or carry off fumes."[101] Aub's point was that in many of these small smelters and junk shops, workers were at high risk for lead poisoning.

Scrap and secondary smelter workers did in fact get lead poisoning.[102] The combination of old metal and the chaotic business of wrangling scrap created ample dust that scrappers could inhale or ingest. And because they were small operations, they tended to have less automation and poorer technical controls when melting down old metal (if that was part of their business).[103] In Baltimore, many of the laborers in the early scrap metal facilities may have been Jewish immigrants or other white ethnics, but by the time the city started tracking occupational lead poisoning, many of these workers were African Americans. Many of the ship scrappers who contracted lead poisoning, for example, were black (Figure 12). Unlike melting lead in pots for casting, torch cutting did heat lead to high enough temperature to vaporize it, producing highly toxic gas.

---

[101] Joseph C. Aub et al., *Lead Poisoning* (Williams & Wilkins Company, 1926), 234.
[102] One worker in the junk smelting business was listed as a "tentative" lead poisoning case in Ohio, for example. Ohio State Board of Health, *Annual Report*, 1914, 795.
[103] On conditions surrounding the smelting and refining of scrap see: Hamilton, *Women in the Lead Industries*, 17; Hamilton, *Lead Poisoning in the Smelting and Refining of Lead*, 9, 18, 35, 81. New Jersey enacted legislation to protect scrap metal workers from lead poisoning, requiring hoods and exhaust ventilation. Ibid., 86.

Figure 12: An African-American ship cutter for Boston Iron and Metals in Baltimore, 1961. This and other photos of ship cutters from this source do not show the workers using any protection from fumes that may contain lead and other toxicants. They also illustrate that these sorts of scrapping jobs commonly fell to African-American workers. **Source**: BGE.65.D, Baltimore Gas and Electric Print and Negative Collection, Baltimore Museum of Industry.

Although Aub wrote in the context of occupational lead poisoning, his comments could well have applied to community lead hazards as well. For the same reason that junk shops and secondary smelters were a hazard to workers, they also posed a threat those who lived around them.

While residents in Baltimore regularly complained of smoke and junk shops beginning in the early 1900s, their objections were often too general to specify pollution from certain industries or metals. But in some cases, residents or health experts did clearly identify community lead hazards. This happened increasingly after 1930 for several reasons. One, as discussed above, was the growth of BCHD and the increased authority given to the agency to investigate industries. In the same decade, Baltimore enacted smoke and zoning ordinances that brought attention and more regulation to the control of smoke. As the scale of secondary lead production increased, hazards became more apparent. The increasing use of automobiles, and by extension lead batteries, was particularly important in expanding secondary lead production and increasing the visibility of lead hazards. As I discuss in the next chapter, child lead poisoning from burning lead battery casings brought a great deal of attention to junk shops and secondary lead smelters in 1930s, further raising public awareness of the issue and formal complaints.

For example, in the wake of publicity surrounding these child lead poisoning cases in 1932, a resident wrote to health commissioner Huntington Williams to inform him that while burning these cases might be problem, worse was the community pollution from the Chesapeake Smelting and Refining Corporation that re-smelted the lead batteries. The writer claimed the plant was "working night and day," smelting 25 tons of battery plates a day and "filling the city with these fumes." The plant's proximity to water brought the fumes closer to the ground and on rainy days "the fumes are terrible and as we breathe the air our lungs are filled with this lead fumes [sic]."[104] (At this point the Chesapeake Smelting Company occupied the place where Southern Smelting is on the map in Figure 11. Chesapeake later moved to its location west of the old Southern/Chesapeake plant). The writer's attunement to the interactions of pollution and urban ecology was remarkable. The microclimate around the harbor did create conditions that kept vapor close the ground. The city, and especially the harbor, was socked in with debilitating fogs about a dozen times a year, according to an early study of weather in the city.[105] And the heat island effect of the city, as well as the regional direction of winds, would have blown pollution from smelters around the harbor northwest into surrounding residential areas.

Smaller junk and scrap dealers in Baltimore also created community lead. Advertisements and listings for junk dealers usually made no indication one way or another whether they smelted their own metal, but some of them clearly did. Baltimore even had a homegrown company, Monarch Engineering, which marketed melting furnaces to scrap dealers.[106] When the BCHD investigated junk yards, it found

---

[104] Letter "A. Citizen, A. Voter, A. Tax Payer," to Williams, September 15, 1932, Folder Lead Poisoning by Burning Battery Cases 1932-1934, Box 3.3-3.4, GHW Papers, AMCM Archives.
[105] Oliver L. Fassig, "Report on the Climate and Weather of Baltimore and Vicinity," *Bulletin of the American Geographical Society* 37, no. 5 (1905): 237–39. These fogs were recorded between 1891 and 1903.
[106] "Metal Dealers" Advertisement, *The Waste Trade Journal*, May 20, 1916, 14.

some with crude smelters, almost invariably worked by African-American laborers.[107] Lead hazards resulted from other practices as well. When a public health nurse went to investigate the homes of children with lead poisoning in 1932, she arrived in Reservoir Hill, an African-American neighborhood in northwest Baltimore, to find an "atmosphere heavily laden with smoke." Residents told her that the smoke came from the chimneys and "to a great extent from an open fire in the rear yard of the Philadelphia Rubber and Metal Company," where battery casings were burned after the lead plates were salvaged.[108]

As this last case suggests, community exposure to lead hazards was not distributed equally. How did the geography of lead hazards relate to social geography in Baltimore during industrialization?

Early on, in the period from 1860 to 1880, community lead hazards were modest and so too was the differentiation of social groups in the city. Transportation limitations kept industry close to railroads and ports, kept workers close to industry, and kept social, ethnic, and racial groups close to each other. Baltimore, like other cities at the time, was compact. In addition, the rowhouse style of building that Baltimore developers pursued allowed for particularly dense and integrated social living. In particular, the development of cheaper housing in alley streets meant that the working class lived shoulder to shoulder with the middle and even upper class. Unlike New York City, Baltimore did not develop extensive tenements, even if some of its alley houses did develop some of the problems associated with tenements.[109] The city had some enclaves of African Americans and European ethnics, but these were small. One of the larger African-American neighborhoods began developing late in this period around Paca and Biddle Streets. Jewish immigrants, who came in increasing numbers after the 1820s, settled in east Baltimore around Lombard and Baltimore streets.[110] Neither of these enclaves was particularly

---

[107] Memo Schulze to Williams, October 29, 1932, Folder Lead Poisoning Cases 1932, Box 3.3-3.4, Series III, GHW Papers, AMCM Archives.
[108] Letter William Warthen, Director Bureau of Child Welfare, to Williams, September 7, 1932, Folder Lead Poisoning by Burning Battery Cases 1932-1934, Box Restricted from Series III, GHW Papers, AMCM Archives.
[109] Mary Ellen Hayward, *Baltimore's Alley Houses: Homes for Working People Since the 1780s* (Johns Hopkins University Press, 2008).
[110] Sandler, *Jewish Baltimore*, 15.

subject to community lead pollution. And due to the integrated style of housing described above, those that did live around lead industries were probably of mixed classes.

From 1880 to about 1910, the city experienced a great influx of immigrants as well as the development of the city's first planned suburbs and the first operating streetcars. Suburban developments like Roland Park and Guilford excluded African Americans and Jews, and working class people in general could not afford to live in those places. Immigration, transportation technology, housing markets and social exclusion combined to create a far more spatially differentiated social space in the city. African-American and Jewish institutions, for example, seem to have been more likely to be located close to polluting industries. For example, the Baltimore Solder Works was located in an area dominated by synagogues in 1906, and the Robertson Lead Works shared a block with a "colored" school from at least 1890 to 1901 (Figure 13). In addition, because Jews disproportionately worked in junk peddling, junk shops – including some that probably produced lead hazards – were disproportionately located in around Jewish neighborhoods.[111]

[111] Bromley *Atlas of Baltimore City*, Plate 1.

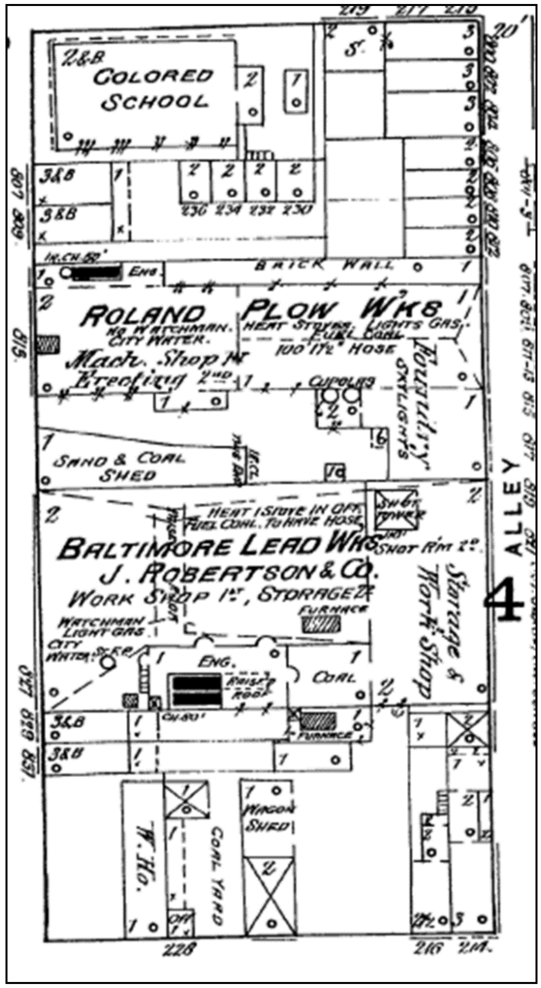


Figure 13: From at least 1890 to 1901, the Robertson Lead Works shared a block with a colored school, potentially exposing students to lead hazards. **Source**: *Sanborn Fire Insurance Map for Baltimore City*, Volume 1, Sheet 27A, 1890, ProQuest Digital Sanborn Maps, 1876-1970, http://sanborn.umi.com.

After 1910, social exclusion, automobiles and road building further exacerbated social differentiation. Baltimore pioneered state-sponsored racial segregation, passing the first racial zoning ordinance in 1911. Although it was overturned by the Supreme Court, realtor agreements, neighborhood association covenants, and less organized racial intimidation kept African Americans penned in to certain neighborhoods. The automobile, like the electric streetcar before it but even more so, helped the more affluent move to the periphery of the city, leaving African Americans, ethnic minorities and the working class in the urban core where lead hazards were concentrated. However, hazards were not evenly shared among these groups as a map of social groups from 1933 overlaid with lead hazards indicates (Figure 14). Lead industries were disproportionately located in or adjacent to Jewish, African-American and Italian neighborhoods.

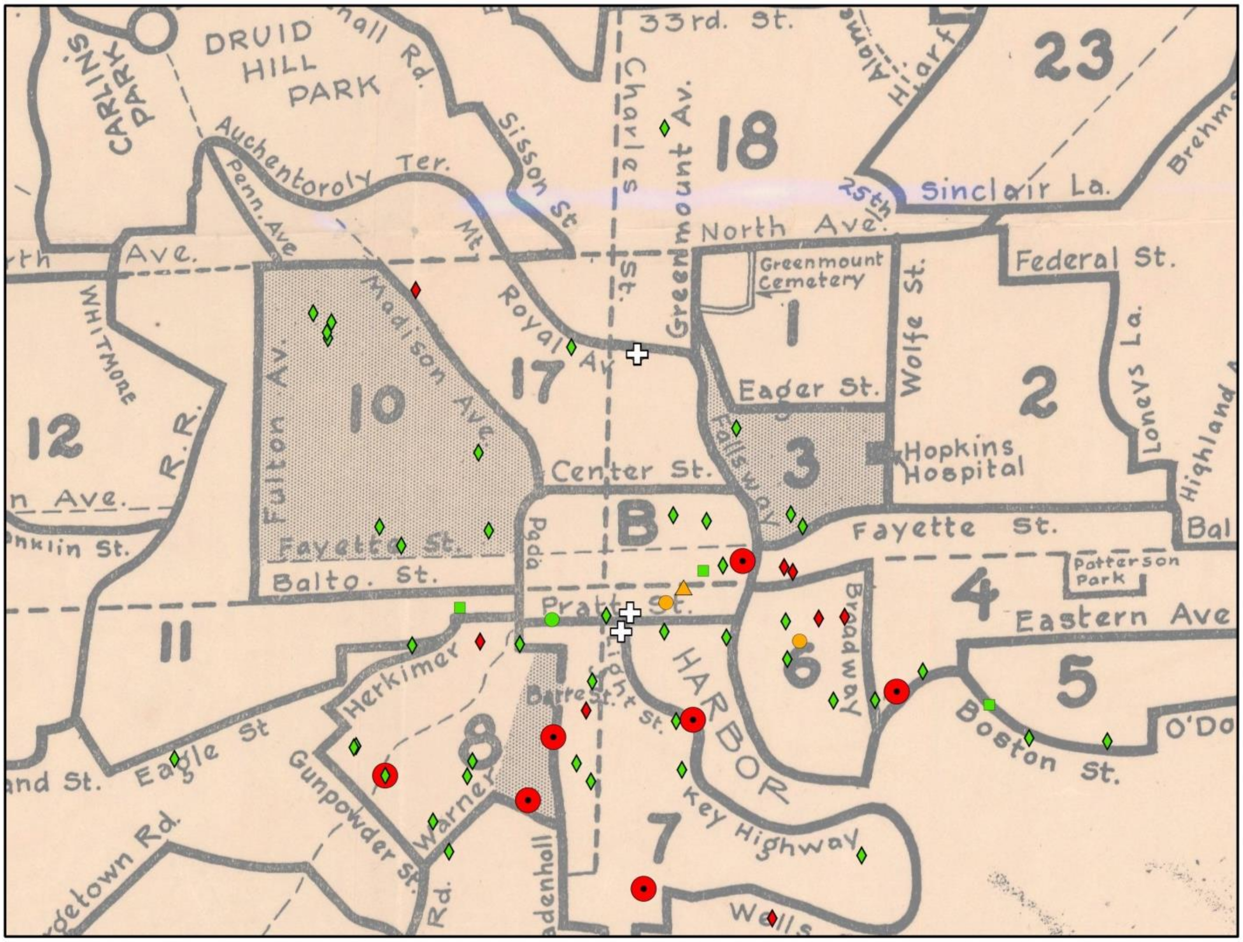


Figure 14: Community lead hazards in relation to ethnic and racial groups in the city, circa 1930s. Shaded areas are African American neighborhoods. Map identifies sections 1, 2, 4, 7, 8, 11, 12, 13, 18 and 23 as "Working Class"; section 3 as "Colored and Jewish"; section 10 as "Colored (Better Class)"; section 5 as "Polish"; section 6 as "Italian": section 17 as "Jewish (White Collar Class)"; and section B as the downtown business district. Out of the frame are neighborhoods classified as "Wealthy," "Americans (White Color Class)" and "Bonton" (i.e., high society). **Sources:** "Maryland's Dominant Distributors," (Baltimore Distributing Company, 1933), MA Collection, MESC, https://jscholarship.library.jhu.edu/handle/1774.2/38693. **Map**: Leif Fredrickson.

Still, some working class neighborhoods not identified by specific race or class lived around lead hazards, particularly in southeast Baltimore. This was the area where many of the lead smelters were located by the 1930s. Several of these lined the black neighborhood of Leadenhall in south west Baltimore, but several were also in the midst of white residents. One of the biggest polluters, the Chesapeake Smelting Corporation, for example, was located in Locust Point, a community that was largely white working class.

Regulations had little effect on community lead hazards until the 1930s, and even then they were moderate. While some affluent Baltimore residents moved to the suburbs to escape city pollution in the early 1900s, other agitated for smoke ordinances. Although the city passed an ordinance in the early 1900s, it was not well enforced. In addition, owners of industry successfully exempted themselves from the ordinances.[112] E.J. Codd, one of the city's largest manufacturers of solder, was one of the key industrialists who gutted these early attempts at pollution control.[113] In 1931, another smoke ordinance was passed that pertained to manufacturers, but again was not well-enforced.

A related matter was zoning. Baltimore passed a provisional zoning plan in the early 1920s and an official zoning ordinance in 1932. Unlike smoke control, zoning was aimed at some key sources of community lead hazards, including junk shops. In the early 1900s, encouragement to regulate the junk trade, particularly small scale smelting, came not from a concern with aesthetics or pollution so much as a concern about shady dealings. In short, some people saw metal melting as a way of removing the traces of stolen goods.[114]

When zoning emerged as a viable, if contested, option for regulation and planning in cities in the nineteen teens and twenties, zoning plans often called into question the viability of junk shop in parts of the city. They were a major target for exclusions, for health, safety, aesthetic, and, no doubt, social reasons, given the marginality of the junk peddlers. But junk peddlers were not powerless. In St. Louis, the Supreme Court struck down the city's zoning ordinances as the result of a lawsuit from junk dealers. But St. Louis's ordinance had focused on aesthetics, and Baltimore felt confident that its focus on health and safety would survive legal challenges.[115] In Baltimore, scrap and junk dealers were sometimes ruled out of sections by the Zoning Board, but they did win some appeals. Even when the city finally passed a permanent zoning ordinance in 1932, complete with extensive bureaucratic descriptions of land use and maps, junk shops remained ambiguous entities at the interface of "commercial" and "industrial" zones. Thus junk shops persisted in many areas that were zoned as "second commercial" (yellow areas on the

---

[112] Ann-Marie Szymanski, "Regulatory Transformations in a Changing City: The Anti-Smoke Movement in Baltimore, 1895–1931," *The Journal of the Gilded Age and Progressive Era* 13, no. 03 (July 2014): 336–376.
[113] "Oppose Smoke Ordinance," *Sun*, November 22, 1904, 12.
[114] One businessman who wrote to the *Sun* while the state legislature was in session hoping to attract attention for increased regulation of junk shops (including inspections and prohibitions on melting) claimed he and many others were "helpless victims." Derby, "Would Regulate Junk Shops," *Sun*, January 27, 1906, 7.
[115] "City Zoning Code Held to be Legal," *Sun*, October 7, 1923, 5.

map in Figure 15), which also happened to be neighborhoods disproportionately inhabited by African Americans, Jews and some other white working class people.

As with many zoning plans, zones tended to reify land use that was already happening rather than rectify problems. Thus while the “industrial” areas of the zoning plan traced around lead smelters, this did little to change the fact that people were already living in or near these industrial areas. For example, the secondary lead smelter, Industrial Metal Melting, was located in an industrial area but was only a block away from residences [116]

[116] *Sanborn Fire Insurance Map for Baltimore City*, Volume 4, Sheet 398, 1953, ProQuest Digital Sanborn Maps, 1876-1970, http://sanborn.umi.com.

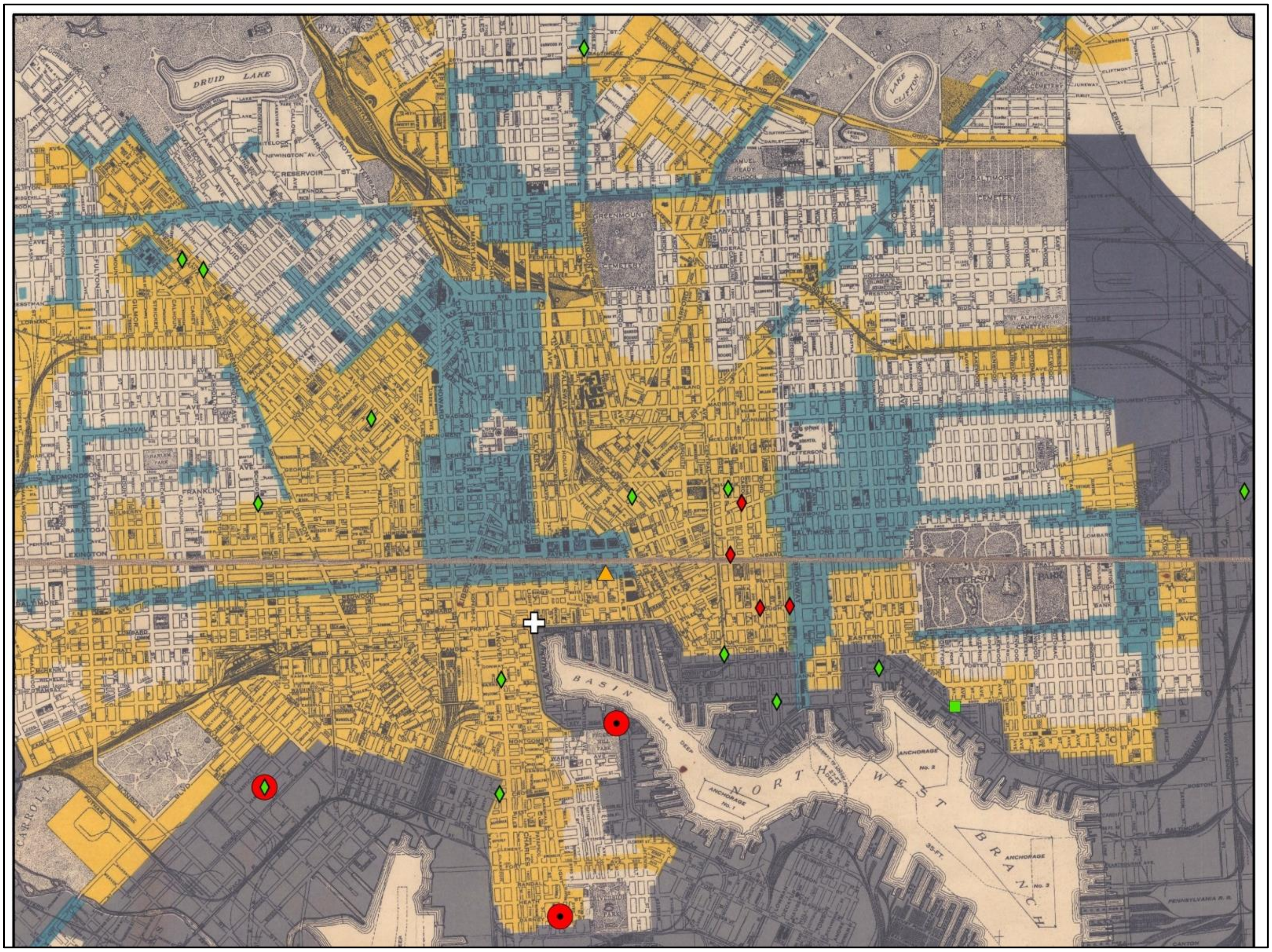


Figure 15: Baltimore zoning map overlaid with lead industries from the 1930s. As the map shows, zoning did little to eliminate scrap metal dealers from African-American, Jewish and Italian neighborhoods. Grey = "industrial," yellow = "second commercial" (businesses that were not industrial could operate) and blue = "first commercial," which was slightly more restrictive than "second commercial." White = only residential; no businesses. **Source:** City of Baltimore, "Use District Map," (Board of Zoning Appeals, 1932), MA Collection, MESC, https://jscholarship.library.jhu.edu/handle/1774.2/35183. **Map**: Leif Fredrickson.

In some cases, however, zoning action did affect lead hazards. In 1934, the Health Department investigated "numerous complaints" lodged with the Police Department regarding thick smoke spilling out of closed shed at the rear of a junk shop. Inside the shed, the BCHD found a "crudely constructed crucible surmounted by a metal hood which was vented into a chimney, and which was used to reclaim lead from scrap metal." The equipment was covered in oxide of lead. When it operated, it produced fumes which were "so dense that vision was obstructed." As was often the case, the worker who carried out this crude refining was an African American who, upon examination, showed signs of lead poisoning. The health authorities suggested he find a new line of work. For the community health hazard – a "genuine health nuisance" as the BCHD put it – the Building Engineer ordered the junk shop to cease reclaiming lead under the provisions of the Zoning Ordinance. Although the report did not state the location of the junk shop, it is likely that it was in one of the commercial use districts in east or northwest Baltimore where the junk shops were clustered in close proximity to residences. Reports like this suggest that even small junk shops could produce significant community lead hazards, and that zoning was effective in curbing some of the worst cases.[117]

Conclusion

In 1886, 21 year old John Bannon emigrated from County Cavan, Ireland to the Baltimore. He soon joined up with two other men in a junk business, later buying them out. The business he ran was called "The Monumental Iron and Metal Company," presumably an homage to his new home. By the early 1900s, his business in central west Baltimore was buying large ships for scrapping. In 1919, he moved his business to east Baltimore, perhaps for a larger lot.[118]

By the time Monumental Iron and Metal was moving across town and Baltimoreans were arguing for a monumental treatment of the Phoenix Shot Tower downtown, much had changed in the city in terms of the lead hazards and geography. The industrialization of the city had brought more lead industries, and those lead industries had helped the metropolitan region to change – to spread outward, to become more socially differentiated – through the development of infrastructure and transportation technology, especially automobiles. These technologies had affected lead industries themselves, allowing them to grow, consolidate and move about in the city, away from the tight association with the harbor and railroads. But while lead industries spread within the city, the more affluent residents of the city spread out much further. In addition, social and economic exclusion – in housing and in the workplace –

[117] As with many junk shops jobs, particularly those involving industrial hazards, the work was carried out by an African American. The worker was "persuaded" to go to the hospital where an examination indicated lead poisoning. The hospital authorities recommended that he stop this type of work. "A Genuine Health Nuisance," *Baltimore Health News*, February 1934,

[118] "John Bannon Dies At Age 92," *Sun*, November 20, 1957, 21; "Hull of Love Point Brought to Port," *Sun*, May 25, 1909, 11.

hemmed in certain groups, especially African Americans and Jews, but also the white working class. The upshot was that, by the 1930s, lead hazards were greater and were less evenly distributed.

Monumental Iron and Metal was just one small example of this. One of John Bannon's specialties in at his new location was recycling the lead from automobile batteries. In the 1930s, Bannon's African American employees would break up old car batteries and melt the lead plates down. This was done with no precaution in an open yard surrounded by primarily African-American residences.[119] But as the residents of this neighborhood and health experts discovered in the 1930s, lead hazards from industry had penetrated beyond the workplace and community environment and into the home.

[119] Memo Schulze to Williams, October 29, 1932, Folder Lead Poisoning Cases 1932, Box 3.3-3.4, Series III, GHW Papers, AMCM Archives.

Chapter 2 – The Depression Disease: Suburban Expansion, Energy Inequality, and America's First Child Lead Poisoning Epidemic

In 1932, when the Baltimore City Health Department was diving head-first into the problem of industrial hygiene, occupational lead poisoning upstaged other industrial diseases. But in that year, industrial diseases were themselves eclipsed by a new lead poisoning problem, a "most interesting and insidious development," as the department put it: The mass poisoning of children from households burning the wooden cases that enclosed lead-acid automobile batteries (Figure 16). Battery recyclers, such as Monumental Iron and Metal, gave away or sold these casings to people who were desperate for fuel for cooking and heating. In 1932, the BCHD reported 36 cases of lead poisoning by this exposure. Thirty five of these cases were children, almost all of them African-American.[1] Poor people in other cities also suffered lead poisoning from this source. The pervasive problem was widely covered in the media in the 1930s. Because Baltimore's epidemic was so well-studied, it took center stage in virtually all of these accounts.[2]

[1] BCHD, *Annual* 1932, 220.
[2] Among others, the following newspapers carried stories about lead poisoning from burning battery casings: *Chicago Defender,* September 17, 1932, 17; *San Jose Evening News*, November 3, 1932, 4; *Eugene Register-Guard* (OR) October 25, 1932, 4; *Tuscaloosa News* (AL) October 23, 1932, 4; *Owosso Argus Press* (MI), October 18, 1933, 11; *Southeast Missourian* (MO) October 31, 1934, 5; *Berkeley Daily Gazette* (CA) October 1, 1934, 14; *Lewiston Daily Sun* (ME) October 1, 1934, 3; *Spartanburg Herald* (SC), May 28, 1935, 4; *Spokane Daily Chronicle* (WA) May 30, 1935, 4; *Chicago Daily Tribune*, June 29, 1935, 10; *Los Angeles Times* January 24, 1936, A4. Many of these were syndicated columns by two doctors, Logan Clendening and Morris Fishbein. Additional newspaper articles are cited throughout the rest of the chapter. It is worth noting that most of the published material on this topic did not use the term "epidemic," although several health experts used that term in unpublished writing. Huntington Williams originally titled his article (discussed later) for the *Journal of the American Medical Association* "Epidemic of Lead Poisoning from an Unusual Source" (Draft in Folder Lead Poisoning 1932, Box Restricted Material Pulled From Series III, GHW Papers, AMCM Archives). The *Baltimore Sun* did refer to poisonings as an "outbreak" in the 1930s. In the 1940s, publications began referring to these poisoning as epidemics, both to characterize ongoing poisoning and retrospectively with regard to the 1930s poisonings.

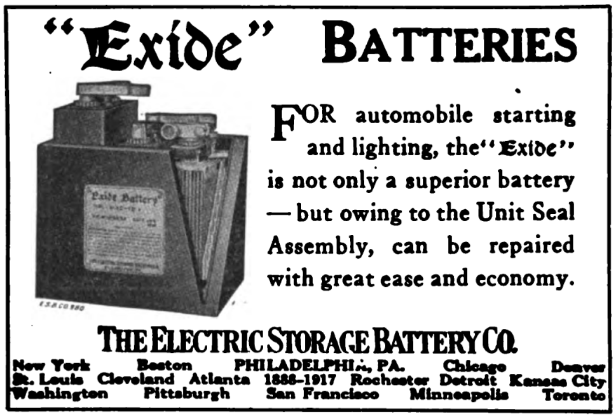


Figure 16: An advertisement for lead-acid batteries, which came into widespread circulation in the 1920s as automobile use increased. Once the batteries were depleted, junk yards would recover the lead for re-smelting and discard the wood casing. Although some battery manufacturers began using hard rubber cases, many continued to use wood in the 1930s. These wood cases were soaked in lead, and burned with a foul, poisonous stench when used as fuelwood by the poor during the Great Depression. **Source:** *Horseless Age,* January 15, 1918, 82/Wikimedia Commons.

Before the 1930s, public health departments in the United States did not think of child lead poisoning as a community health problem.[3] Occasional outbreaks of lead poisoning from lead pipes brought attention as a community health problem, but the concern was not sustained, and it was not specific to children.[4] Experts saw lead poisoning as an occupational health problem and a problem that occasionally afflicted other individuals in a rather unsystematic way. Then the outbreak of child lead poisoning from batteries struck. At the Baltimore City Health Department, this problem was not particularly congruous to the existing divisions of labor between child welfare, epidemiology, and industrial health, but under the leadership of an ambitious new commissioner, Huntington Williams, the department aggressively confronted the problem. The epidemic pushed Baltimore, and ultimately the United States, into the modern public health approach to child lead poisoning, which included screening with blood tests, materials testing, reporting and tracking cases, and enacting policies aimed at prevention.

Beyond narrating the epidemic and the origins of the public health approach just mentioned, this story illuminates some important aspects of public health knowledge, practice and politics. It shows, above all, the importance of non-experts in concert with experts in the production of public health knowledge. Historians of science and medicine sometimes depict non-experts as being scientifically

[3] In Australia, however, health experts identified child lead poisoning from lead paint as a public health problem around 1900, as I discuss in the next chapter.
[4] On lead pipe poisoning epidemics, see Werner Troesken, *The Great Lead Water Pipe Disaster* (MIT Press, 2006).

naïve, but also having rich local and experiential knowledge. Medical or scientific experts, on the other hand, are depicted as having extensive scientific knowledge, but being tightly constrained by "discourses" or "paradigms." The suggestion is often that the worldviews of non-experts, especially if they are highly marginalized or "subaltern" people, are conflicting or incommensurable with expert knowledge. As I argue here, non-expert knowledge played a critical role in the discovery of the cause of the first child lead poisoning epidemic. But that knowledge was not medically naïve, as one historian has argued, nor was it incommensurable with scientific knowledge. Rather, expert and non-expert knowledge of pollution overlapped, they were complementary. Still, I emphasize the role of non-expert knowledge because my archival research shows how close the pivotal role of a community member was to being completely excised from the historical record. This emphasis is also important because the careful evaluation of non-expert contributions to our understanding of public health challenges provides an incentive to search for the many such cases that remain to be discovered.

Identifying the cause of child lead poisoning was just the first step in dealing with the epidemic. In many ways, Baltimore's response to the battery case burnings was a huge success. The city health department, with help from hospital physicians and community members, responded rapidly to a health emergency. The city quickly shut off the source of contaminated material once it was identified. They went beyond regulation in assisting in the removal and disposal of battery casings. Most importantly, a charitable organization supplied an alternative to the banned source of fuel that was contaminated with lead. Part of the reason that the response was successful, at least in the short term, was that, even though it only affected a small, marginalized minority of the population, lead poisoning was framed as part of a broader problem that touched all Americans – namely the Great Depression.

Lead poisoning from burning battery cases, however, did not end with the Depression. The problem continued (absent the collective response of the 1930s) because the root of the problem, energy inequality, persisted long after the Great Depression. Indeed, it was exacerbated in the years that followed. Energy networks, public policy and metropolitan development fused to produce both disparities in access to clean energy (i.e. gas and electricity) and toxic material flows (lead-acid battery recycling) that were at the heart of the epidemic (Figure 17). While the battery case burning crisis shed light on some of these deeper structures, the disproportionate impact was the product of deep structural inequalities. Rather than addressing those inequalities over the first half of the twentieth century, Baltimore's political system ultimately reinforced them.


had made no speaking dates in the campaign, and that he had not yet decided whether he would make any.

Would Remedy Abuses

In his article Mr. Smith agrees with other members of the advisory board of the National Economy League that legislation giving cash benefits to veterans has passed far beyond the bounds of reason and become a peril to the nation. He called for a remedy of abuses in so-called "veterans' relief."

"Nobody," the former Governor said, "will take the negative side of the question that the man who offers himself to his country in time of trouble should be rewarded. If left to the veterans themselves and to the officials of the Government who have to deal with it, there is no doubt that a just and equitable system of compensation and reward would be arrived at, but the unfortunate thing about it all is that it is bedeviled by politics."

Blames Politicians

Mr. Smith laid a large share of the blame for the recent bonus army disorders in Washington upon politicians who encouraged the marchers to come to the Capital by holding out the illusion that a bonus measure might be passed and signed.

"Though I dislike to say it," he added, "I feel it is true, also, that they did this in face of the fact that they could not

Figure 17: Advertising section from the 1932 *Baltimore Sun* with side-by-side advertisements of modern energy sources and systems for automobiles and homes -- but not for everybody, as the concurrent lead poisoning outbreak from burning battery cases in that same year revealed. **Source:** Advertisement, *Sun*, September 14, 1932, 4.

The first half of the twentieth century was a period of incredible expansion in networks of gas and electricity. Energy networks began as neighborhood-scale service providers. From there, they expanded and merged with other networks. As they expanded, use within the networks' covered areas also intensified. More users connected to the networks and users consumed more energy. But both extensification and intensification only went so far by the 1930s. While big pipelines and high-tension power lines passed through rural areas, those places rarely benefited from the new energy networks because they could not afford them and because energy utilities did not try to make them affordable to those groups. The same was true of many urban residents as well. Renters, the poor, and African Americans often had little or no access to gas and electricity, despite the buzz of electric lights and the roar of gas burners around them.[5]

Energy supply and lead-related technologies were dynamically related. Lead-related technologies helped expand energy use. Pipelines systems used lead, and once in place, gas pipelines helped expand the production of lead. and electrical systems used lead. Electrical systems also used lead, and they helped expand the production of lead-related electrical products. One of these electrical products was the lead acid battery, which, in turn, helped spur another energy-technology combination: the gasoline-fueled, battery-started automobile. The proliferation of this technology resulted in a great flow of lead-acid batteries into the world. Thus lead was critical to the expansion of cheap energy and transportation networks.

But the benefits of those systems were not distributed equitably. The very citizens most often denied the benefits of the emerging metropolitan-wide energy systems, were the same citizens harmed by the worst externalities of these systems. Lead-acid batteries assisted people in moving out to the suburbs in their automobiles, but those batteries were then funneled back into the urban core, where they poisoned workers and families. The distribution of these benefits and harms was often taken for granted in the past, as it is today, but the regulatory structure that shaped gas and electrical services was the result of political and business decisions in the late nineteenth and early twentieth century. In Baltimore, the debate over the role of the state in gas utilities was incredibly vigorous. It was part of, and indeed an exemplar, of the widespread debate over natural monopolies, and by extension the role of the state in shaping the

[5] The story of energy utilities in particular challenges two of the key assumptions of neoclassical economics about capitalism: 1) that economies of scale (the declining average costs per unit typical of "natural monopolies") are not common; and 2) that capitalist expansion is a reaction to consumer demand, rather than the creation of consumer demand. See Samuel Bowles, Richard Edwards, and Frank Roosevelt, *Understanding Capitalism: Competition, Command, and Change* (Oxford University Press, 2005).

equitability and efficiency of capitalist markets. Many alternatives were proposed for the regulation and ownership of Baltimore energy services, and several of those alternatives would have substantially altered the access to energy that emerged by the 1930s. Instead, the system that emerged tended to deepen both energy inequality and environmental health inequality, revealing the often double-sided nature of energy injustice.[6]

Discovering the Epidemic

Over the course of the summer in 1932, a clear understanding of the lead poisoning epidemic in Baltimore unfolded as the result of contributions from the latest lab testing techniques, community knowledge and public health experience. The first victim to be identified with lead poisoning was a seven-year-old African-American girl. On June 29, concerned relatives brought her to the Harriet Lane Home at Johns Hopkins Hospital. She was unconscious, and had previously experienced convulsions followed by "stupor." A tuberculin test indicated tubercular meningitis, which was a common problem in poor and African-American communities in Baltimore. But a lumbar puncture – a procedure that tests spinal fluids – suggested lead poisoning. Such confusion showed the diagnostic challenges of the era. The symptoms of acute lead poisoning included encephalitis, headache, constipation, convulsions, colic, dizziness, drowsiness, vomiting, and loss of motor control. But those symptoms were not specific to lead poisoning. Moreover, diagnostic tests and indicators such as lumbar punctures, x-rays, blood cell stippling, and gum discoloration were unreliable because testing technologies were relatively new and because reactions to lead exposure differed in their presentation. Finally, Americans of the era typically were exposed to lead over the course of their entire lives, which meant that its mere presence in the body was not usually considered worrisome.[7]

In order to get a better handle on what disease the child had, Dr. Miriam Brailey, an intern at the Harriet Lane Home, visited the child's house. Brailey found the mother who "moved about with

[6] On energy justice, see Benjamin K. Sovacool, Roman V. Sidortsov, and Benjamin R. Jones, *Energy Security, Inequality and Justice* (Routledge, 2013).
[7] Huntington Williams et al., "Lead Poisoning from the Burning of Battery Casings," *Journal of the American Medical Association* 100, no. 19 (1933): 1485–1489.

difficulty" and seemed "confused mentally." A neighbor, Melrose Easter, helped answer Brailey's questions and took the doctor on a tour of the house to look for fresh paint, loose plaster or enameled beds, which Brailey knew to be potential sources of lead poisoning for children.[8] After a "fruitless search," Easter offered that perhaps the family had become sick from breathing in the bad smelling vapors put off from burning battery casings, which were a common source of fuel for heating and cooking in surrounding neighborhood, according to Easter. Brailey took a sample of a battery casing for lab work. The lab used spectrographic analysis to confirm that the casings were indeed contaminated with lead. Spectroscopy was a very new application for public health analysis, and the *New York Times* highlighted its use in determining the source of lead poisoning in Baltimore's epidemic.[9]

It is worth dwelling for a moment on the biography and significance of Melrose Easter who played a crucial role in what came to be the first concerted effort to combat a child lead poisoning epidemic. Little of Easter's life has survived in public records. He was born in 1896 in Hinton, West Virginia. His father was an engineer for the War Department and the railroad. Sometime before 1920, Easter moved to Baltimore – part of the Great Migration of African Americans from the rural South to cities – where he worked as a driver for a pottery maker and a coal ship loader.[10] Apparently, he was a good citizen: In 1943, he tried to save a fellow tenant who caught on fire while smoking.[11] Outside of these few documents, little is known about Easter beyond what Brailey conveyed in her writing. Her description of Easter oozed with stereotypes. He was a "large Negro" whose "eyes were bloodshot and whose breath was strong with whisky." His notions reflected the "piety of his race." Fortunately, Brailey

---

[8] Ibid; The *JAMA* article suggests only that Brailey searched for "fresh paint or plaster," but a longer draft of Brailey's account makes it clear she was interested in "loose plaster or enameled beds." Miriam Brailey, "An Account of Storage Battery Casings As a Source of Lead Poisoning," (no date), Folder Lead Poisoning From Burning Battery Casings, Box Restricted Material Pull From Series III, GHW Papers, AMCM Archives.

[9] "Savants to Confer on Spectroscopy," *New York Times*, July 15, 1934, N1. On spectroscopy and environmental health, see Anthony Travis, "Instrumentation in Environmental Analysis, 1935-1975," in Peter J. T. Morris, *From Classical to Modern Chemistry: The Instrumental Revolution* (Royal Society of Chemistry, 2002).

[10] U.S. Census, Enumeration District 38, Ward 3, Baltimore City, Fourteenth Census (1920), Sheet 7A; U.S. Census, Enumeration District 4-53, Block 33, Ward 3, Baltimore City, Maryland, Population Schedule, Sixteenth Census (1940), Sheet 9B; Allen Melrose Easter, Draft Registration Card, Serial Number 2228; His father was John Easter: *Official Register of the United States, Containing a List of Officers and Employees in the Civil, Military and Naval Service* (Washington: GPO, 1881), 294.

[11] "Man Burns Self to Death," *Afro-American*, January 30, 1943, 15.

also reported what Easter said about himself. Easter told Brailey he had studied at the Tuskegee Institute for "a year or so," learning the "physiology of bones, lungs and stomachs," and had considered studying medicine before the complexities of the circulatory system led him to abandon the plan.[12]

Despite Brailey's patronizing description, she took Easter's opinion seriously enough to follow up on it with testing. And when tests showed that Easter was correct, she was scrupulous enough to insist that he get credit. It is because of her that we even know of Melrose Easter. The *Baltimore Sun* did not mention him in articles on the epidemic, and the *Baltimore Afro-American* did not cover the story.[13] The BCHD's *Health News* story credited Brailey with the "brilliant" discovery. When the health commissioner Huntington Williams drafted an article about the epidemic for the *Journal of the American Medical Association* (*JAMA*) he left Easter out. After reviewing Williams's draft, Bailey wrote, "It is very kind of you to link me at all with the storage battery situation, for after all, old Melrose Easter was the man with the idea." She reminded Williams of this a second time as well, and ultimately her own narrative discussing Easter was printed in the article.[14]

Melrose Easter's story shows, on the one hand, how important non-experts can be to identifying public health problems and, on the other hand, how easily their contributions can get lost in scientific attribution. There are many other documented cases where non-experts played critical roles in identifying public health issues, but it is hard to know how many have been left out.[15] It also shows that public health knowledge was the product of combined expert and non-expert knowledge, and that these knowledge bases were overlapping. Easter's knowledge was not scientifically naïve, or "a-medical" as one historian has argued.[16] And it is not so much a question of who discovered the cause of lead poisoning epidemic –

---

[12] Williams et al., "Lead Poisoning from the Burning of Battery Casings."
[13] The *Afro-American* did not cover the story.
[14] "Lead Poisoning From Burning of Battery Casings," *Baltimore Health News*, October 1932, 73-74; Brailey to Williams (letter), January 21, 1933, Folder Lead Poisoning by Burning Battery Cases 1932-1934, Box 3.3.-3.4, Series III; Brailey to Williams (telephone note), February 20, 1933, Folder Lead Poisoning 1932, Box Restricted Material Pulled from Series III; both in GHW Papers, AMCM Archives.
[15] For some examples, see Robert W. Miller, "How Environmental Hazards in Childhood Have Been Discovered: Carcinogens, Teratogens, Neurotoxicants, and Others," *Pediatrics* 113, no. Supplement 3 (April 1, 2004): 945–51.
[16] Christopher Sellers has argued that Easter's suggestion of sickness secondary to noxious vapors was rooted in an "a-medical" understanding of the world, unlike that of a medical expert like Brailey. Even if Easter did not study medicine at the Tuskegee Institute – I have not been able to confirm or disconfirm it – Easter's reference to

Easter, Brailey or any of the other people involved – but that the discovery was the product of many people with different types of experiences and knowledge.

While it took a fortuitous combination of citizens to diagnose the problem, the discovery of the cause of lead poisoning in the seven-year-old African-American girl snowballed into the identification of more lead poisoning cases. Hospitals admitting these children contacted the Baltimore City Health Department based on the belief that the cause might be a widespread practice that public health experts would best handle.[17] In the fall of 1932, the BCHD discovered a significant, if spatially concentrated, practice of recycling lead-acid batteries and giving away or selling the wooden casings for fuel.

Utility Regulation and Energy Expansion

Primitive though it was, burning battery casings in the 1930s was part of a larger complex of technologies, ideas, policies and economic practices that shaped energy networks in Baltimore. Baltimore was a pioneer in developing energy networks, and its energy utilities were known for many innovative strategies that expanded energy infrastructure and use. But the energy networks that developed in the Baltimore region in the first half of the twentieth century primarily expanded access for businesses and the middle and upper class. Spatially, energy access grew in leaps and bounds on the periphery of the city, both following and incentivizing suburbanization. Thus, while energy access expanded, it left a gaping hole in the center of the metropolis where the urban poor were concentrated. That energy networks developed this way was not simply a matter of businesses responding to consumer demand in anything resembling the "logic of the market." Rather it was the result of the interplay of ideas about the role of the state in economic regulation, politics, technology and business strategy. These factors combined to greatly

---

physiology does not match with a description of him as "a-medical." Christopher C. Sellers, "The Dearth of the Clinic: Lead, Air and Agency in Twentieth-Century America," *Journal of the History of Medicine and Allied Sciences* 58, no. 3 (2003): 255–91. Medical experts were not oblivious to discovering pollution through more immediate sensory experiences in the same ways as non-experts. One nurse investigating the lead poisoning incidents looked in vain for lead exposure from utensils and canned goods. But on returning to the neighborhood for more investigation, she noticed heavy smoke in the air, which she eventually traced to the burning of battery casings in a scrapyard and in nearby houses. William Warthen to Williams, September 7, 1932, Folder Lead Poisoning by Burning Battery Cases 1932-1934, Box Restricted Material Pulled from Series III, GHW Papers, AMCM Archives.

[17] Williams et al., "Lead Poisoning from the Burning of Battery Casings."

expand energy access for some segments of society and in doing so, deepened energy inequality by leaving the poor in the urban core behind.

In Baltimore, as in other parts of the nation, the late nineteenth century and the early twentieth century were times of tectonic change in the structure of capitalism and profound reassessments of the role of state and social institutions in economic life. Before the Civil War, state-society relations were characterized by forthright state action at the local level and active, if often indirect, state action at the national level. Americans conceptualized public and private boundaries fluidly. They saw the state as having a complementary role to other institutions in the creation of the commonwealth. In the Gilded Age decades after the Civil War, the rise of big business, class conflict and national markets resulted in a reconfiguration of state-society relations. Public and private boundaries hardened. State-society relations increasingly manifested as the right to be free of government regulation and interference. The federal government sought to unleash big business through greater legal protections for corporations. This emphasis on distinctions between public and private roles and a limited state were known as *laissez faire*. But Gilded Age *laissez faire* was an exceptional moment in U.S. history rather than a baseline. And as problems of class conflict, technological risk, market failure and corruption grew in the late nineteenth century, Americans looked to give the state a more active role, whether through the older model in which public and private power were intermingled, or as an authority given more exclusive, special powers – a model that borrowed much from the European experience.[18]

[18] For the active role of the local state in the nineteenth century, see William J. Novak, *The People's Welfare: Law and Regulation in Nineteenth-Century America* (University of North Carolina Press, 1996). For the argument the national government was an active, if often indirect, state, and that the *laissez faire* system of the Gilded Age was exceptional, see Brian Balogh, *A Government Out of Sight: The Mystery of National Authority in Nineteenth-Century America* (Cambridge University Press, 2009). For the role of the government, especially the federal courts, in unleashing big business, see Morton J. Horwitz, *The Transformation of American Law, 1870-1960: The Crisis of Legal Orthodoxy* (Oxford University Press, 1992). The federal government also took a more active role during the Gilded Age, subsidizing railroads and using its military to appropriate Indian lands; see Richard White, *"It's Your Misfortune and None of My Own": A New History of the American West* (University of Oklahoma Press, 1991); Richard White, *Railroaded: The Transcontinentals and the Making of Modern America* (W. W. Norton & Company, 2011). Historians have taken a variety of views on what and who drove the reorganization of the state in response to Gilded Age problems. See, for example, Samuel P. Hays, *The Response to Industrialism, 1885-1914* (University of Chicago Press, 2014); Samuel P. Hays, *Conservation and the Gospel of Efficiency: The Progressive Conservation Movement, 1890-1920* (Atheneum, 1969); Robert H. Wiebe, *The Search for Order, 1877-1920* (Macmillan, 1967); Stephen Skowronek, *Building a New American State: The Expansion of National Administrative Capacities, 1877-*

The role of the state in dealing with monopolies and economic competition were two of the key questions among reformers who sought an alternative to the hands-off approach to business in Gilded Age.[19] Utilities were often at the heart of these discussions for a number of reasons. Like other large businesses, people criticized big utilities for price gouging, poor service, and political corruption. But utilities also appeared to be a special kind of business, what came to be known as a "natural monopoly." Natural monopolies have been defined in various ways, but the gist of these characterizations has centered on the notion that the supply of goods and services are best provided by only one large entity, be it public or private. Economists often described natural monopolies as cases where competition failed. Competition might fail because it was inefficient, even destructive to business, not yielding better prices or services. Or competition might fail because it resulted in monopoly pricing, unrelated to the true cost of delivering goods or services. Natural monopolies often had infrastructure that had to be duplicated to provide competition, and it often simply ended in consolidation. Railroads and energy utilities were classic natural monopolies, according to many Progressive era economists.[20] Gas utilities, which were rapidly expanding around 1890 at precisely the time when discussion of natural monopolies was cresting, provided good examples for economists. Not only did laying multiple gas mains under a street seem ludicrous, it was highly disruptive to traffic. On the other hand, the voracious assimilation of small gas utilities into big companies raised fears of monopoly power.

1920 (Cambridge University Press, 1982); Theda Skocpol, *Protecting Soldiers and Mothers* (Harvard University Press, 2009); Barbara Young Welke, *Recasting American Liberty: Gender, Race, Law, and the Railroad Revolution, 1865-1920* (Cambridge University Press, 2001); Martin V. Melosi, *Effluent America: Cities, Industry, Energy, and the Environment* (University of Pittsburgh Press, 2000); Daniel P. Carpenter, *The Forging of Bureaucratic Autonomy: Reputations, Networks, and Policy Innovation in Executive Agencies, 1862-1928* (Princeton University Press, 2001). For the way in which Americans looked to Europe for ideas about the role of the state (and vice versa), see Daniel T. Rodgers, *Atlantic Crossings* (Harvard University Press, 2009). On the way that the "new liberalism" that followed the Gilded Age drew on the classical liberalism and commonwealth ideas of the pre-Gilded Age period (as opposed to being an absolute shift to a "modern" administrative state), see Balogh, *A Government Out of Sight*.

[19] Ellis Wayne Hawley, *The New Deal and the Problem of Monopoly* (Princeton University Press, 2015), 3–14; Gerald Berk, *Louis D. Brandeis and the Making of Regulated Competition, 1900-1932* (Cambridge University Press, 2009), 37–41.

[20] On utilities and natural monopolies in this period, see, for example, Rodgers, *Atlantic Crossings*, 106–32; Richard R. John, *Network Nation* (Harvard University Press, 2010), 194–99. Rodgers and others trace the idea of a natural monopoly to John Stuart Mill.

The problem of natural monopolies, in other words, was double-sided. The term "natural monopoly" suggested that the characteristics mentioned above would naturally create monopolies. Once created, these monopolies could have their way with consumers. Problematic monopolies did arise in some cases, but despite the "natural" moniker, many businesses that fit the model of a natural monopoly did not automatically take over their markets. They became embroiled in competition, much to their chagrin and to the chagrin of consumers and residents who saw this competition as inefficient.

In Baltimore, businessmen, politicians, workers and intellectuals batted around all many ideas about the objectives and forms of state intervention in gas and electric utilities in the late nineteenth and early twentieth century. The focus of this ferment was a corporation that eventually became known as the Consolidated Gas, Electric Light and Power Company of Baltimore (CGELP). CGELP traced its lineage to the Gas Light Company of Baltimore, which was the first commercial gas lighting company in the United States when it began operations in 1816.[21] The Gas Light Company manufactured gas (as opposed to tapping natural gas), usually from coal, and delivered it by pipe to lamps. Despite health and safety concerns, demand for gas increased in the late nineteenth century, bringing more competitors into the market. In the 1850s and 1860s, the public generally saw competition in gas as a good thing, although governments in England, by this point, were already granting exclusive privileges and endorsing the consolidation of gas utilities. In the United States, competition bred price wars, which bred consolidations. In Baltimore, the first big merger occurred in 1880, creating the Consolidated Gas Company. But other companies arose, and residents of the city also began seeing the downside of competition as multiple companies ripped up streets for gas mains. To curb competition, the state of Maryland passed a law in 1886 prohibiting the creation of new gas corporations in Baltimore, subject to biennial review. This was followed by another gas consolidation in 1888.[22]

---

[21] By the 1830s, the Gas Light Company was suppling 3,000 privately owned lamps and 100 public ones. David Erlick, "The Peales and Gas Lights in Baltimore," *Maryland Historical Magazine* 80, no. 1, Spring 1985, 15.

[22] Christopher Castaneda, "Manufactured and Natural Gas Industry," *EH.Net Encyclopedia*, eh.net/encyclopedia/manufactured-and-natural-gas-industry/; Thomson King, *Consolidated of Baltimore, 1816-1950: A History of Consolidated Gas, Electric Light and Power Company of Baltimore* (The Company, 1950), 85. The gas meter was critical to making gas companies profitable in the 1850s, which brought in more competition.

Although these policies and consolidations toned down gas competition, the City and Consolidated faced an uncertain future. Consolidated might become a monopoly. Or intense competition might return, since state legislation only foreclosed competition in the short term.[23] On hand to comment on the unstable situation was Richard T. Ely, an economist at Johns Hopkins. Ely honed his ideas on natural monopolies in the midst of struggles over state intervention in Baltimore's gas service. In 1888, Ely wrote a series of columns for the Baltimore *Sun*, which were later published as a book, and he argued that Baltimore's situation was indicative of other cities.[24] Ely's writings, based on the situation in Baltimore, were perhaps the most influential in popularizing the issues surrounding natural monopolies and government intervention in utilities, especially gas utilities.[25]

For Ely, who had witnessed the "gas wars" in Baltimore, unchecked competition in gas service was bad. It unnecessarily tore up streets and resulted in a yo-yoing of prices from unsustainable low rates to high price-gouging rates. In the long term, Ely argued, the low rates of competition would yield to consolidation and ultimately to monopolistic exploitation. A city-run utility would be more rational and transparent than a private business and could yield revenue, offsetting taxes. As the state's tax commissioner, Ely suggested the state not allow the chartering of any more gas or water corporations.[26] And he argued the cities ought to buy gas utilities and, if that did not work, go into competition and drive them out. Ely cited European cities that had instituted this form of government and other forms of state-run organizations, especially the U.S. Post Office. Thus Ely, typical of many "new liberals" of the

---

Although government intervention in gas utilities greatly increased after the 1880s, there was some government control over gas utilities through the power of government contracts and the dispensation of franchises for using pipelines under roads before the 1880s. George Thomas Brown, *The Gas Light Company of Baltimore: A Study of Natural Monopoly* (Johns Hopkins Press, 1936), 31–37.

[23] "The Gas Monopoly," *Sun*, November 23, 1887, 2.

[24] For Ely's thoughts discussed here, see in general his "Problems of Today" columns for the *Sun* in 1888: February 8, 1; February 11, 1; February 15, 1; February 18, 1; February 22, 1; March 7, 1; March 21, 1; March 23, 2; and Richard Theodore Ely, *Problems of To-Day: A Discussion of Protective Tariffs, Taxation, and Monopolies* (T. Y. Crowell, 1888); Richard Theodore Ely, *An Introduction to Political Economy* (Hunt & Eaton, 1889); Richard Theodore Ely, *Natural Monopolies and Local Taxation* (Robinson & Stephenson, Manufacturing Printers, 1889); Richard T. Ely, "Municipal Ownership of Natural Monopolies," *The North American Review* 172, no. 532 (1901): 445–55.

[25] Brown, *The Gas Light Company*, 5.

[26] Richard T. Ely, *Supplementary Report on Taxation in Maryland* (Maryland Tax Commission, 1888), 75.

Progressive era, looked both to new state interventions in Europe and to old forms of state authority in America.[27]

Ely's ideas about public ownership were influential,[28] but in 1890, many Baltimoreans found themselves with enough on their hands simply trying to keep Consolidated from becoming a state-sanctioned monopoly. Despite high profits, Consolidated tried to push its advantage further in 1890, lobbying the Maryland legislature to do away with state lawmakers' biennial re-assessment of gas rates and the prohibition on new gas companies in Baltimore. Instead, Consolidated asked for a 25-year monopoly, with provisions for payments to the city and rate-setting. Despite heavy lobbying and bribery from Consolidated, intense opposition from Baltimore business people, laborers and politicians defeated the creation of an unchecked gas monopoly in the city.[29] While politicians emphasized the importance of maintaining political control of the gas utility and business people emphasized the potential for price gouging, labor organizers emphasized the way the gas utility was already excluding the working class . Labor activists criticized Consolidated for excluding the "toiling masses" from gas by charging too much money and not laying pipes in the alleys where poor people lived.[30]

In the 1890s and early 1900s, people in Baltimore and elsewhere continued to debate what should be done with gas utilities – and why. As the defeat of the 1890 bill that would have enforced a private monopoly showed, there were multiple reasons for wanting municipal control or ownership of gas utilities. Ely's ideas continued to be influential. But the question of government intervention in utilities continued to be controversial. Attitudes toward competition and monopoly were highly contextual. When competition reigned, people bemoaned the chaos; when monopolies loomed, people denounced the

[27] Rodgers, *Atlantic Crossings*; Balogh, *A Government Out of Sight*, 354–55. Ely's rejection of public regulation of private utilities, however, seems to be an exception to Balogh's description of the "new liberals" as intellectuals who sought to break down the distinct public and private spheres that arose in the Gilded Age. Ely wrote, "It is desirable to separate by as sharp a line as possible public and private undertaking, and this end can best be accomplished by ownership of gas works by municipalities." Ely, "Problems of Today: Article XX," *Sun*, February 15, 1888, 1.
[28] National newspapers and trade magazines covered Ely's ideas. Locally, the *Sun*'s editorials often simply paraphrased Ely's arguments. See "How To Deal With Natural Monopolies," *Sun*, February 15, 1888, 2; "City Gasmaking," *Sun*, March 16, 1888, 2.
[29] "Gas Extortion and the Legislature," *Sun*, January 31, 1890, 2; "Plain Facts About Gas," *Sun*, February 17, 1890, 6; "History Repeats Itself," *Sun*, March 13, 1910, 5.
[30] "Bravo! Second Branch," *Sun*, March 11, 1890; "Resentment Blazing Out," *Sun*, March 14, 1890, 1; "People Who Burn Candles and Live in Alleys," *Sun*, March 14, 1890, 2.

exploitation. Beliefs about the state of the state mattered just as much as the nature of business. While some reformers argued for greater state intervention, and even public ownership, other reformers feared that government corruption and inefficiency would not solve problems with utilities and natural monopolies.

Socialists and some other reformers argued for public ownership of gas in the name of helping the working class and poor. Woodrow Wilson, in an address to Baltimore City Democrats in 1896 when he was a professor at Johns Hopkins, declared that the modern industrial city was not a corporation owned by property holders but a "humane economic society." He decried that private ownership of gas was "pernicious" and would not benefit the whole city, while municipal ownership would be broadly beneficial. Although he suggested that municipal ownership would allow more people to access services, he was vague on how far that would go.[31] More explicit were the platforms of various socialist and labor organizations in the late nineteenth and early twentieth century that frequently included the public ownership of gas and other utilities as a key evolutionary step toward a society in which the fruits of productions were more equally shared.[32]

Beyond distributive justice, there was another rationale for setting aside profit and operating municipally owned utilities in a way that made their services available to most or much of the population: to control infectious diseases that threatened the health, and ultimately the wealth, of the entire city. Above all, late nineteenth and early twentieth century cities built or acquired water supply systems (and to

---

[31] Wilson also believed municipal ownership had to await reform of political machines. Henry Bragdon, "Woodrow Wilson Addresses the Citizens of Baltimore, 1896," *Maryland Historical Magazine* 37, No. 2, June 1942, 150-170. Wilson was a student of Ely.

[32] Albert May Todd, *Municipal Ownership, with a Special Survey of Municipal Gas Plants in America and Europe* (Public ownership league of America, 1918); Ira Kipnis, *The American Socialist Movement 1897-1912* (Haymarket Books, 2005), 64; Elizabeth Sanders, *Roots of Reform: Farmers, Workers, and the American State, 1877-1917* (University of Chicago Press, 1999), 56; Judith Sealander, *Grand Plans: Business Progressivism and Social Change in Ohio's Miami Valley, 1890-1929* (University Press of Kentucky, 2015), 125–26; Richard William Judd, *Socialist Cities: Municipal Politics and the Grass Roots of American Socialism* (SUNY Press, 1989), 91. Ely eschewed socialist values about distributive justice, but he and other Progressive reformers also rejected socialism as being politically impractical. Richard Theodore Ely, *The Strength and Weakness of Socialism* (Chautauqua Press, 1899); Balogh, *A Government Out of Sight*. Socialists who advocated municipal ownership and the distributional justice nevertheless drew heavily on Ely's ideas at times. See Charles Henry Vail, *Modern Socialism* (Commonwealth Company, 1897).

a lesser extent sewer systems) in order to tamp down typhoid and similar water-borne diseases.[33] Ely, for example, stated that the "importance of general use of water in large quantities cannot be overestimated" and thus it was "questionable whether any special charge should be made for its use."[34] And Baltimore's municipally owned water works did often run at a loss.[35] But Ely and others, including another influential Hopkins professor and former student of Ely, Albert Shaw, argued that while municipal ownership of water supply could be justified on public health grounds, gas could only be justified on more efficient service.[36]

Through the early 1900s, there continued to be considerable debate about the form and purpose of government intervention in gas utilities. The influential reformer Frederic Howe – a student of both Ely and Wilson at Hopkins – argued that municipal ownership of services like gas, electric and water could improve the condition of the poor and correct the problem of the slums.[37] The *Sun* carried articles on "municipal socialism" in Britain, although this term sometimes simply meant municipal ownership, rather than a socialistic goal of distributive justice.[38] Locally, influential people continued advocating for public ownership. In 1899, Baltimore created a Municipal Lighting Commission, which argued for the passage of an enabling act that would allow the city to create a municipal gas works. Councilman George Brown took up this crusade most fervently in the early 1900s. He argued for it because he believed it would be more efficient and because he saw the politics of utility regulation – granting franchises, regulating rates and competition and so on – as a tool of political machines. Machines received money in exchange for being soft on utilities and blocking bills that would create a public utilities commission (which had been introduced every year since 1892). Ely had made a similar argument years before, arguing that the machines mobilized poor people to elect representatives that then worked against the poor's interest by

---

[33] Melosi, *The Sanitary City*, 83–86.
[34] Ely, "Problems of Today: Article XXI," *Sun*, 1888, February 18, 1.
[35] In 1911, for example, the Baltimore waterworks were operating at an annual loss of $400,000. Glenn Marston, *Facts on Municipal Ownership in 268 Towns and Cities* (Public Service Publishing Company, 1915).
[36] "Municipal Gas Works," *Sun*, October 24, 1891, 8.
[37] "Praises New System," *Sun*, March 19, 1906, 2; Frederic C. Howe, "The Case for Municipal Ownership," *Proceedings of the American Political Science Association* 2 (1905): 102.
[38] "Ownership by Cities," *Sun*, May 20, 1902, 2; "Municipal Socialism," *Sun*, December 10, 1902, 4; William Bryan, "Bryan Studies Cities: He Tells of Municipal Ownership in Great Britain," *Sun*, December 27, 1903, 2.

being too cozy with utilities. Other councilmen opposed municipal ownership as "too socialistic." But the bigger obstacle was the feeling among councilmen, even those sympathetic to the idea of municipal ownership, that it was far too complicated for the city to try to take over or initiate its own gasworks.[39]

Consolidated, meanwhile, was making its own moves. After consolidation and state regulation in the late 1880s, Consolidated did well for a while until the late 1890s and early 1900s when regulated rates and renewed competition – this time from electricity utilities – bit into its profits.[40] Initially, the company responded by trying to expand into two markets that it had neglected: suburban developments and the market for gas heating and cooking.[41] Consolidated also did away with charging a connection fee in 1900 and reduced the deposit required to insure that gas bills were paid. These charges had been a hindrance to poorer people getting gas hook ups. But even in the face of a coal shortage in 1902, due to a miners strike, the company refused to temporarily reduce gas rates (as the Baltimore Citizens' Permanent Relief Committee urged), or to provide financing for gas stoves (as gas utilities in some cities did).[42]

Eventually the company did what it had always done to remain profitable in the face of competition: swallow the competitor. In 1906, Consolidated Gas merged with the Baltimore Light and Power Company to become the Consolidated Gas, Electric Light and Power Company of Baltimore City (CGELP). Consolidation brought brighter prospects for the gas and electric company, attracting New

---

[39] "Municipal Lighting," *Sun*, March 1, 1900, 12; "Mr. Brown's 'Only Way,'" *Sun*, September 27, 1906, 14; George Stewart Brown, "Municipal Ownership of Public Utilities," *The North American Review* 182, no. 594 (1906): 701–8. For Ely, see: "Monopolies and Pure Politics," *Sun*, January 23, 1889, 2. Utilities in other cities also avidly supported political machines in order to maintain their public franchises and shield their businesses from the "whims of democracy," as one historian put it. Daniel Amsterdam, *Roaring Metropolis: Businessmen's Campaign for a Civic Welfare State* (University of Pennsylvania Press, 2016), 29. "For Ownership by City," *Sun*, January 16, 1906, 14; "Time Not Ripe They Say: City Officials Believe in Municipal Ownership in Abstract," *Sun*, April 5, 1906, 7.

[40] King, *Consolidated of Baltimore*, 124–25.

[41] In 1900, the Company advertised the "neat and clean" aspect of gas heat as well as free gas range connections. This initiated a decades-long push for consumers to adopt gas for heating and cooking. Ibid., 1931. In 1901, the company gained the right to extend into the new suburban development of Forest Park in northwest Baltimore. More suburban extensions followed. Ibid., 134, 170. Between 1899 and 1909, the company increased the mileage of gas mains by 41.1 percent and sales increased by 82 percent, and in 1904 it built a huge gas manufacturing plant at Spring Gardens in southwest Baltimore. Ibid., 171.

[42] "To Make Gas Popular," *Sun*, July 23, 1902, 12; "Discusses Fuel Question," *Sun*, September 10, 1902, 12; "To Buy Coal for Poor," *Sun*, August 12, 1902, 7. Another alternative to coal was gasoline stoves, but these were the target of bans as a result of their fire risk – a risk advocates for the poor believed was overblown, classist and, they speculated, promulgated by the gas utility, since gasoline stoves were putatively a competitor. Letter to Editor from "H.," *Sun*, September 22, 1902, 10;

York investors and pushing the company to seek more investments in infrastructure and ways to bring in more energy into its network.

The consolidation of gas and electric companies brought renewed concerns about monopoly power, which in turn finally yielded a new approach to utility regulation. Although the idea of public ownership did not go away entirely – a councilman representing a working-class area of Baltimore continued to advocate for it[43] – middle-class reformers pushed hard for a Public Service Commission (PSC). In Baltimore, the strongest organizations backing the PSC were affluent neighborhood associations and local business associations. Charles Grasty, the owner of the Baltimore *Evening News*, was a key proponent of this sort of reform. Grasty attacked Consolidated's high rates and poor service (uneven gas pressure) in the 1890s, along with the city's machine politics, which he excoriated for handing out special favors to utilities and other private businesses. These groups wanted better service and reasonable rates – but reasonable by the standards of their class and, for that matter, their race. Grasty was no radical. He opposed public ownership, let alone socialism, and was a strong proponent of segregation.[44]

CGELP fought bitterly against legislation creating a PSC. The company at first offered to bring natural gas to the city, which was cheaper than its manufactured gas, in exchange for a monopolistic contract with the city rather than a PSC. When the city rejected that offer, CGELP threatened to stiff-arm the introduction of natural gas to the city (which it did). Nevertheless, a powerful political constituency that included Baltimore's mayor and the state's governor (who was not running again and so was more insulated from machine politics) pushed through the PSC legislation in 1910.[45]

---

[43] In contrast to Progressive reformers who came from the middle class, the advocates of public ownership represented the working-class neighborhood of Hampden. "Would Take Gas Plant," *Sun*, February 4, 1910, 4.

[44] James B. Crooks, *Politics & Progress: The Rise of Urban Progressivism in Baltimore, 1895 to 1911* (Louisiana State University Press, 1968), 17–19, 121–26. Charles Grasty had helped attract British capital for the racially exclusive suburban development Roland Park, where he lived. Antero Pietila, *Not in My Neighborhood: How Bigotry Shaped a Great American City* (Ivan R. Dee, 2010), 38–39.

[45] Crooks, *Politics & Progress*, 108–11, 117–20. Of course, CGELP was even more opposed to public ownership than regulation. Delbert Lowe, *History of the Consolidated Gas, Electric Light and Power Company of Baltimore*, 1928, 263–66, archive.org/details/HistoryOfTheConsolidatedGasElectricLightAndPowerCompanyOfBaltimore; Brown, *The Gas Light Company*, 84–107.

Under PSC rate regulation, Consolidated made up for losses in profit margins by expanding its business. Expansion was already part of the of the energy utility business model, even before PSC rate regulation, however. Energy utilities faced a situation in which consumer demand was highly variable – shaped by the rhythms of seasons, night and day, the work day, eating and sleeping – but their resources were extremely difficult and expensive to store. Great fluctuations between the peaks and troughs in demand meant a utility's generating equipment would sit idle, and excess power produced would be lost. Alternatively, there would be too little production and infrastructure, and customers would face shortages. To deal with this problem, utility managers sought to expand and diversify their customers' base in order to smooth out peaks and valleys in demand.[46] CGELP did this as well. In 1908 it reduced electric rates in order to attract more customers, hoping to smooth out fluctuations in demand and make up what was lost on smaller profit margins with more total sales.[47]

PSC rate regulation added to the technological impetus for expansion as CELP sought to make up for lower rates by expanding its business. The company encouraged electrical use with an appliance store and created programs to help customers install auxiliary gas for heating.[48] Consolidated also continued pricing incentives for the use of gas for cooking and heating, and it advertised gas as clean, modern and acceptable even in "restricted and exclusive" suburbs that banned smoke and other nuisances.[49] In addition to marketing and assistance with the purchase of appliances, the company was a national leader

[46] Samuel Insull of Chicago's Commonwealth Edison Co. was a pioneer of utility load management. For Insull and the exigencies of utility and network technologies, see Thomas Hughes, *Networks of Power: Electrification in Western Society, 1880-1930* (Johns Hopkins University Press, 1993), 216–22.
[47] King, *Consolidated of Baltimore*, 175. Theodore Kappen, "Growth of House Heating in West," *Gas Age*, April 8, 1922, 423. Consolidated Gas, Electric Light and Power Company of Baltimore, *American Gas Centenary, 1816-1916* (The Company, 1916), 325.
[48] Consolidated Gas, Electric Light and Power Company of Baltimore, *American Gas Centenary, 1816-1916*, 329. These efforts payed off. CGELP had 16,605 electrical customers in 1910. By 1920, it had 79,469, more than four times as many. Most of these were residential consumers. Total consumption of electricity skyrocketed 900 percent in the same period. Christopher F. Jones, *Routes of Power* (Harvard University Press, 2014), 184–88.
[49] For the first time, in 1911, consumers used the majority of their gas during the day. King, *Consolidated of Baltimore*, 195. Regulation after 1910 brought lower gas rates which brought more customers, and the company brought in even more customers with marketing, variable rates and assistance with appliance hook ups. Gas rates fell from 1.50/cubic foot in 1886, to 1.10 in 1905, to .75 by 1916. John Bailey, "Past and Present Condition in Baltimore," *The Gas Age* July 1, 1916, 16-18, GBS. This rate was the cheapest in any major city using manufactured gas. *Statistical Abstract of the United States* (U.S. Government Printing Office, 1922), 636. Natural gas was anywhere from .30 to .65 cu. ft. for the handful of cities that used it in 1917. "Domestic Fuel Appliances," *The Gas Industry*, 14, no. 1, January 1914, 117. "House Heating Business," *Gas Age*, October 15, 1917, 367.

in using variable rates to attract gas heat customers. Variable rates made gas use relatively cheaper for bigger (i.e. wealthier) consumers and relatively more expensive for small (i.e., poor) users or potential users.[50]

Despite its vehement objections, Public Service Commission regulation was not so bad for CGELP, and in just a few years it was praising the wisdom of the creation of the PSC.[51] In the 1910s and 1920s, CGELP grew rapidly, especially in the suburbs,[52] and it attracted international capital from London investors.[53] It was not the case that PSC regulation as it occurred in Maryland was either what CGELP preferred or what was, de facto, an optimal system for CGELP, as some historians have argued about corporate regulation in the Progressive era.[54] What CGELP clearly would have preferred and what would have given it the most power and profits was a state grant of monopoly with as few strictures on what it could charge and how it would run its business as possible. It lobbied for such a set-up endlessly.

But short of the dream of unregulated, state-sanctioned monopoly, PSC regulation was perhaps the next best thing for Consolidated. The regulatory regime that held from 1886 to 1909 – state legislative control – often benefited CGELP due to the close and probably corrupt relationship between the company

[50] "New Rates for House Heating," *The Gas Record*, August 9, 1916, 83. King, *Consolidated of Baltimore*, 210–12.Theodore Kappen, "Growth of House Heating in West," *Gas Age*, April 8, 1922, 423; "New Rates for House Heating," *The Gas Record*, August 9, 1916, 83.
[51] John Bailey, "Past and Present Condition in Baltimore," *The Gas Age* July 1, 1916, 16-18, GBS.
[52] "American Gas Centenary," *Baltimore*, June 1916, 11-12, GBS. CGELP took over existing energy utilities in the suburbs, either by buying them outright or by leasing the rights to operate their businesses. King, *Consolidated of Baltimore*, 198–99. By the first two decades of the twentieth century, it had bought energy utilities in the suburban areas of Forest Park, Mount Washington, Roland Park, Govans, Towson, Mount Winans, and Gwynn Oak. It also bought the Suburban Gas Company, the Baltimore County Electric Company, the Patapsco Electric Company. By 1920, it was selling almost 7 billion cubic feet of gas, had 144 thousand gas customers, 134 thousand gas ranges and 38 thousand water heaters. It was a recognized leader among eastern cities in using manufactured gas for house heating. It also had about 65,000 electric customers using about 350 million kilowatt hours a year. CGELP, "Report for Fiscal Year Ending June 30, 1912," *Commercial and Financial Chronicle*, October 26, 1912, 1119, GBS; Ibid. Consolidated Gas, Electric Light and Power Company of Baltimore, *American Gas Centenary, 1816-1916*, 260."Consolidated Gas, Electric Light & Power Co. of Baltimore," *Moody's Manual of Investments: Part III Public Utility Investments* (New York: Moody's Investor Service, 1920), 480. Theodore Kappen, "Growth of House Heating in West," *Gas Age*, April 8, 1922, 423.
[53] King, *Consolidated of Baltimore*, 192.
[54] Several historians have argued that Progressive era regulation was either structured to benefit big corporations or, whatever its original intent, functioned to benefit big corporations. Gabriel Kolko, *Triumph of Conservatism* (Simon and Schuster, 2008); James Weinstein, *The Corporate Ideal in the Liberal State, 1900-1918* (Beacon Press, 1968); Martin J. Sklar, *The Corporate Reconstruction of American Capitalism, 1890-1916: The Market, the Law, and Politics* (Cambridge University Press, 1988). This general thesis – historians have termed it "political capitalism" or "corporate liberalism" – is beyond the scope of this discussion. My point here is that does not fit with the evidence about CGELP.

and some legislators. But CGELP did not like the uncertainty of biennial reviews of its monopoly privileges and rates. And there was always the fear that cozy machine politics could give way to greater citizen control over the company. PSC control brought greater order to utility regulation and it insulated regulation from democratic control. Commissions were often staffed by people who had a cozy, amiable relationship with utilities. Commission members were usually political appointees, but they also tended to be drawn disproportionately from certain occupations, namely lawyers, businessmen and bankers.[55] While CGELP ended up thriving under the control of such a Commission, many Baltimoreans were unhappy with the PSC. Criticisms ranged from policy details to the argument that the PSC was simply overmatched by CGELP's power to the belief that the Commission was conspiring with Consolidated.[56]

These criticisms kept alive ideas about public ownership and even municipal gas socialism, but by and large the political debate became increasingly narrow. In practice, theories about natural monopolies and reformist values that tried to balance the interests of companies and consumers produced a focus on utility rates. In Maryland as in other states, this resulted in regulatory commissions that became embroiled in details – and lawsuits—about “reasonable” and “fair” rates of return for utilities.[57] Commissions often failed to produce “fair” rates in the eyes of the public, in part because debates and legal cases drew out changes in rates for years. In addition, regulatory commissions tended to reduce what had been a robust discussion about the role of the state in providing services to citizens to a series of technocratic and legal questions.[58]

---

55 Morton Keller, *Regulating a New Economy: Public Policy and Economic Change in America, 1900-1933* (Harvard University Press, 1990), 60–61.
56 See letters to editor in the *Sun* from November 29, 1915, 6; February 2, 1916, 6; August 6, 1920, 6. On municipal ownership/socialism of energy utilities, see “Maloy Warns of U.S. Control over Utilities,” *Sun*, August 9, 1924, 18; “Socialists Give Miss Gilman Nomination for Mayoralty,” *Sun*, February 1, 1935, 22.
57 Thomas K. McCraw, *Prophets of Regulation* (Harvard University Press, 2009), 57–60.
58 Keller, *Regulating a New Economy*, 62–63. As Brian Balogh has argued, intellectuals, especially economists, also shrunk away from public, general discussion in favor of internal disciplinary disputes in and after the 1910s. Balogh, *A Government Out of Sight*. Setting aside claims that the PSC conspired with utilities, one way to think about the change before and after the PSC is as a change from the exercise of what Steven Lukes calls the “first face of power” – the power of the utilities to fight against public ownership and competition – to the exercise of the “second face of power” after the creation of the PSC: the power to remove or sideline an option from political discussion in the first place. Steven Lukes, *Power: A Radical View*, 2nd ed. (Palgrave Macmillan, 2005).

But while the PSC model of utility regulation became increasingly taken for granted, there had been other possibilities. Even outside the radical goals of socialism, public ownership of gas utilities would likely have spread the benefits of services around more equally, as was the case with urban water supply. Municipal ownership of waterworks did not eliminate inequalities in water service, but it did make a difference. In the first half of the twentieth century, for example, cities that owned their own water utilities showed greater reductions in disease and mortality among African Americans than those with privately run systems.[59] The vast majority of American gas and electric utilities, however, remained in private hands.[60]

In Baltimore, private utility ownership with public regulation brought benefits to many, but it also deepened energy inequality. While energy inequality undoubtedly existed in the nineteenth century and early twentieth century, virtually all people had to rely on coal and wood for heating and cooking.[61] But the uneven expansion of gas and electric power changed that. Reductions in rates made "gas for cooking a household necessity" according to the company in 1916.[62] Yet many Baltimoreans did not have gas for cooking, even by the 1930s and 1940s. In general, there were great disparities in the quality of cooking energy across tenancy and, especially, race in 1940 (the earliest date the U.S. census collected information on household energy). Electric and gas energy sources were the cleanest and safest sources of energy. Coal and wood were the dirtiest. Kerosene and gasoline stoves were cleaner than coal and wood, but they were also common culprits in devastating house fires. In 1940, over 97% of white owned houses

---

59 Werner Troesken, "Race, Disease, and the Provision of Water in American Cities, 1889-1921," *The Journal of Economic History* 61, no. 3 (2001): 750–76. In Baltimore, African-American death rates were reduced by 42% between 1908 and 1940 while white death rates were reduced by 29%. Increased access to public sanitary services probably played a strong role in the differential reduction in black mortality rates. Werner Troesken, *Water, Race, and Disease*, NBER Series on Long-Term Factors in Economic Development (MIT Press, 2004), 6.
60 Keller, *Regulating a New Economy*, 57.
61 Lighting was a different matter, particularly in Baltimore where lighting companies had existed for a long time. In the nineteenth century and early twentieth century, only the affluent had gas or electric light. But that changed in the next few decades as electric lighting became more common among the non-affluent. There were disparities, however. In 1940, 96.8% of all homes in Baltimore had electric lighting. Over 99% of white owned homes had electric lighting, but only 86.8% of non-white tenants had electric lights. Since these are not relevant to battery burning cases, I do not discuss them in more depth. U.S. Census, *Sixteenth Census of the United States, Housing, Volume II, General Characteristics* (GPO, 1943), 459.
62 Consolidated Gas, Electric Light and Power Company of Baltimore, *American Gas Centenary, 1816-1916*, 325.

had gas stoves, but only 84% of black owned houses did. Most black households were renters, anyway, who had much worse access to energy. Only 41% of black tenants had access to gas for cooking and virtually none (12 in the entire city) had electricity. By comparison, 66% households in the suburbs of Baltimore beyond that municipal boundary had access to gas or electricity, and even rural non-farm households had better access to these types of clean energy sources (45%). Only rural farm households had worse access, although it is worth pointing out that many of these households used wood for heating and cooking because they owned their own woodlots, making the source cheap (Figure 18).[63]

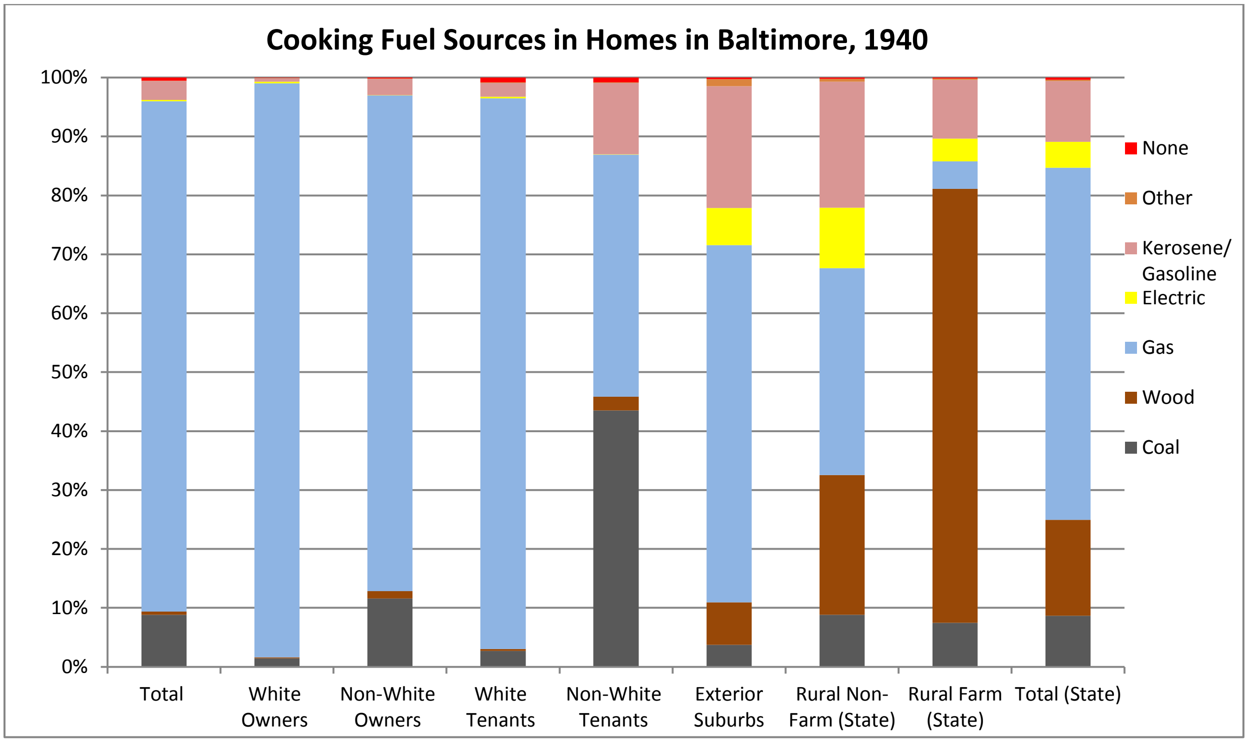


Figure 18: Cooking fuel sources for homes (occupied units) in Baltimore and Maryland in 1940. As the chart shows, while there were great disparities in energy between rural and urban Maryland (most of urban Maryland is Baltimore), there were also great disparities within Baltimore, particularly between black renters and the rest of the population. **Source:** U.S. Census, *Sixteenth Census of the United States, Housing, Volume II, General Characteristics* (GPO, 1943), 460-461. **Graph**: Leif Fredrickson

Energy disparities are also evident when looking at households with central heating. By the 1920s, the combination of business mergers, technological exigency (reducing demand peaks) and regulation (limits on prices) had pushed CGELP's energy networks far outside the urban core. The coverage was impressive, put largely theoretically for the less well off in the urban core. As the map

[63] This was the first year of the housing census and there is not good data that I know of on energy use by social group in Baltimore before this date.

shows, while households (dwelling units) with central heat were common in the city in 1940, they formed a sort of doughnut of modern heating around inner city neighborhoods that still relied on older sources of heating and older sources of energy. This yielded fewer options for heating, did not allow them to benefit from some systematic attempts at relief during the Great Depression such as Consolidated's voluntary rate reductions, and it generally required them to burn dirtier fuel to cook and heat, whether that was coal or, ultimately, used lead battery casings. It is not surprising then that the battery case burning epidemic was centered in one of these modern energy deserts (Figure 19).[64]

[64] King, *Consolidated of Baltimore*, 271. Well before the Depression, the poor had to scrounge for fuel, using, for example, wood from demolished buildings. C.E. Lesher, *Coal in 1915 – Part B: Distribution and Consumption*, United States Geological Survey, Mineral Resources of the United States (Washington: GPO, 1916), 493.

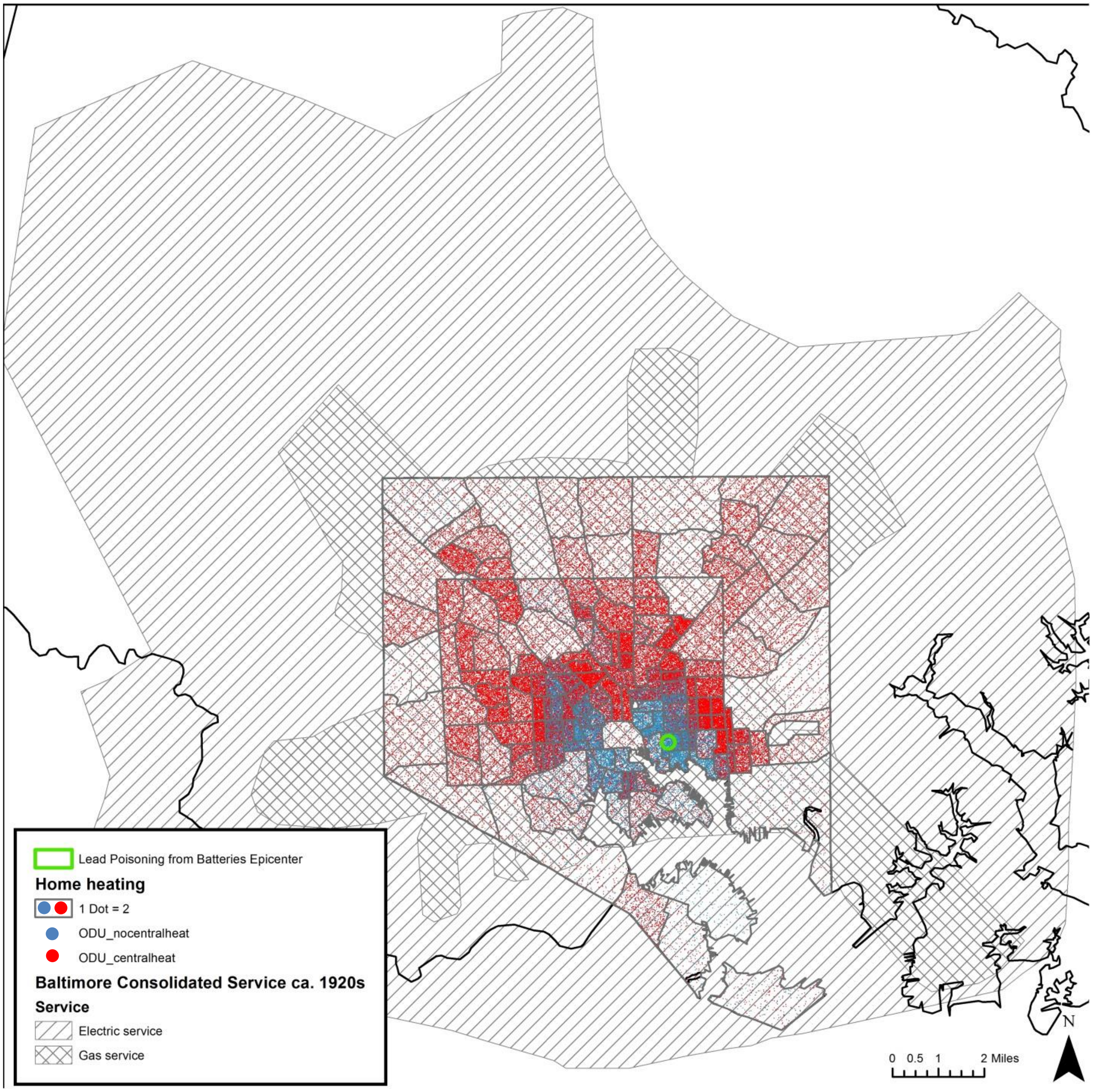


Figure 19: The relationship of lead poisoning to access to central heat. As the map illustrates, despite wide coverage including extensive coverage well outside the city limits, many homes (occupied dwelling units, or ODUs) in the urban core had no central heat, and it is in one of these gas/electric "deserts" that the battery case burning epidemic was centered. **Sources:** Census data on central heating from NHGIS Minnesota Population Center; battery burning cases locations from Folder Lead Paint Poisoning Cases 1931-1932, Box Restricted from Series III, GHW Papers, AMCM Archives; Delbert B. Lowe, *History of the Consolidated Gas, Electric Light, and Power Company of Baltimore*, January 6, 1928. **Map**: Leif Fredrickson.

Lead and Energy Feedback Loops

There were deep connections between lead and energy beyond their conjunction in the battery case burning epidemic. Lead technologies and energy technologies were often intimately interconnected. There were feedbacks between the development of lead products and energy systems and vice versa.

Ultimately, the proliferation of lead-acid batteries that resulted in a ready, if poisonous, source of fuel in the inner city was connected to the expansion of gas and electric networks, and, of course, the expansion of gasoline-based automobiles.

Lead facilitated the use of gas and the expansion of gas services. As mentioned in Chapter One, lead pipes and soldering were important to the expansion of water systems. In some ways lead was even more important for gas since tight reliable fittings were crucial to preventing dangerous (and smelly) gas leaks. London was the first place to light public street lamps with gas in 1804, and those lamps drew their fuel from lead pipes.[65] In the nineteenth century, lead pipe and composite pipe containing lead were used to convey gas, but because these pipes were easily bent, companies came to prefer iron pipe.[66] Lead pipe continued to be used, however, at meter connections because it could be easily bent and its flexibility would protect meters.[67] And solder, red lead, and white lead were used extensively for pipe connections.[68]

Lead also facilitated the use and expansion of electrical networks. Lead-acid storage batteries were important for the early development of electrical systems. Initially, when these systems were relatively small, and consequently had great peaks in energy use due to a rather non-diverse mix of customers, companies used storage batteries to collect power during lulls and fill demand during peak use. As electrical utilities grew in the early 1900s and expanded and diversified their customer base, demand peaks smoothed out. The diversification was built, in part, on industrial customers, however, who needed reliable electrical supply to run their operations efficiently. To buffer against outages that could sour their industrial and commercial customer base, utilities converted their peak-management batteries to use as reserve power. And some large utilities installed new, huge lead-acid batteries to supply power for

---

[65] Consolidated Gas, Electric Light and Power Company of Baltimore, *American Gas Centenary, 1816-1916*, 245.
[66] *Gas Making* (Scranton: International Textbook Co., 1906), 11.
[67] In the nineteen teens, when gas companies shifted to using iron connections. "Proceedings, First Annual Meeting, The American Gas Institute," *American Gas Light Journal*, December 17, 1906, 1071, GBS.
[68] Frederick Schultz, *Solder, Its Production and Application: With a Brief History of Tin and Lead* (Macneal Printing Company, 1908), chap. XVII Qualities and Grades of Solder; American Gas Institute, *Proceedings of the American Gas Institute* (The Institute, 1916), 294. "The making of sound joints to gas fittings is of the utmost consequences," one early manual noted, directing workers to rub the "best and red white lead" into the pipe threads before adding solder to the joint. John Eldridge, *The Gas Fitter's Guide* (J. Eldridge, 1891), 22.

a short period of time in the case of a problem.[69] Consolidated installed the largest of these reserve batteries in the world in Baltimore in 1912. The battery drew most of its power from Pennsylvania Power Company's Holtwood dam, at the time the largest hydroelectric dam in the United States. CGELP's battery weighed in at over a million pounds, most of that weight in the over 20,000 lead plates carefully arranged in a series that took up a factory floor-sized space (Figure 20).[70]

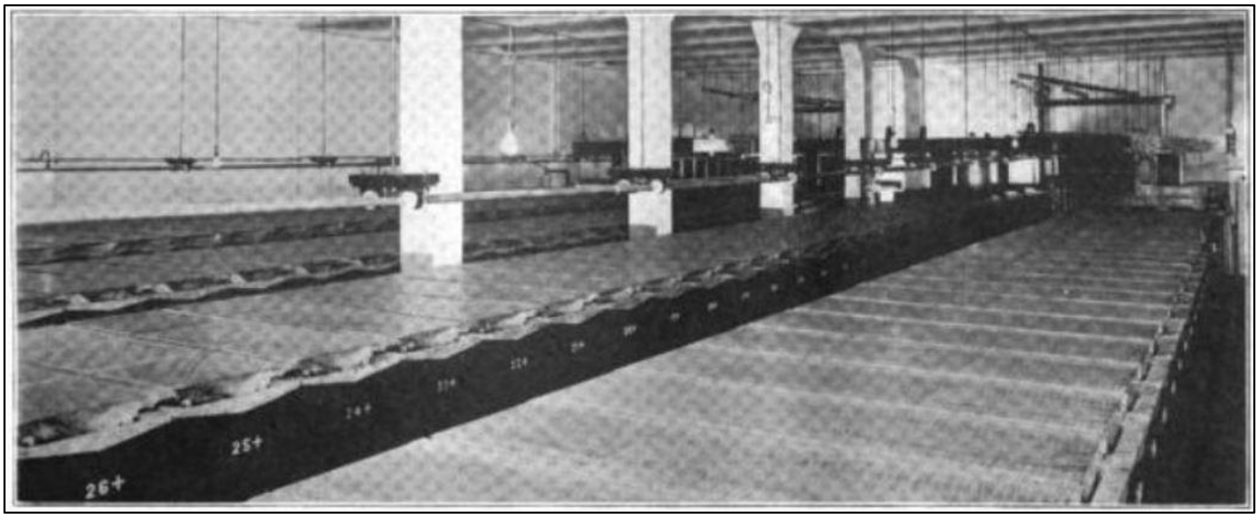


Figure 20: Consolidated Gas, Electric Light, and Power Company of Baltimore installed the largest lead-acid battery in the world in 1912 to provide back-up electricity to the city. Lead batteries were an important component of early electrical systems, to deal with demand peaks and as reserves. **Source:** "The Largest Storage Battery Installation," *Journal of Electricity, Power and Gas*, May 4, 1912, 411.

The expansion of energy networks, in turn, facilitated the manufacture of lead-related products. The metal industry, railroads and shipbuilders all came to rely on the intensive use of electricity delivered by CGELP.[71] As mentioned in the previous chapter, these industries also used a lot of lead. Likewise, the supply of gas assisted in the production of solder and other lead products, as well as their use in the field

---

[69] J.L. Woodbridge, "Changes in Storage Battery Practice," *Electrical World*, July 8, 1916, 57; "Storage-Battery Practice in Central Station Service," *Electrical Review*, October 30, 1920, 674; King, *Consolidated of Baltimore*, 185. Cities that installed large storage batteries for stand-by power included New York, Chicago, Boston, Brooklyn, Spokane, Minneapolis, Kansas City, Rochester and others. "Reserve Current for Electric Lighting and Power Companies," *The Central Station*, July-June 1911-1912, 49-50.

[70] On the Susquehanna and Holtwood Dam, see Ibid., 162; Lowe, *History of Consolidated*, 8–9. On the battery, see "The Largest Storage Battery Installation," *Journal of Electricity, Power and Gas*, May 4, 1912, 411; "Largest Single Storage-Battery Installation in the World," *Electrical World*, June 22, 1912, 1390. It is not clear how often CGELP used the battery or how long it was in use. In his history, King claimed the battery guaranteed "absolute continuity of service for the direct-current district" and thereby made "possible economies of operation in connection with the purchase of the hydro power." Ibid., 200.

[71] Jones, *Routes of Power*, 194.

(i.e., soldering and lead burning work).[72] Finally, both gas and electricity were important to the expansion of the relatively new electronics industry – an industry that included the manufacture and use of lead-acid batteries.

Baltimore became an important center for electronics and automobile-related products and services, including batteries. The city had been a leader in using storage batteries for transportation, creating the first electric street car line in the United States in 1885. The short-lived line, which ran on part of the normally animal-powered Union Passenger Rail system, used electric storage batteries built in Baltimore. Safety concerns torpedoed the line, opening the door for Richmond, Virginia to create the first sustained electric street car system in 1888.[73]

Hopes for battery-powered streetcars ebbed, but as batteries improved, they appeared more promising for use in automobiles.[74] In the late nineteenth and early twentieth century, automobiles powered by steam, electric batteries and gasoline all jostled for primacy among consumers. One of the upsides of electric vehicles was that users did not have to crank them by hand to start – a task that was hard, frustrating and sometimes dangerous. CGELP got into the business of providing charging garages for electric vehicles beginning in 1911.[75] In the same year, however, Charles Kettering developed the means to start gas engines using an electric battery. This led to the increase in manufacturing and distribution of lead-acid batteries for self-starting alongside batteries for electric vehicles. In Baltimore in 1917 the Auto Electric Corporation opened, which was the largest plant in the East devoted to repairing and charging batteries for "self-starting systems."[76] In the same year, an electric automobile company

[72] Gilbert Shadwell, "Gas as an Aid in Manufacture of Solders," *American Gas Engineering Journal*, August 7, 1920, 101-104.
[73] The inventor Leo Daft designed the electric cars and the Viaduct Manufacturing Company built the batteries. "Street Cars by Electricity," *Sun*, July 16, 1885, 4; Herbert H. Harwood, *Baltimore Streetcars: The Postwar Years* (JHU Press, 2003), vii. The Baltimore and Ohio Railroad also used a huge battery to haul its trains through a tunnel in the city. "New Electric Marvel," *Sun*, November 17, 1900, 7.
[74] Robert C. Post, *Urban Mass Transit: The Life Story of a Technology* (Greenwood Publishing Group, 2007), 37; Alfred D. Chandler, *Scale and Scope: The Dynamics of Industrial Capitalism* (Harvard University Press, 2009), 402–5.
[75] King, *Consolidated of Baltimore*, 193–94.
[76] "New Battery Concern," *Sun*, April 29, 1917, A11.

opened a branch in the city.[77] Advertisements for battery dealers and advice columns on maintaining batteries appeared regularly in newspapers in and after the late 1910s. In the 1920s, battery-starting, gasoline-powered automobiles became the dominant technology, surpassing both electric and manual crank automobiles. Thus lead-acid batteries, which grew out of both the demand and supply of electrical power, helped foment that use of the automobile, its infrastructure (roads), and its other energy sources (oil).[78]

The 1920s saw the further expansion of automobile ownership and battery production, both in the city and nationally. In Baltimore, automobile registration continued to climb even through the first years of the Great Depression (Figure 21).[79] More automobiles meant more lead-acid batteries in circulation and this meant more recovery of battery lead for re-use. As described in Chapter One, the lead from these batteries became an increasingly important item for scrap dealers. They also became critical feedstock for lead production. As primary lead production fell off considerably during the Depression, for example, secondary lead production climbed to about 80% of primary production (Figure 8, Chapter One).[80]

---

[77] "Electric Company Here," *Sun*, July 22, 1917, A3.

[78] Joseph J. Corn, *User Unfriendly: Consumer Struggles with Personal Technologies, from Clocks and Sewing Machines to Cars and Computers* (JHU Press, 2011), 94–97; Richard H. Schallenberg, "The Anomalous Storage Battery: An American Lag in Early Electrical Engineering," *Technology and Culture* 22, no. 4 (1981): 725–52. While the electric grid helped foster battery manufacturing, making electric and electric-start vehicles more likely, the incomplete extension of the electrical grid to suburban areas made fully electric vehicles less promising. Thus in a way the partial electrical grid was particularly helpful to electric-start vehicles. Curtis Darrel Anderson and Judy Anderson, *Electric and Hybrid Cars: A History* (McFarland, 2005), 4–9.

[79] "Big Battery Factories Increasing Production," *Sun*, January 20, 1929, A11. In Baltimore, the opening of Hogge Battery Plant and the Jupiter Battery Company. Avery McBee, "What They are Talking About Along Automobile Row," *Sun*, May 3, 1925, FA6; "Seven New Industries Are Established in the City," *Sun*, April 9, 1924, 9; "New Battery Company Here," *Sun,* August 17, 1924, A13.

[80] Recovery of lead from batteries increased rapidly in the nineteen teens and twenties, and then leveled off during the Depression of the 1930s. Some small scale lead recycling took place in the nineteenth century and the early twentieth century. In 1910, industries recovered 55,422 short tons of lead. This more than doubled to 124,650 in 1920 and then more than doubled again to 255,800 in 1930. By this point, cars batteries dominated an emerging, if highly incomplete, lead recycling loop: Most lead was used to make automobile batteries, and most of the supply for secondary lead was from automobile batteries. Geological Survey (U.S.), *Flow Studies for Recycling Metal Commodities in the United States* (U.S. Dept. of the Interior, U.S. Geological Survey, 2004), F-1. *Statistical Abstract of the United States* (U.S. Government Printing Office, 1939), 725. United States Bureau of Mines, *Mining Industry of the United States of America* (U.S. Government Printing Office, 1922), 39.

Figure 21: Passenger automobiles grew at a rapid rate in the late nineteen teens and early twenties. By the early 1930s, there were about 100,000 vehicles registered in the city. **Sources**: See Chapter 7. **Graph:** Leif Fredrickson.

In Baltimore, many dealers who had long dealt in metal scrap avidly took in lead from batteries. Likewise, some battery dealers got into the business of recycling old batteries.[81] This system began with automobile owners who took used batteries to service stations and battery repair shops that were scattered throughout the city and suburbs. The shops would then sell the batteries to the smaller number of junk shops in the city who would then break the batteries apart and the sell the lead plates to a re-smelting factory. The battery casings were then sold or given to nearby residents in order to raise a little more money or at least avoid hauling the casings to the dump. In some cases, they were burned in the junk yards to dispose of them.[82] The system thus essentially funneled lead from the automobiles of suburbanites to the inner city.

[81] Central Battery owned by Max Selzer, for example, repaired and sold batteries, but also got into the business of breaking down old batteries. When African Americans in the neighborhood asked Selzer for battery casings, he gave them away. Memo Schulze to Williams, September 9, 1932, Folder Lead Poisoning Cases 1932, Box 3.3-3.4, GHW Papers, AMCM Archives.
[82] Memo Schulze to Williams, October 29, 1932 and Letter “A. Citizen, A. Voter, A. Tax Payer,” to Williams, September 15, 1932, both in Folder Lead Poisoning Cases 1932, Box 3.3-3.4, GHW Papers, AMCM Archives.

Although the production of storage batteries declined during the Depression, secondary lead recovery only fell a little in the first years of the Depression before climbing again.[83] The stock of batteries "kept up remarkably well in 1932," the Bureau of Mines reported, especially in urban areas, and there was an "active demand from smelters all year." Backlash against rebuilt (as opposed to re-smelted) batteries, which were often faulty, also increased battery scrapping.[84] In Baltimore, lead battery recycling at the junk shops increased during the early years of the Depression. Several of the smaller operators reported increases between 1929 and 1931 and Berg Bros, who was by far the largest dealer in batteries, doubled the batteries they received from about 1000 per week in 1929 to 2000 per week in 1932.[85] It is unclear if the increase represents an increase in battery recycling in urban regions (in contrast to the national patterns), or whether some junk dealers had gone out of businesses and those that remained received more batteries. Either way, more lead from Baltimore's "lead shed" was funneled into the urban core during the Great Depression.

Exposure: Work, Communities, Families

The first line of people to suffer the effects of lead exposure from battery recycling were the workers in scrap yards who broke down the batteries. As the previous chapter outlined, occupational lead poisoning had become a serious concern by the 1910s and storage battery production was at the forefront. As Alice Hamilton wrote, in an article excerpted in the *Sun*, "The making of storage batteries is everywhere recognized as dangerous."[86] Although lead poisoning remained a serious problem in battery factories, the attention trained on them had brought some improvements.[87] In contrast, those working in

[83] *Statistical Abstract of the United States*, 1939, 725. Other scrap, like iron, fared much worse in the Depression than lead. Zimring, *Cash for Your Trash*, 83.
[84] In 1931, secondary lead production equaled 53% of primary production, but by 1932 it had risen to 69%. United States. Bureau of Mines and Geological Survey (U. S.), *Minerals Yearbook* (Washington : Bureau of Mines : Supt. of Docs., U.S. G.P.O., 1933), 168. For problems with rebuilt batteries, se Consumers avoided rebuilds and metal trade associations pressed scrap dealers to break up batteries so that they could only be smelted, not rebuilt. "Battery Gyp," *Popular Mechanics* 1933, 675.
[85] Memo Schulze to Williams, October 29, 1932 in Folder Lead Poisoning Cases 1932, Box 3.3-3.4, GHW Papers, AMCM Archives.
[86] Alice Hamilton, "Lead Poisoning in 28 Trades," *Sun*, March 19, 1911, L7.
[87] "Big Battery Factories Increasing Production," *Sun*, January 20, 1929, A11.

secondary lead production, especially in battery breaking, received very little attention.[88] Although the most serious cases of lead poisoning affected families who burned battery casings, lead batteries exposed people in the urban core in other ways as well. Some of the workers from these neighborhoods, for example, were directly employed in the lead battery recycling business. Lead poisoning from batteries brought increased scrutiny to these businesses, but even before that, workers in both battery junking businesses and lead re-smelting businesses had come to the attention of the BCHD for lead poisoning cases. Berg Bros and Chesapeake Smelting and Refining Corporation each had several cases of occupational lead poisoning. The businesses were both owned by Mr. Berg, who was apparently less amenable to the educational approach of the health department to prevent and mitigate lead poisoning.[89] “From witnessing the procedure it is evident that considerable lead adheres to the hands of these employees,” a BCHD agent wrote. “Although we have cautioned employers of the possible dangers of these men getting lead poisoning little attention appears to be given toward preventative measures.” Racial disparities pervaded this line of work: Every one of the battery breaking laborers found by the BCHD was African-American. This was notable even to a department accustomed to racially segregated work places.[90]

According to Baltimore junk dealers, residents started using discarded battery casings in small numbers in the late 1920s, but as the Depression hit and as word of mouth spread about the casings, use of them increased considerably.[91] Burned in crowded houses with leaky stoves, the fumes from these casings poisoned families over the course of many months of exposure (Figure 22and Figure **23**).

---

[88] One small piece of coverage was a news article about a worker in Spokane, WA tasked with smashing batteries with a broad-ax in the basement of the Alaska Junk Company. He sued the business in 1931, claiming he had become paralyzed and was informed of the danger of lead poisoning. The company claimed all junk salvagers used a similar method. “Lead Poisoning Jury Still Out,” The Spokesman-Review, June 24, 1931, 6.

[89] Letter Schulze for Mr. Berg, Chesapeake Smelting and Refining Corporation, September 16, 1932, Folder Lead Poisoning by Burning Battery Cases 1932-1934; Memo Schulze to Williams, October 29, 1932, Folder Lead Poisoning Cases 1932, both in Box 3.3-3.4, GHW Papers, AMCM Archives.

[90] Memo Schulze to Williams, October 29, 1932, Folder Lead Poisoning Cases 1932, Box 3.3-3.4, GHW Papers, AMCM Archives.

[91] Memo Schulze to Williams, October 29, 1932, Folder Lead Poisoning Cases 1932, Box 3.3-3.4, GHW Papers, AMCM Archives.

Figure 22: A woman cooks on a wood stove in Baltimore in the 1940s while a baby sleeps nearby. Despite the expansion of gas service in the Baltimore metropolitan area, many low-income Baltimoreans did not have access to this energy source. Some used lead-acid battery casings for fuel, especially during the Great Depression, which exposed residents in cramped quarters to lead pollution. **Source:** Photo cpha0456, Box 1, Series VIII, Citizens Planning and Housing Association Records (hereafter, CPHA), Langsdale Library Special Collections, University of Baltimore (hereafter, LLSC).

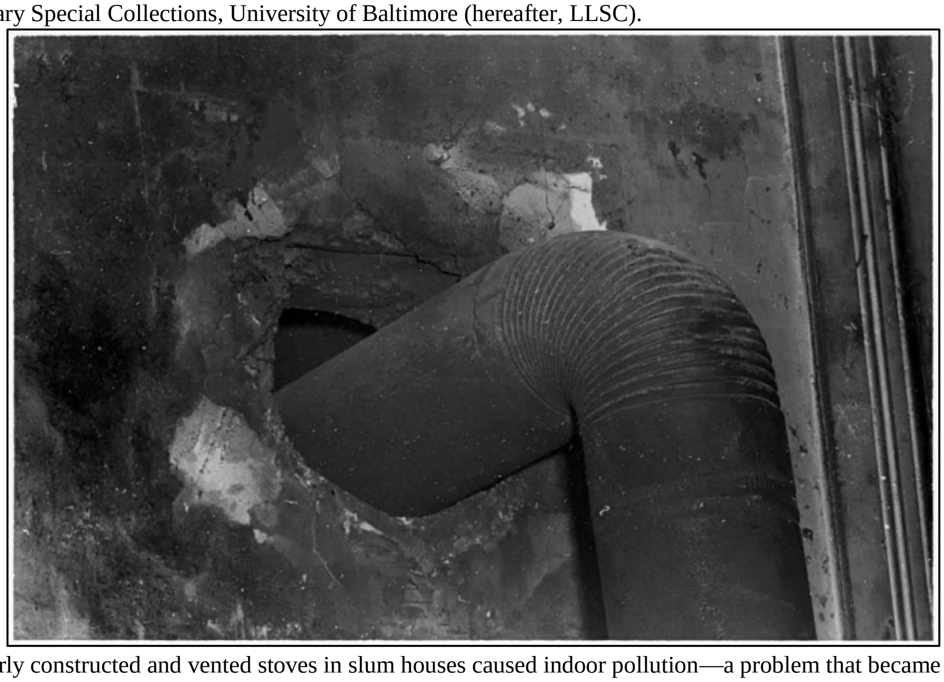


Figure 23: Poorly constructed and vented stoves in slum houses caused indoor pollution—a problem that became particularly significant when desperate tenants burned the casings from lead-acid batteries. **Source:** Photo cpha0449, Box 1, Series VIII, CPHA Records, LLSC.

Of the six scrap and junk shops that dissembled batteries in the city, five of these were concentrated in a relatively small five by seven block area in east Baltimore. One other was located in north central Baltimore. Not surprisingly, given the spatial concentration of the lead battery recycling industry, the effects of lead exposure were borne disproportionately by certain populations. Of the 57 lead poisoning cases that eventually resulted from battery case burning, all except one involved African-American families. This was because African Americans were more likely to live near battery junk shops and because these families were poorer and more desperate for fuel.[92] As noted in Chapter One, smelting of reclaimed lead could also produce community exposures (and perhaps burning battery casings could as well), and these exposure were, by the 1930s, conditioned by the separation of Baltimore into neighborhoods that were relatively distinct in terms of class, ethnicity and race. Lead battery breaking yards were concentrated around African-American neighborhoods. Larger secondary smelters were located near African-American neighborhoods and white working-class neighborhoods in southwest Baltimore, as noted in Chapter One.

The confluence of energy inequality and lead poisoning could come together in other ways as well. With the rise of automobiles and leaded gasoline in the 1920s, two new sources of lead-burdened fuels became available: leaded gasoline itself and used crankcase oil. These fuels were not designed to be used in domestic stoves (and vice versa), and so like other fuels of opportunity, it is hard to know when and how often they were used in homes. Leaded gasoline was probably not used frequently, outside of shortages of gasolines designed for stove use. A shortage like this occurred during World War II and the *Afro-American* and *Sun* both reported, without much detail, on the use of leaded gas in stoves. Dr. R.H. Riley, of the state Department of Health, warned that leaded gas fumes could be inhaled or get could on food and utensils. Poisoning was particularly a threat to children.[93]

Used crankcase oil from automobiles, often called "waste oil," was also used in stoves from time to time. Industries and shops often used this waste oil for heating, especially when they produced a lot of waste oil themselves. To use the more dispersed waste oil from automobiles, collectors or collection sites

---

[92] Memo Schulze to Williams, October 29, 1932, Folder Lead Poisoning Cases 1932, Box 3.3-3.4, GHW Papers, AMCM Archives.

[93] "Using Lead in Gasoline May prove Fatal," *Afro-American*, November 14, 1942, 20; "Warned against Use of Leaded Gasoline," *Sun*, November 3, 1942, 5. Using leaded gas was a "common practice" among people living in "trailer camps," the *Sun* reported, presumably referring to trailers set up for war housing. "Warning Issued on Leaded Gas in Cooking Stoves," *Sun*, October 26, 1942, 24.

were needed. Sometimes cities paid for these services and sometimes, when there was a high demand for waste oil, collectors paid the city for privilege. This oil was also sold for domestic use or mixed with virgin oil before sale. Oil heaters became more popular in the 1920s, at exactly the time that automobile use was increasing and leaded gasoline was coming into use.[94] National newspapers carried stories of experiments about heating with crankcase oil, and these experiments showed it could work.[95] But it is difficult to say how prevalent this was in Baltimore or in other cities. Baltimore, for example, had a great problem with the dumping of waste oil into streets and rivers in the 1920s and after, suggesting that the reuse of waste oil was not widespread.[96] In addition, there were other uses for waste oil besides heating, so collection and resale did not necessarily entail use in heating, let alone domestic heating. Still, there was probably some use of waste oil in this way, which would have been quite dangerous given that crankcase oil could contain a very high percentage of lead – higher than leaded gasoline itself.[97]

The Public Health Response

The BCHD threw itself into the new problem with great energy, organizing both the public health response in Baltimore as well as using the incident to better understand lead poisoning in general. Wilmer Schulze, the Director of Environmental Hygiene, carried out most of the on-the-ground work in Baltimore. The new health commissioner, Huntington Williams, enthusiastically pushed a research and education agenda that would extend beyond the particular Baltimore lead poisoning cases. In this, Williams had something of a successful template to work from. He had just come off the successful discovery of a source of food poisoning (cyanide polish for silverware) and had used a combination of regulation, professional publishing and education to eliminate the problem.[98] Faced with the lead battery

[94] King, *Consolidated of Baltimore*, 267–68.
[95] "New Fuel Industry Appears as Crank Case Oil Test Wins," CSM, September 14, 1923, 4.
[96] "Regulation of Waste Oil to Be Considered Today," *Sun*, July 26, 1927, 22.
[97] A study in the 1970s found that used crankcase oil had a lead content of 0.8 to 1.2 percent – orders of magnitude higher than leaded gasoline. EPA, *State of Maryland Waste Oil Recovery and Reuse Program*, 1974, 83.
[98] In 1928 a mass poisoning following a convention dinner at a hotel in Utica challenged Williams, a district health officer for the state. Williams and his family were victims of a similar mysterious poisoning at a hotel the following year. The source, as it turned out, was cyanide-laden polish used to clean silver plates in fancy hotels. Because the cyanide poisonings were hard to distinguish from food poisoning, many hotels had been unknowingly serving poison on a silver platter to their guests for years. Williams' public health sleuthing, in which he investigated the kitchen and noticed the almond-smell of cyanide from the polish, was followed by more research and public health

casing issue, Williams explicitly sought to replicate his past success in uncovering, mitigating, and publishing on an emerging public health poisoning mystery.[99] Williams' research ultimately took a two pronged approach, including both a study of the extent and dynamics of battery casing use in Baltimore and a study of lead poisoning victims themselves.

Use of lead gasoline and waste oil for heating and cooking, however, never resulted in a concentrated outbreak of lead poisoning cases and thus did not catalyze a serious public health response. The epidemic resulting from burning battery casings did, and the response from the Baltimore City Health Department largely mirrored what Williams had done in dealing with the outbreaks of poisoning from silver polish: research, education, and mild regulation. Williams was a master of public relations, and put his skills to use quickly and effectively. The BCHD helped publicize the issue at the local level using its own *Health News*, helping run stories in Baltimore's newspapers,[100] and broadcast warnings on the radio. It also carried out door to door surveys that informed many residents and businesses of the problem. At the national level, Williams sent close to a hundred letters and copies of reports to other health departments, physicians, and those working in the battery and lead industry. Other major cities also had poisonings from battery cases, but Williams's aggressive networking probably helped save the health and perhaps lives of children in many cities that took preemptive measures. Williams also placed a news item in the *Journal of the American Medical Association* and ultimately a short article.[101]

In addition, the BCHD helped to remove access to battery casings themselves. Williams made a sort of *ad hoc* regulation against selling or giving away battery casings, bringing the police commissioner on board to help with education and enforcement. After junk dealers complained that the garbage dumps

---

education and regulation of cyanide polish. He then published his research findings and public health action in the *Journal of the American Medical Association*. Huntington Williams, "Cyanide Poisoning, Acute and Nonfatal, Apparently from Hotel Silver Polish," *Journal of the American Medical Association* 94, no. 9 (1930): 627–630.

[99] Letter HW to Park, October 10, 1932, in Folder Lead Poisoning by Burning Battery Cases 1932-1934, Box 3.3-3.4, GHW Papers, AMCM Archives.

[100] The *Afro-American* did not carry a story on it, though Williams did contact the paper about it. The *Sun* and the *Baltimore American* did cover the story.

[101] "Two Children Dead in Poison Fume Tragedy," *Chicago Daily Tribune*, October 20, 1935, 11; "7 Cities Have Lead Poison Epidemic," *Toledo Blade*, August 25, 1947, 6. Charles Gaither, Police Commissioner, to Schulze (letter), September 19, 1932, Folder Lead Poisoning by Burning Battery Cases 1932-1934, Box 3.3-3.4, Series III, GHW Papers, AMCM Archives; Williams et al., "Lead Poisoning from the Burning of Battery Casings."

had raised their prices on battery casings in response to increasing need to dispose of them, Williams arranged with the city engineers to have casings delivered and incinerated for free at the city incinerator.[102]

For all this, however, Williams' approach would have had very limited effectiveness on its own. Unlike silver polish, technological substitutes were not easy to come by – one could not, for example, easily supply cleaner energy alternatives to houses that did not already have gas connections. And unlike silver, heat was essential. Many households who were using battery casings did switch to coal once they learned of the lead poisoning danger, others were reticent about saying whether they used casings.[103] Others, like one man with 400 casings in his cellar, refused to give them up until another fuel was delivered.[104]

Although BCHD memos sometimes expressed surprise that households continued to use or hold on to battery casings, the reason is not hard to explain. It was not that residents were unconcerned with lead poisoning. Rather it was that heating was quite literally a matter of life and death for some of these families. During the harsh winter of 1933-34, a reporter in a poor part of Baltimore relayed stories of a mostly bed-ridden woman who "burned paper and rags in the egg beater" to keep her room warm after she ran out of coal. Another woman believed she would have frozen to death if the grocery store had not extended emergency credit to her husband. A family literally in rags with no way to heat their house despaired at what would happen to them. And a single father begged for coal to heat the "icebox" where he cared for his young girl.[105] Hospitals reported several cases of frostbite, and in December 1933, a 40 year-old African-American man who lived a few blocks east of the battery burning cases, froze to death *in his home*.[106] Those families who could afford to switch to other forms of fuel to avoid poisoning. But

---

[102] Ibid. Schulze to W.R. Strauss (letter), September 16, 1932, Folder Lead Poisoning by Burning Battery Cases 1932-1934, Box 3.3-3.4, Series III, GHW Papers, AMCM Archives.
[103] Memo Schulze to Williams, March 30, 1933, Folder Lead Poisoning by Burning Battery Cases 1932-1934, Box 3.3-3.4, Series III, GHW Papers, AMCM Archives.
[104] Handwritten note, from Schulze I think, but maybe HW, no date (probably circa March, 1933)
[105] "Reporter Finds Much Distress in Baltimore's Poorer Streets," *Afro-American*, February 17, 1934.
[106] "Cold Wave Here Claims Victim," *Afro-American*, January 6, 1934, 12; "Negro Is Frozen to Death in Room," *Sun*, December 28, 1933, 20.

those residents who could not afford other forms of fuel made the horrible, but understandable, decision to continue to using battery casings.

A solution to the problem, in other words, required providing another fuel source so that households would not either freeze to death or continue to seek out battery casings. This solution was provided by the Family Welfare Association, Baltimore's largest charitable organization that by 1932 had been almost completely overwhelmed by the economic hardship of the Great Depression.[107] By March of 1933, Schulze found that virtually all the families he surveyed had stopped using casings. A few stated they were purchasing their own coal from the store (perhaps with credit extension as in the case mentioned above). But the majority was receiving coal from the FWA, for which several families worked.[108] Even the man with 400 cases in his cellar yielded them after receiving promises that the FWA would continue to supply fuel.[109] After 1933, there were no more cases of lead poisoning from battery cases for the remainder of the 1930s and the 1940s.

During the Depression, rather than blaming either the junk yard owners who distributed battery casings or the families that used them, government officials blamed broader economic forces for the crisis and painted the issue as one that concerned the entire nation. From the start, Williams stressed the disproportionate effects on poor blacks, but dubbed the epidemic the "Depression Disease." The Indiana State Board of Health likewise wrote that the poisonings vividly showed "the depth to which economic conditions have driven many people," and it argued that "lead poisoning should not be added to the grim price which many people are already paying for economic conditions over which they have no control." This framing acknowledge social disparities in poisonings while also tying the poisonings to a broader issue in a way that cultivated solidarity with, and responsibility for, the victims.[110] More powerful than

[107] Jo Ann E. Argersinger, *Toward a New Deal in Baltimore: People and Government in the Great Depression* (University of North Carolina Press, 2011).
[108] Memo Schulze to Williams, March 30, 1933
[109] Handwritten note, from Schulze I think, but maybe HW, no date
[110] "Lead Poisoning From Burning of Battery Casings," *Baltimore Health News*, October 1932, 73-74; Williams et al., "Lead Poisoning from the Burning of Battery Casings." Indiana State Board of Health *Bulletin* 25, No. 9, September 1932. As of December 1932, Indiana had not recorded any cases of lead poisoning from battery casings. William King to Williams (letter), December 16, 1932. Both in Folder Lead Poisoning by Burning Battery Cases 1932-1934, Box 3.3-3.4, Series III, GHW Papers, AMCM Archives.

framing alone, however, was the fact that the Great Depression spared few, save the most fortunate. Citizens who enjoyed working class or even solidly middle class lives before the 1930s experienced firsthand, or through friends and relatives, what it felt like to wonder how they were going to pay the gas bill or put food on the table. A savvy bureaucratic entrepreneur like Williams took advantage of the vast expansion of empathy triggered by hard economic times, to frame a collective appeal that resonated with the many Baltimoreans, whatever their relationship to the benefits and hazards dealt by a political economy infused with lead.

Conclusion

Unfortunately, that was not the end of lead poisoning from burning battery casings in Baltimore or in the United States. In 1940, a Chicago hospital recorded fifty cases of lead poisoning from the fumes of burned battery cases.[111] A 1941 survey from Lexington, Kentucky concluded that “a heavy percentage of children exposed to fumes from burning batteries” were affected by lead poisoning.[112] In 1944, Dr. I Blanche Bourne, a Maryland native and graduate of Baltimore’s Morgan College, revealed poisoning from battery case burning in St. Louis.[113] In 1945, over a dozen children in Staunton, Virginia salvaging battery cases from the city dump were poisoned by lead fumes.[114] By 1947, the accumulation of cases, largely brought on by fuel shortages during World War II, resulted in a renewed portrayal of a nationwide lead poisoning epidemic from batteries.[115] Even after the end of the Great Depression and the Great Wars – in the midst of the affluence of the post-war period – the so-called “Depression Disease” returned. In Baltimore in 1957 two African-American children were hospitalized as a result of burning battery casings – the first such cases in the city since the 1932 epidemic.[116]

[111] “5 Poisoned by Battery Fumes,” *Chicago Defender*, February 3, 1940, 11.
[112] “Lexington to Bury Discarded Batteries,” *Kentucky New Era*, February 7, 1941, 3.
[113] “Dr. Bourne Passes Specialty Board,” *Afro-American*, May 5, 1951, 12. I. Blanche Bourne, “Epidemic Lead Poisoning in Children from Storage Battery Casings,” *Journal of the National Medical Association* 36, no. 6 (November 1944): 187–93.
[114] “Warning Issued On use of Old Batteries as Fuel,” *Washington Post*, August 13, 1945, 7.
[115] “7 Cities Have Lead Poisoning Epidemics,” *Toledo Blade*, August 25, 1947, 6.
[116] “Junk Dealers Warned of Lead Poisoning,” *Afro-American*, February 26, 1957, 12.

The geography of these poisonings reflected the continuing energy inequalities in the United States: They afflicted the poor in the inner city and the poor in rural areas.[117] Energy inequalities between cities and rural have received attention and policies, such as the New Deal's Rural Electrification Act, have focused on reducing these inequalities. The REA became one of New Deal's biggest capital investment projects and one of its greatest successes – indeed, one of the greatest successes in federal policy generally. It did not erase the huge disparities between cities and rural areas for decades, but it did make serious progress. And, importantly, it brought these disparities to the surface.[118]

Much less attention has been devoted energy inequality *within* cities. In fact, the narrative about the rural-urban divide in energy access has tended to obscure differences within those places. And while the federal government did produce policies to bring modern heat and light services to homes in urban areas, it did not effectively do so for all homes. Title I of the 1934 Housing Act provided loans to repair and remodel existing housing. This policy did contribute to an uptick in renovation and repairs.[119] But remodeling old homes had to compete with lenders who were often more interested in investing in new development than in updating old homes. Moreover, the act did not work well for multiple dwelling homes, which was where much of the energy inequality and general substandard housing in cities was concentrated. Although the housing act did not specifically exclude multiple dwellings, the $2,000 repair and improvement loan was not scaled up for buildings that had multiple dwellings. Thus, many owners of multiple dwellings passed on the loans. Critics savaged the act as belying the administration's interest in low-cost housing, noting that federally-created public housing would never be adequate to the demand for low-cost housing.[120]

The result was that energy inequality persisted as a serious, and severely under-recognized, problem in the city. As the Baltimore *Sun* noted in 1947, many homes in Baltimore were little different

[117] The rural poor in Canada were also victims of this sort of poisoning. J. Wyllie, "A Family Outbreak of Lead Poisoning from Burning of Storage Battery Casings," *Canadian Medical Association Journal* 70, no. 3 (March 1954): 287–90.
[118] Laurence Malone, "Rural Electrification Administration," *EH.net*, accessed July 20, 2016, eh.net/encyclopedia/rural-electrification-administration/.
[119] C.P. Trussell, "FHA Tackles Financing of New Homes," *Sun*, November 4, 1934, 2.
[120] "Sees Weak Points in Housing Act," *New York Times*, July 8, 1934, RE2.

than they had been a hundred years before. Of the 230,000 homes in the city, 20,000 still used coal and wooden kitchen ranges and about 68,000 had no central heat. Most of the homes without central heating used oil and coal heating stoves. Stores in slums still sold small bundles of wood, bags of coal and charcoal, and small containers of kerosene. Many inner city residences had come to rely on kerosene and oil stoves for heating and cooking. In the cramped conditions of slum housing, these were incredibly dangerous and resulted in a number of awful deaths. Those who could not afford even this cheap fuel for heating went straight from work to bed.[121]

In the first half of the twentieth-century, the expansion of energy networks fundamentally changed American life. These networks were cornerstones of a broader movement of technological system building that has, in the words of the historian Thomas Hughes, created a “material constitution” that rivals, and perhaps surpasses in importance the Declaration of Independence and the Constitution.[122] This assessment was not limited to scholars. A similar sentiment was evident in the Consolidated Gas, Electric Light and Power Company’s literature when, during a push for the shift from coal to gas heating in the winter of 1917, it declared that the transition would be accompanied by citizens signing a “Declaration of Independence” from “the drudgery of the coal furnace by substituting quick, clean and comfortable gas heating.”[123] Like the polity created under the Declaration of Independence and Constitution, however, the benefits conferred by the “material constitution” were not for everyone in the United States.

[121] Henry Frank, “Modern Baltimore's 1847 Improvements,” *Sun*, September 14, FS1. Ted Waters, “Defective Stoves Claim Many Lives,” *Afro-American*, February 21, 1948, M8.
[122] Thomas P. Hughes, *American Genesis: A Century of Invention and Technological Enthusiasm, 1870-1970* (University of Chicago Press, 2004), 2.
[123] “House Heating with Gas in Baltimore,” *The Gas Industry*, January 1917, 38.

Chapter 3 – The Rise of Child Lead Paint Poisoning: Medical Knowledge and the Metropolitan Ecology of Paint

Industrialized paint manufacturing pumped billions of pounds of white lead into the environment from the 1880s to the 1940s. To put it mildly, that is a lot of white lead, one of the most poisonous substances of the modern era, especially for children. And yet health officials in Baltimore and elsewhere recorded only a scattering of child lead poisoning cases from paint – or any source for that matter – in this period. When health authorities did discuss the occasional cases of child lead poisoning, their explanations focused on behavioral oddities (children who gnawed all of the paint off of their cribs) or specific products (especially toys) rather than the exposure that resulted from the spread of lead on the surfaces of houses and buildings.

But if white lead was so poisonous, and if it was so widespread in this period, should not there have been more cases of child lead poisoning? Why only in the post-World War II period, when lead paint production and consumption was in *decline*, did cities like Baltimore see a spike in child lead poisoning cases? Is the discrepancy between the proliferation of white lead and child lead poisoning (Figure 24 and Figure 25) a paradox that calls into question the extent of recorded child lead poisoning? Or is it explainable in a way that confirms the official reports and statistics on child lead poisoning, i.e., that there was not a significant amount of child lead poisoning, and what of it existed was due to extreme behaviors or specific products, not the general use of lead paint in housing?

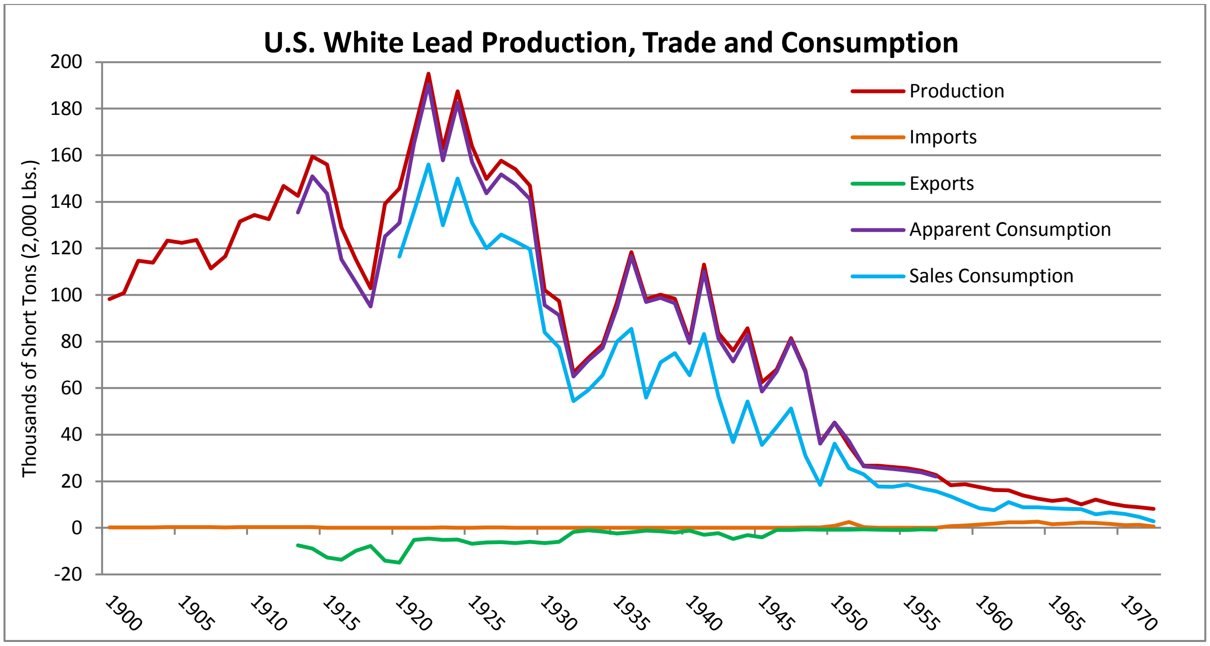


Figure 24: Annual white lead production, imports, exports (as negative) and two estimates of consumption. ("Apparent Consumption" = Production + Imports – Exports; "Sales Consumption" is a government estimate based on sales.) As the graph shows, white lead production and consumption climbed rapidly in the late nineteenth century and peaked in the 1920s, after which it declined rapidly. **Source:** Bureau of Mines, United States Geological Survey *Mineral Resources of the United States* and *Mineral Yearbooks* various years. **Graph:** Leif Fredrickson.

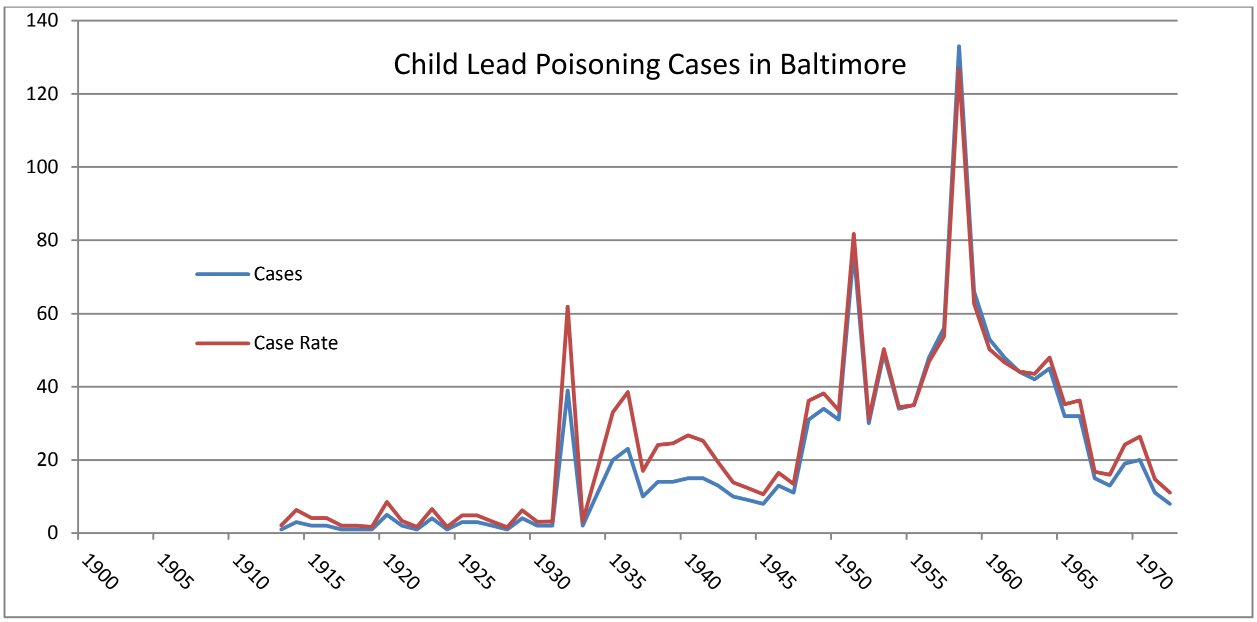


Figure 25: Counts of child lead poisoning cases and age adjusted case rates in Baltimore based on public health reports and medical archives reveal very few cases before the late 1940s, with the exception of a spike in cases in 1932 from lead battery casings (see Chapter 2). The disparity between the expansive use of white lead and reported child lead poisoning cases has prompted debate among historians about whether there was "silent epidemic" of lead poisoning in the period before the late 1940s. **Sources:** Patient Index Cards, Shoebox 21, Edwards Park Collection, AMCM Archives; Baltimore City Health Department *Annuals* 1932-1972, in Maryland Room, Enoch Pratt Library. **Graph:** Leif Fredrickson.

Historians have taken drastically different views on this conundrum. One interpretation, what we might call the "social constructivist" or "silent epidemic" camp, argues that child lead poisoning was widespread but vastly under-diagnosed in this period. Before the 1920s, the argument goes, the recording and discussion of child lead poisoning was rare because biotic, infectious diseases loomed much larger in the minds of health experts. In addition, as germ theory gained dominance in the early 1900s, health experts increasingly focused on treating the environment and individuals in ways that targeted specific germs, rather than concerning themselves with investigating and sanitizing the environment in general. In other words, health experts saw germs as the cause of disease and control of germs as the cure for disease, which militated against the identification of a chemical etiology. Because lead poisoning symptoms were not very specific, and because health professionals lacked awareness, resources and good diagnostic tools, lead poisoning was undiagnosed or misdiagnosed.

Proponents of this interpretation argue that the pervasive use of white lead virtually guaranteed child lead poisoning. Thus child lead poisoning was not only significant but was a “silent epidemic.” As the focus on child health became more prominent and infectious diseases declined in the early twentieth century, more physicians began noticing and discussing child lead poisoning, particularly in the 1920s and 1930s. And when public health departments began larger scale campaigns to assess the prevalence of child lead poisoning, which happened mostly in the 1950s and 1960s, they easily found the disease in abundance. The recorded spike in child lead poisoning in the post-World War II decades was thus more of a social construct – a result of changing diagnostic technology, awareness, priorities and so on – rather than a reflection of a real change in the incidence of child lead poisoning.[1]

Other historians – a “scientific realist” or “anti-silent epidemic” camp – have argued that very few child lead poisoning cases were recorded before 1945 because there were, in fact, very few child lead poisoning cases. The cases that occurred were rare and resulted from unusual conditions. Although white lead was widely used, it was not dangerous because it was not peeling or otherwise deteriorating. There

---

[1] Fee suggests that childhood lead poisoning was a “silent epidemic” that was far more widespread than medical experts acknowledged. Likewise Warren argues that childhood lead poisoning was happening on as large a scale before 1945 as after. They suggest the differences in incidence of lead poisoning between cities was the result of lack of awareness or effort in looking for lead poisoning. Christian Warren, *Brush with Death : A Social History of Lead Poisoning* (Baltimore; London: Johns Hopkins University Press, 2001); Elizabeth Fee, “Public Health in Practice: An Early Confrontation with the ‘Silent Epidemic’ of Childhood Lead Paint Poisoning,” *Journal of the History of Medicine and Allied Sciences* 45, no. 4 (October 1, 1990): 570–606.

were, of course, poor housing conditions, but pre-1945 slum housing often had no paint, according to this argument, let alone relatively expensive lead paint. In contrast, after World War II, two critical aspects of housing changed, according to proponents of this view: 1) Affluent city dwellers moved to the suburbs leaving behind their white lead-encrusted houses that the urban poor then filtered into; and 2) Because this housing was managed for, and inhabited by the poor, it deteriorated, leading to peeling lead paint that was eaten by children. Thus these historians argue that medical professionals were essentially correct in their diagnoses and that there was not significant child lead poisoning, especially from deteriorating lead paint, before 1945.[2]

This debate is significant for both material and epistemological reasons. Lead exposure has huge consequences for human development. The debate about the extent of lead exposure – and its disparities – before 1945 is therefore highly materially significant. If it was a "silent epidemic," it was silent only in the sense that it was not heard or communicated by experts. But it would have been heard by the bodies and brains of its victims regardless. The answer to this question is in part tied up in the epistemological significance of this story, for which there are two aspects. First, it examines how and why health experts, particularly physicians, came to be concerned about child lead poisoning. On another level, it engages with the question of what historians are to do with what is essentially expert testimony from the past, especially when it seems we have little else to go on to evaluate this testimony. Should we assume that, while imperfect, the way experts (physicians) understood reality (the extent of child lead poisoning) was largely correct, as some historians have argued?[3] Or should we see their ideas as so buffeted by cultural norms, scientific paradigms, institutions and other social factors that they cannot be seen as reliable?

---

[2] English argues that child hood lead poisoning largely happened the way physicians understood it. Changes in the definition of lead poisoning and changes in housing conditions and those who lived in them resulted in greater lead poisoning cases Burnham is in line with English, and also argues that Fee is mistaken in suggesting that other cities had childhood lead poisonings on par with Baltimore that were simply not surveilled or diagnosed. Peter C English, *Old Paint : A Medical History of Childhood Lead-Paint Poisoning in the United States to 1980* (New Brunswick, NJ: Rutgers University Press, 2001); John C. Burnham, "Unraveling the Mystery of Why There Was No Childhood Lead Poisoning," *Journal of the History of Medicine and Allied Sciences* 60, no. 4 (2005): 445–77.

[3] Burnham, "Unraveling the Mystery of Why There Was No Childhood Lead Poisoning"; Ellen K. Silbergeld, "The Unbearable Heaviness of Lead," *Bulletin of the History of Medicine* 77, no. 1 (2003): 164–71.

In what follows, I examine the published literature on child lead poisoning from the late nineteenth to the mid-twentieth century, looking at the various ways this literature might have reflected actual child lead poisoning versus other factors. I argue that there were various factors that held back the proper diagnosis of child lead poisoning, and thus an understanding of its prevalence.

But showing that child lead poisoning was under-diagnosed does not tell us how prevalent it was. One way to address this gap in knowledge is to try to understand the extent of lead exposure by examining the history of lead paint and housing in light of social and metropolitan history. Here I argue that that lead paint hazards in housing increased from the early twentieth century to the 1930s. I draw extensively on trade publications, manual and advice columns to show the lead paint deterioration was not anomalous. The technological ideal of white lead paint – pure white lead, applied by a professional under ideal environmental conditions – was perhaps more anomalous. Moreover, suburbanization, war and other systematic factors produced systematic paint deterioration.

In the final section of the chapter, I turn to archival medical records that show that medical experts did record cases of child lead paint poisoning from deteriorated housing before 1945, something historians have not previously found. In addition to lending credence the argument that child lead poisoning from deteriorating paint was not rare, these medical records show the importance of archival sources and the need to be attuned to what experts end up reporting in the published record versus the archival record. The way these records have been buried reveals a different kind of social construction of knowledge – or perhaps social *destruction* of knowledge –in which a medical knowledge about the world is filtered through sexism and the hierarchy of professions. The experts who seem to have first documented poisoning from deteriorating paint and plaster were female social workers. Their gender and the tenuous nature of their profession were probably one reason their discoveries were overlooked at the time.

Together, this chapter provides a more comprehensive account of child lead paint poisoning before World War II by expanding our knowledge of both the reporting on deteriorating lead paint, and the supply of deteriorating lead paint. Although it is still difficult to say exactly how widespread child lead exposure and poisoning was from these hazards, the evidence suggests it was much more significant than the published literature at the time suggested.

The Discovery of Child Lead Poisoning

Child lead poisoning was a little discussed phenomenon in the medical literature in the nineteenth and early twentieth century. In the nineteenth century, lead poisoning from painting – usually called "painter's colic" – dominated published material on lead poisoning. In the early 1900s, as industrial processes amplified the use and production of lead, published material increasingly included discussions of "industrial lead poisoning." The study of adult occupational lead poisoning, however, invited attention to child lead poisoning, both because occupational lead poisoning could result in child lead poisoning and because the science of industrial hygiene produced knowledge and technologies that facilitated the study of child lead poisoning. Health experts slowly published more on child lead poisoning, especially poisoning from paint, from the 1890s to the 1920s. In the 1930s, reference to child lead poisoning increased, followed by another acceleration in and after the 1950s.

What I mean by "child lead poisoning" is roughly what was meant by the phrase at the time: A lead exposure sufficient to cause death or extremely severe and easily recognizable (if not identifiable) signs and symptoms, such as colic, paralysis or encephalopathy.[4] The following chapter explicates four

[4] In terms of blood lead levels – which would not have been used at the time – this would usually be in the range of 80 to hundreds of micrograms of lead per deciliter of blood. After World War II, blood lead levels indicating abnormal or concerning exposure, and sometimes equated objectively with "lead poisoning" fell from 60 micrograms down to 10 micrograms. At present, no level of lead in the blood is considered safe or normal for children, although 5 micrograms is often used to distinguished children with "elevated" blood lead. It is worth noting that even in the late nineteenth and early twentieth century, some physicians were also concerned about the effects of chronic exposure from lead and sub-acute effects. The Harvard neurologist J.J. Putnam in particular helped instigate a recurrent, though restrained, concern that the chronic effects of low level exposure were a serious and prevalent public health problem. Putnam argued that chronic exposure to "minute quantities" of lead could cause health problems. J.J. Putnam, "Toxic Affections From Arsenic and Lead," in John Marie Keating, *Cyclopædia of the Diseases of Children: Medical and Surgical* (Lippincott, 1890), 615–16. See also, Sir Thomas Oliver, *Lead Poisoning in Its Acute and Chronic Forms* (Pentland, 1891), 20–21. He established that this was reasonable by showing that lead was more commonly found in the urine of people with chronic nervous conditions than in those without. Physicians may have misdiagnosed children who had these "lighter grades of symptoms" according to Putnam. James J. Putnam, "On Certain Unrecognized Forms of Lead-Poisoning; And on the Possibility of Mistaking Bismuth for Lead in Urine Analyses," *The Boston Medical and Surgical Journal* 109, no. 14 (1883): 315–317. Nervous conditions included: chronic sensory neuritis, chronic or subacute myelitis, spastic paraplegia and "Pure neurasthenic symptoms." James J. Putnam, "A Supplemental Inquiry into the Frequency with Which Lead Is Found in the Urine," *The Boston Medical and Surgical Journal* 121, no. 22 (1889): 530–533. Another physician wrote,

elements of my argument. First, most physicians believed that child lead poisoning was under-diagnosed and many believed that child lead poisoning was much more prevalent than was recognized. Second, I argue that the accumulation of knowledge and institutions helped bring more attention to the child lead poisoning. Third, I argue that the decline of infectious diseases may have helped foreground child lead poisoning by slowly removing diseases that confounded diagnosis and by allowing physicians to focus more on new and less common diseases. But the evidence is equivocal. Finally, I argue that while these changes were important, they do not really explain the timing of increased attention to child lead poisoning in the 1920s and 1930s. Nor do arguments about under-diagnosis give us much of a sense of how prevalent child lead exposure and poisoning might have been. For that we need to turn to the social and material history of housing.

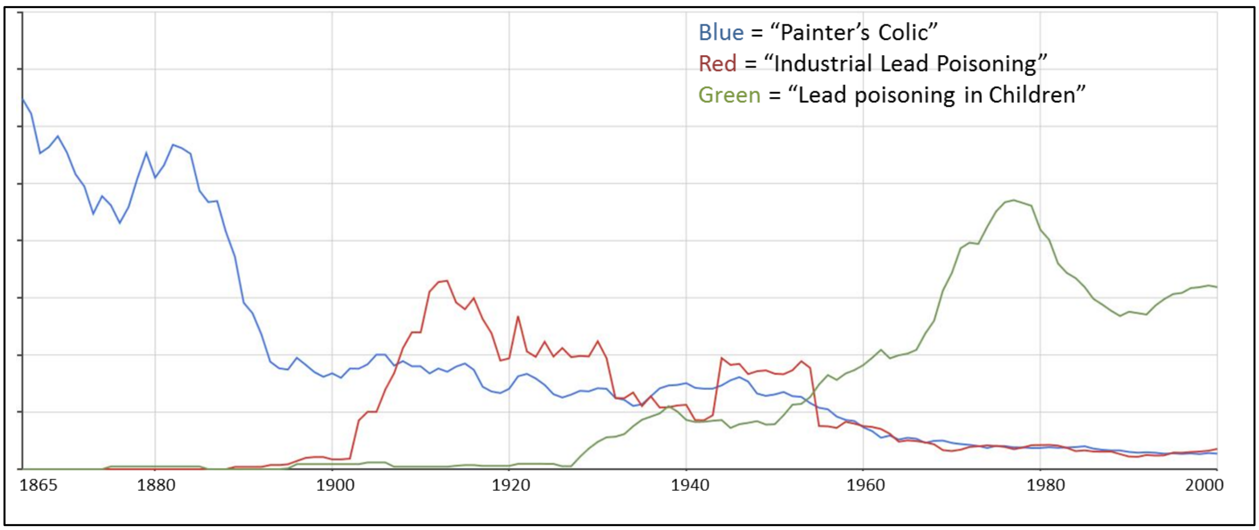


Figure 26: An N-Gram showing the percentage of books with the phrases "Painter's Colic," "Industrial Lead Poisoning," and "Lead Poisoning in Children," in the Google Books library. Since it is the relative importance of these phrases, I have excluded the vertical axis, which would be in millionths of a percent. The graph suggests that concern about lead poisoning in painters was established in the nineteenth century and that concern about industrial lead poisoning increased rapidly around 1910 (and also during World War II). Concern about child lead poisoning emerged very slowly in the late nineteenth and early twentieth century, gaining more ground after the mid-1920s, and coming to dominate lead poisoning concern in the mid-1950s. **Source:** Google Books. **Graph:** Leif Fredrickson**.**

Child lead poisoning emerged as a medical issue in the late nineteenth century with physicians considering food and paint to be key sources of exposure for children. The French physician, Louis Tanquerel des Planches' seminal 1839 essay on lead stated that children rarely contracted lead poisoning

"There is probably more of the sub-acute lead poisoning in children than is diagnosed." Horatio C. Wood, *American Medico-Surgical Bulletin* (The Bulletin Publishing Company., 1896), 534.

("colic") because they did not usually work in places that exposed them to lead. But Planches also noted that toys, food and other sources to poison children, and he "confessed" that the diagnosis of child lead poisoning involved "great difficulty."[5] When children appeared in the literature on lead poisoning in the nineteenth century, it was often in relation to food. At Johns Hopkins, the only recorded child lead poisoning case around the turn-of-the-century was a young girl who was "in the habit of eating the remains of food left in tin cans."[6] In addition to its pervasive use in canning solder, lead was a hazard in other foods, including confectionaries. In the 1850s, medical authorities documented (often retrospectively) a string of lead poisoning cases in Europe and the United States in which confectioners used chrome yellow, which contained lead, to color baked goods and candies. A study published in *Science* in 1889 by William Glenn, the head chemist at the Baltimore Chrome Works of Baltimore, found no chrome yellow used by bakers (among those they sampled), but did find that the majority of candy sold in Baltimore markets contained chrome yellow. On a typical market day, ten to thirty pounds of such candy was sold a day. "Such candy, consumed in such quantities," Glenn wrote, "cannot have failed to produce in Baltimore an abundance of lead-poisoning." In Baltimore and other communities, Glenn concluded, chrome yellow poisonings were probably the cause of undetected lead poisoning.[7] When physicians did first start dedicating articles to child lead poisoning (as opposed to including children in discussions of lead poisoning), they focused on another source of exposure: lead paint. Child lead paint poisoning cases in the nineteenth century were usually associated with wet paint.[8] But in some cases, children were poisoned by ingesting dry paint.[9]

The very fact of belief that child lead poisoning was rare perpetuated its underreporting, and some pediatricians urged their fellow to take the possibility more seriously. Some medical textbooks did not

[5] The American physician Samuel Dana translated Planches' book into English in 1848. Louis Jean Charles Marie Tanquerel Des Planches, *Lead Diseases* (Daniel Bixby and Company, 1848), 5, 65.
[6] Thomas, "Generalized Lead Paralysis," 211.
[7] Wm. Glenn, "Chrome Yellow Considered as a Poison," *Science* 13, no. 326 (1889): 347–49. Glenn had teamed up with the *Baltimore American* for the purpose of ascertaining if confectioners were using chrome yellow in the city and, if so, to stop its sale.
[8] English, *Old Paint*, 11–13.
[9] Leo Newmark, "Lead Palsy in Children," in *Medical News* (Henry C. Lea's Son & Company, 1895), 505–6.

mention child lead poisoning; others thought it was relatively rare or unimportant in children.[10] But others, such as the Harvard neurologist James J. Putnam believed the affliction was a potentially serious if misunderstood phenomenon.[11] One reason to take it seriously was that children might be especially vulnerable. While a number of texts repeated the claim that children were less susceptible to lead poisoning, a growing number of researchers argued the opposite: That children's developing nervous systems made them more vulnerable.[12] Another reason that children were more vulnerable was that their environment – the plethora of toys, utensils and other objects with lead in them that children regularly handled – and their behavior, such as mouthing objects, made them more likely to be exposed to lead.[13]

One reason that there were not more reports of child lead poisoning was differences between adults and children confounded diagnosis. A combination of sulfur from cavities and lead caused gum discoloration known as a "lead line" but this diagnostic sign was less visible (or absent) in children, whose teeth were usually in better condition than adults. Physicians noted this diagnostic problem would lead to under-diagnosis of child lead poisoning as early as the 1880s.[14] Another sign in adults was paralysis of the upper extremities, especially the classic "wrist drop" of lead poisoned painters. But

---

[10] Henry Ashby and George Wright, *The Diseases of Children* (London: Longman, 1893, Second Edition for American Students) and George Tuttle and Bern Gallaudet, *Diseases of Children* (New York: Lea Brothers & Co., 1906, Second Edition). A rare problem for children and/or children as less susceptible: Luther Emmett Holt, *The Diseases of Infancy and Childhood* (D. Appleton and Company, 1902), 416, where it is described as "very rare."

[11] J.J. Putnam, "Toxic Affections From Arsenic and Lead," in Keating, *Cyclopædia of the Diseases of Children*, 615–16. See also, William H. Wells and John Taylor, *Manual of the Diseases of Children* (Blakiston's Son & Company, 1901), 566–67.

[12] Henry Chapin, "Lead Paralysis In Children," *The Medical Record* 25, no. 20 (May 17, 1884): 546–47. D. D. Stewart, "Lead Convulsions: A Study of Sixteen Cases," *The American Journal of the Medical Sciences* 109, no. 3 (1895): 301.

[13] The neurologist Wharton Sinkler, an early researcher of lead paint poisoning in children, was astonished that more cases of lead poisoning did not occur, given the numerous sources of lead in drinking water, cooking utensils, rubber nipples on baby bottles, solder in cans and chromate pigments in toys, clothes and other articles. Wharton Sinkler, "On Lead Palsy in Children; With a Report of Three Cases," *Transactions of the Association of American Physicians* 9 (1894): 134. Leopold Putzel noted that children were "very apt to put into the mouth any substance with which they come in contact, and it is therefore advisable, in cases of lead poisoning in children, to carefully examine their toys, etc." Doctors, Petzel urged, should reject statements that claimed the impossibility of lead exposure when "well-marked symptoms" of poisoning were present. Leopold Putzel, *A Treatise on Common Forms of Functional Nervous Diseases* (W. Wood & Company, 1880), 181–84.

[14] The "lead line" was also known as the "blue line." Smith, "Original Communications," 549–50. John Brown, "Unsuspected Lead Poisoning in Children," *The British Medical Journal*, January 25, 1890, 7. J.J. Putnam, "Toxic Affections From Arsenic and Lead," in Keating, *Cyclopædia of the Diseases of Children*, 615–42. Sinkler also mentions this, Sinkler, "On Lead Palsy," 140.

researchers eventually discovered that children tended to get paralysis in the legs, not in the upper limbs.[15] Poliomyelitis, a disease that particularly ravaged children, confounded diagnosis, with one physician stating that it was "impossible for any neurologist to distinguish between" the two diseases.[16] The proper diagnosis of epilepsy and convulsions was another area in which ambiguous signs and differences between children and adults were a problem.[17]

Although the first articles dedicated to child lead poisoning in the 1880s and 1890s were about lead paint, pediatricians like Putnam still considered this source a relatively minor hazard compared to water pipes and food.[18] But an outbreak of child lead poisoning in Australia in 1892 suggested otherwise. Australian researchers struggled to find the source of lead, initially looking classic sources like candy wrappers and drinking water, before concluding that the children were ingesting dust from the crumbling lead paint on porches. Over the course of the next few decades, hospitals in Queensland admitted hundreds of children with the diagnosis of lead poisoning. Ultimately, a public health campaign to educate people and ban and remove lead paint was successful.[19]

The Australian research took time to develop and to be incorporated into medical literature in the Britain and America. But in 1913, Kenneth Blackfan, a physician at Johns Hopkins, described several cases of childhood lead poisoning from paint Baltimore. Blackfan's studies, which drew extensively on the Australian research, helped inaugurate a new era of child lead paint poisoning research in the United

---

[15] J.J. Putnam, "Toxic Affections From Arsenic and Lead," in Keating, *Cyclopædia of the Diseases of Children*, 615–42. Putnam and Sinkler discussed this at the 1894 Congress of Physicians and Surgeons reported in the *Maryland Medical Journal* 21, May-October 1894, 152.
[16] Chapin, "Lead Paralysis In Children." The neurologist Chapin cited, Edward Seguin, went so far as to claim that lead paralysis was a form of poliomyelitis. For a debate about this and the general confusion about the differential diagnoses for these symptoms, see "American Neurological Association Eight Annual Meeting," *The Journal of Nervous and Mental Disease* 7, No. 3, July 1882, 539-544.
[17] J.J. Putnam, "Toxic Affections From Arsenic and Lead," in Keating, *Cyclopædia of the Diseases of Children*, 615–42. Pearce Bailey, "The Diagnosis of Idiopathic Epilepsy," *American Medico-Surgical Bulletin,* August 8, 1896, 157.
[18] J.J. Putnam, "Arsenical Poisoning – Lead Poisoning," in Edwards, *Diseases of Children, Medical and Surgical*, 1200.
[19] Mervyn J. Eadie, *The Flowering of a Waratah: A History of Australian Neurology and of the Australian Association of Neurologists* (John Libbey Eurotext, 2000), 23–25; J. L. Gibson, "A Plea for Painted Railings and Painted Walls of Rooms as the Source of Lead Poisoning amongst Queensland Children," *Australian Medical Gazette* 23 (1904): 149–53.

States. Looking at them in their intellectual and environmental context helps illuminate the ongoing discovery of child lead paint poisoning.

Blackfan worked at the intersection of the two incipient medical fields critical to identifying child lead poisoning problems: pediatrics and neuroscience. Even after creation of a separate American Pediatrics Society, hospitals did not consider child diseases a distinct specialty, in part because hospitals did not have the resources to devote facilities to children. Physicians who dealt extensively with children before this point trained and worked as general practitioners. Blackfan, for example, had been a country doctor in 1905, before going on to work at large city hospitals. At Johns Hopkins, pediatrics remained an outpatient activity until the opening of the Harriet Lane Home for Children in 1912. That same year, Johns Hopkins attracted John Howland, a leader in the burgeoning research field of research on the biochemical bases of child diseases. Howland assembled a group of researchers at the Harriet Lane Home that included Blackfan, who had been Howland's chief resident at a hospital in St. Louis. Under Howland's leadership, the Harriet Lane Home became a renowned center of pediatrics, combining Howland's dual emphasis on the latest quantitative methods in chemistry *and* traditional bedside observation. Like other physicians in Howland's group, Blackfan had to learn to use chemical diagnostics. He was known as a "superb diagnostician" as well as a "master of hospital care," according to one historian. At Harriet Lane, Blackfan worked on several different diseases, including hydroencephalopathy (brain swelling from fluid). Together with Walter Dandy (a protégé of the famous neurosurgeon Harvey Cushing), Blackfan published groundbreaking research in 1913 on the heretofore unknown mechanism of hydroencephalopathy.[20]

In 1913, Blackfan and Henry Thomas, a neurologist who had studied adult lead poisoning cases previously, teamed up to investigate a child whose neurological problems and death were ultimately traced to lead paint. On August 22, 1913, the Harriet Lane Home admitted a white, five year old boy from the Home for the Friendless (an orphanage). Leading up to his admission the boy suffered from various

[20] A. McGehee Harvey, *Adventures in Medical Research: A Century of Discovery at Johns Hopkins* (Baltimore: Johns Hopkins University Press, 1976), 60, 64, 68, 193–207.

problems: headache, stiffness, restlessness, and vomiting. After a few days, the boy's condition rapidly worsened into convulsions and then coma. The boy's signs and symptoms were classic for lead poisoning (with the exception of vomiting). But acute lead poisoning signs and symptoms were not specific to the disease, and doctors did not initially suspect lead. Spinal punctures and other diagnostic tests also did result in a lead poisoning diagnosis. After a week in the hospital, the child's condition improved and he went back to the orphanage. Five months later, headaches and vomiting returned and the child was admitted again. His case attracted much interest at the hospital and was "studied most carefully from every side." But nothing shed light on the cause until someone spotted a "very fine but typical lead-line on the gums." Blood worked showed stippling of red cells, which confirmed to the doctors that "poisoning of lead was the cause of the trouble." [21]

The doctors then set about trying to find the source of the lead. They noticed white lead around the child's mouth and found he had nibbled lead paint off of the crib in the hospital. Investigating the orphanage, they found that the bedstead in his room was "chipped off much more than from the others." The doctors concluded that he had a "peculiar habit" and found that he "would gnaw any painted object unless he was most carefully watched." The patient made a "remarkable" recovery and was sent back to the orphanage. Three weeks later he fell into severe convulsions again and died. After a discussion of research on lead poisoning and its relationship brain swelling and meningitis – research primarily carried out in France and Australia –Thomas and Blackfan concluded, lead poisoning "may not infrequently be the unsuspected cause of so-called serious meningitis."[22]

Three years later, Blackfan again published on child lead poisoning, drawing on two more cases originating in the slums of east Baltimore. Blackfan established a general progression of signs and symptoms for children as they became more lead poisoned. But given the variety of signs and symptoms,

[21] Henry M. Thomas and Kenneth D. Blackfan, "Recurrent Meningitis, due to Lead, in a Child of Five Years," *American Journal of Diseases of Children* 8, no. 5 (1914): 377–380. I inferred the race of the child from lead poisoning cases indexed in Shoebox 21, EP Collection, AMC.
[22] Ibid.

as well as the variation in these signs and symptoms across victims of lead poisoning, Blackfan concluded that the diagnosis and classification of lead poisoning cases would be difficult.[23]

After Blackfan's studies, clinical researchers in Baltimore and other cities started publishing much more on child lead poisoning, especially poisoning from paint. Another one of Howland's hand-picked physicians, Edwards Park, began tracking child lead poisoning cases sometime around Blackfan's studies. Parks was an expert in bone histology who did groundbreaking research on the use of x-rays to identify lead poisoning in children.[24] In 1927, he took the helm of the Harriet Lane Home and directed it for the next two decades.[25] Although the number of cases was never large in any year in the 1920s, they did grow from the nineteen teens, to twenties to thirties.[26] This interest in child lead poisoning was mirrored in the increase in academic articles and books that mentioned or focused on lead poisoning.

The accumulation of knowledge and institutional capacity produced a feedback loop that increased awareness of child lead poisoning over time. At the same time, declines in death rates and disease rates allowed health experts to focus on newer (or different) diseases such as lead poisoning.[27] Death rates declined in Baltimore and other cities in the nineteenth and twentieth-century. Infant mortality declined steeply. The control of epidemic infectious disease was critical to this decline.[28] Sanitation,

[23] Early cases exhibited irritability, restlessness, poor appetite, bleeding gums, and stomach and leg pain. In protracted cases stomach pain became continuous and severe and children were constipated "as a rule"; vomiting was rare. Muscles aches became extremely painful and children often had some degree of paralysis of the legs that resulted in a distinctive "waddling gait." (Unlike adult lead poisoning victims, children rarely had wrist drop). Despite these signs, Blackfan noted that "not infrequently" parents noticed nothing abnormal until the development of cerebral disturbances. Physicians, who might also be confused by early stage lead poisoning cases, could draw on other diagnostics, such as lead lines on gums or stippled red blood cells. Urine and feces could also be examined for lead. Even children in early stages were found to have lead in feces. On the other hand, lead was not always found in urine when it was present in feces. In late stages of child lead poisoning, children often had very severe encephalopathy and/or convulsions. These, too, were not particularly distinctive to lead poisoning. Blackfan did note that convulsions from lead poisoning had the "peculiarities" of a tendency to recur and they were often deadly. Kenneth D. Blackfan, "Lead Poisoning in Children with Especial Reference to Lead As a Cause of Convulsions," *The American Journal of the Medical Sciences* 153, no. 6 (1917): 877–887. Blackfan recapitulated his conclusions from his lead poisoning studies in "Lead Poisoning in Children," *Midland Medical Journal* 17, 1918, 5-7.
[24] Harvey, *Adventures in Medical Research*, 199–207, 216; Park, E., Jackson, D., and Kajdi, L., "Shadows Produced by Lead in the X-Ray Pictures of the Growing Skeleton," *American Journal of Diseases of Children* 41, no. 3 (March 1, 1931): 485–99.
[25] source
[26] "Lead Poisoning" and "Lead Encephalitis" cases, Patient Index Cards, Shoebox 21, Edwards Park Collection (hereafter EP Collection), AMCM Archives.
[27] The arguments that follow about the institutionalization of pediatrics, rising medical knowledge, and declining death and disease rates, owe a great deal Christian Warren. Warren, *Brush with Death*, 42.

better nutrition and better therapeutics all contributed to reduction in disease transmission as well as the better prospects for victims of disease.[29] There were probably deaths from lead poisoning that went undiagnosed or unrecorded because hospitals and cities were swamped by other diseases. Those diseases might even have been killing people with lead poisoning before lead could kill them. However, it is questionable how important these declines were relative to lead poisoning. Even boosting lead poisoning deaths by an order of magnitude, lead poisoning fatalities are barely visible against a selection of deaths from other sorts of diseases. It is hard to imagine that a decline from two or three thousand infectious disease deaths to about 1,500 or 1,000 made the handful of lead poisoning deaths more visible around the early 1920s (Figure 27). Cases and deaths from a number of infectious diseases did decline just before or in the 1930s. But many increased in and after the 1920s. Moreover, the scale of many of these diseases still remained very large compared to the amount of child lead poisoning cases even when there was a decrease.

---

[28] Insect vector diseases, such as malaria, yellow fever, and typhus had once contributed substantially to Baltimore's death toll, but by the end of the nineteenth century contributed a percent or less to total deaths. Smallpox had rocked the city with epidemics over the nineteenth century, but the last one was in 1882-1883. Many formerly epidemic diseases became endemic or disappeared completely. Other diseases remained, but deaths from them dropped. One other biotic disease, pneumonia that was not highly infectious (but was associated with tuberculosis) contributed much to the death rate, as did diabetes, cancer, cardiovascular diseases, and other chronic diseases. William Howard, *Public Health Administration and the Natural History of Disease in Baltimore, Maryland 1797-1920* (Carnegie Institution of Washington, 1924).

[29] For example, construction of a sewage system for Baltimore, between 1905 and 1918, and calcium hypochlorite treatment of the water supply, beginning in 1911, helped typhoid cases plummet. Some therapeutics, particularly diphtheria antitoxin which Baltimore began distributing freely in 1898, helped curb a disease that was particularly deadly for children. BCHD, *Annual* 1915, 165-170, 186-188; Ibid., 121. Physicians and the health department ramped up inoculations against diphtheria in the 1930s, with around 80,000 children receiving the toxoid inoculation between 1935 and 1939. BCHD, *Annual* 1939, 27-28.

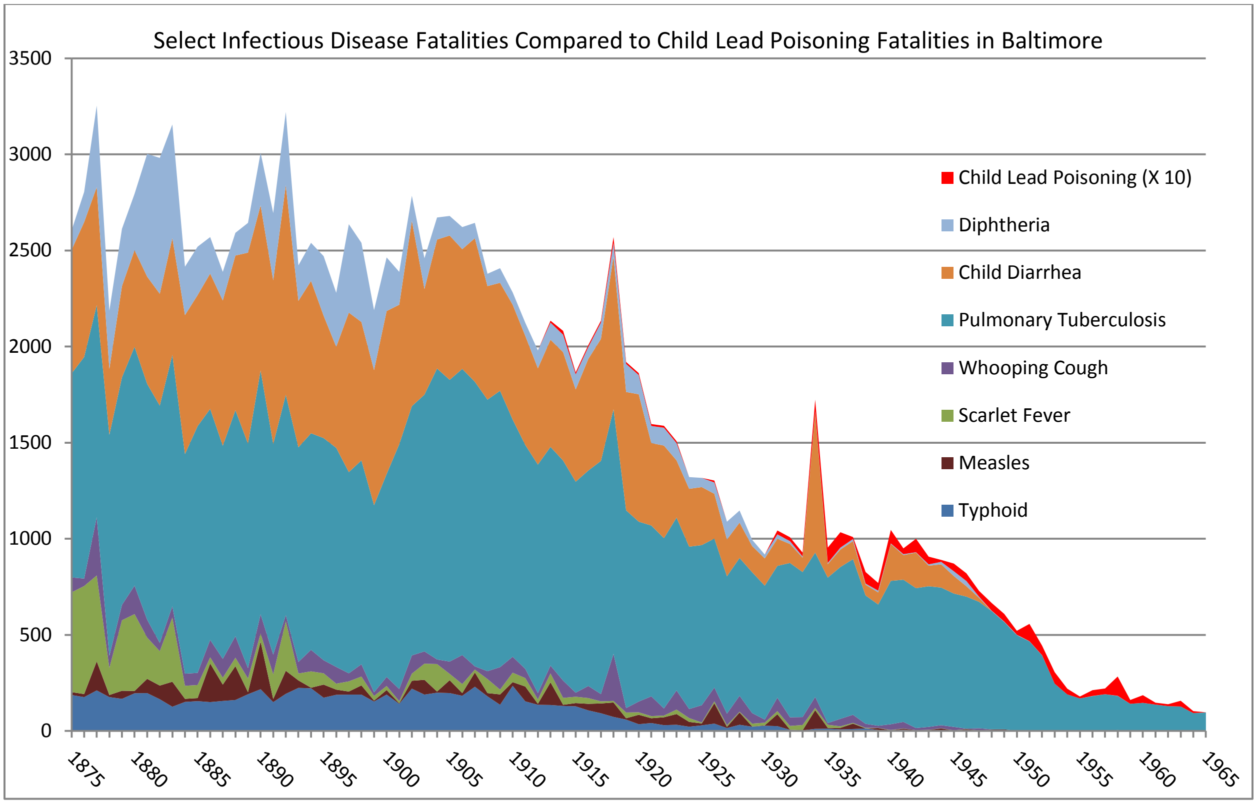


Figure 27: Deaths from select diseases including fatal child lead poisoning cases. The latter have been multiplied by 10 so that they are more visible. As the graph indicates, child deaths from lead poisoning contributed a miniscule amount to the overall deaths in the city compared to infectious diseases (and would have even if they were ten times as high). Note that this graph does not include all deaths from infectious diseases. Influenza, dysentery, meningitis and other forms of tuberculosis also contributed large numbers to the death toll. **Sources:** Baltimore Sub-Department of Health and BCHD *Annuals*, various years; Howard, *Public Health Administration*. **Graph:** Leif Fredrickson.

Lead Paint, Housing and Metropolitan Development

The problem of lead poisoning diagnosis in the late nineteenth and early twentieth centuries shows that child lead poisoning was under-diagnosed.[30] Physicians who were experts on the matter at the time generally believed that. But acknowledging it was under-diagnosed still does not tell us how widespread it was. Was it more prevalent than the published studies suggest, but still occasional? Or is there reason to believe they were more common than that? One way to approach these questions that gets around problems with the published literature is to look at the environmental risks such as lead paint exposure rather than the meager published literature on cases. Using a richer documentary record on housing, we can get a better picture of the extent and disparities in child lead paint poisoning in the early twentieth century.

[30] And these were only the cases that resulted in severe signs such as seizures, paralysis and death. A much broader swath of the population, were exposed to relatively low levels of lead that, by today's standards, would be alarming.

Baltimoreans coated their environment with lead paint from the nineteenth century until at least 1951 when the city banned it.[31] Baltimore's geography, city planning and architecture were conducive to homeownership, which in turn was conducive to the use of lead paint because homeowners were in a better position, both financially and legally, to invest in quality paint. Property parcels were originally planned with the idea of having 100 feet of space in front of houses and 200 feet behind. Later re-subdivision allowed building behind these houses, creating space for alley houses.[32] Maryland's ground rent system separated land ownership and home ownership. People typically bought a house and paid annual rents to the owner of the land, who was often the seller of the house. The ground rent system incentivized the building of alley houses and rowhouses because many houses on a piece of ground yielded more annual ground rent. Ground rents also drove down the initial purchase price for homes, since a homebuyer did not have to buy the land. And because the homes were tightly packed and shared walls, heating costs were lower. Finally, Baltimore's robust ethnic savings and loan banks, also contributed to relatively high homeownership rates, especially among white ethnics. These factors made for relatively high homeownership rates in Baltimore.[33] Because houses were cheaper to buy and build, developers and homeowners were more likely to invest in more expensive materials, which may well have included high quality lead paint.[34]

Baltimoreans built many houses around the turn-of-the-century when white lead was in high use. In the early 1880s, emerging out the Civil War, the building cycle climbed into a prolonged period of

---

[31] And, in fact, some continued to use it after the 1951 ban.

[32] Baltimore Urban Renewal and Housing Authority (BURHA), "Community Renewal Program," 1966, in Folder 2, Box 10, Series XII, Baltimore City Department of Planning Records (hereafter, BCDP Records), LLSC.

[33] The ground rent system separated ownership of the land and the house on it. Homeowners owned their house, but usually paid rent to a separate owner of the land. Land owners who would collect ground rent on their land could get more money by dividing it up into many small parcels which they could collect rent from. Hayward, *Baltimore's Alley Houses*, 32–33. Charles Belfoure and Mary Ellen Hayward, *The Baltimore Rowhouse* (Chronicle Books, 2012); Morton Hoffman, "The Role of Government in Influencing Changes in Housing in Baltimore: 1940 to 1950," *Land Economics*, 1954, 126.

[34] Belfoure and Hayward, *The Baltimore Rowhouse*, 116. Baltimore was not unique in having these factors. Many cities had some version of rowhouses and ethnic savings and loan banks. Philadelphia had a ground rent system for a while. Philadelphia and Detroit, among other cities, had very high homeownership rates. Like so many aspects of cities, Baltimore was neither unique nor representative of other cities. It was a variation. Other cities had many homeowners and a lot of lead paint as well, but perhaps on average less than Baltimore.

above average building, lasting about 10 years until the Panic of 1893.[35] Baltimore followed these trends, although it had an anomalous building boom during the late 1890s.[36] By the 1880s there was about as much white lead being produced as there was in the 1940s. Although there are no numbers or much in the way of specifics on the use of lead paint in nineteenth century Baltimore, there were a number of distributors in the city. In the early 1900s, manufacturers and distributers began marketing white lead more widely, emphasizing its beauty, durability and, although it was more expensive than other paints, its economy. Advertisements and columns in the *Sun* and *Afro-American* touted the durability and beauty of white lead. Some advertised the virtues of pure white lead, while others pitched lead in combination with other ingredients. One company selling its paint in Baltimore trumpeted a "superior" combination of lead, zinc and asbestos. [37]

Although lead paint was relatively expensive, it was not just a luxury for the rich. Advertisers courted middle and working-class homeowners. Despite the expense of lead paint, in the long-run it was cheaper than paints that had to be replaced frequently, according to proponents, who also asserted it would increase home values. The upfront costs were eased in the 1920s when buying on installment became available for contractors.[38] Painters expressed the need for professionals and high quality lead paint.[39] But advertisers and advice columnists sang the praises of cheap ready-mix paints that anyone could apply. Thus many types of homeowners used lead paint, including the working class homes.[40]

---

[35] John Riggleman, "Variations in Building Activity in United States Cities" (Dissertation, Johns Hopkins University, 1934), 37.
[36] It seems Baltimore's builders, perhaps many of them speculative developers, took advantage of cheap labor and materials costs during the depression to build homes. It is not clear why this was different from national trends, but perhaps the general low-cost of entry into building and buying a home in Baltimore made builders more bullish. "Builders Are Busy," *Sun*, August 28, 1894, 8; "Boom in Building," *Sun*, September 9, 1897, 10.
[37] See, for example, ads in the *Sun* for May 28, 1887, April 20, 1905, and the National Lead Company's display ad the *Afro-American*, September 18, 1909; "Paint Beauty," *Afro-American*, September 4, 1909, 3; "How To Know Pure Paint: A Way in Which It May Be Identified Before Using.," *Afro-American,* March 21, 1908. In 1939 $2.85 a gallon compared to $1.25 for non-lead paints. "Display Ad: Save on Paint," *Afro-American* , May 27, 1939.
[38] "Value Painted On," *Afro-American*, September 11, 1909, 7. Similarly, advertisers argued that older lead paint could be painted over without burning or scraping, which saved labor and thus money. Dutch Boy advertisement, *Sun*, March 19, 1929, 4. Two financial institutions, the Aetna Finance Corporation in Philadelphia and the Commercial Credit Company of Baltimore provided this service. "Selling Painting on Installments," *The Carter Times*, February 1925.
[39] A house painter featured in the *Afro-American* stated that his secret to good business was using durable white lead paint. In his 23 year career, he had painted 3,000 houses. "People You Ought to Know: Louis Mickle 3,000

People painted both the exteriors and interiors of houses with lead. Baltimore painters advertised the use of lead paint for interior work. Brick rowhouses were also sometimes painted. Much of the row housing built in the late nineteenth century used locally produced "soft brick" that needed to be painted so that it would not absorb moisture. Only around 1910 did builders start using and advertising homes with "hard-fired" brick that did not have to be painted.[41] In the early twentieth century, many new rowhouses also included porches, columns, and other exterior wood pieces that were painted.[42]

Although local production and consumption of lead paint is hard to track, an industrial survey of Baltimore provides one rough estimate. In 1913, producers from outside of the city with wholesale businesses in Baltimore sold 1,600 tons of lead to manufacturers in the city who used the lead to make paints, varnishes and dyes. However, 80% of the ready-mixed paint sold in the city was purchased from outside the city, probably adding another couple hundred tons of the lead to Baltimore's environment.[43]

In short, lead paint was highly desirable and, despite being more expensive than other paints, was widely used across race and classes and by both professionals and do-it-yourselfers in the first few decades of the twentieth century in Baltimore. But lead paint becomes far more hazardous when it

---

Houses," *Afro-American* , January 30, 1932. For another painter touting lead paint, see "People You Ought to Know: Nelson Gray An Apple a Day Keeps the Doctor Away.," *Afro-American* , December 12, 1931

[40] Some advertisements tried to convince homeowners to use professional painters. See Dutch Boy advertisement, *Sun*, September 17, 1929, 9. Edna Collins, born in 1894 in Spring Row, Baltimore, remembered that her family painted their first house (all the woodwork and sills) with three or four coats of lead paint. According to Dane Hammond who grew up during the Depression in Stone Hill in Baltimore, lead paint was widely used. Interviews with Edna Collins and Dane Hammond, both in Series II, Stone Hill in Hampden Collection, LLSC. The city also used lead paint in and on its buildings. "Office of the Building Committee, New City Hall," *Sun*, June 10, 1873, 2; "Municipal Matters," *Sun*, May 28, 1898, 7.

[41] Interior lead painting: Advertisements in the *Sun*: September 12, 1925, 13; September 13, 1928, 5; May 16, 1928, 9; July 15, 1934, 15; October 25, 1942, SP20; July 22, 1946, 16. Later, in 1937, builders started using formstone to build rowhouses, which also did not require painting. Mary Ellen Hayward and Charles Belfoure, *The Baltimore Rowhouse* (Princeton Architectural Press, 2001), 181.

[42] Hayward and Belfoure, *The Baltimore Rowhouse*.

[43] J. Edward Aldred and Ernest Illmer, *Industrial Survey of Baltimore: Report of the Industries Located within the Baltimore Metropolitan District* (Baltimore, 1915), 8, Pullen Collection, LLSC. The *Wall Street Journal* published an article on paint sales in the 1920s that showed unmixed ("white lead in oil") sales at about four times that of ready-mixed paint (of all kinds). "Paint Production," *Wall Street Journal*, December 8, 1922, 10. This amount is in the ballpark, but greater than, what one would expect for Baltimore based strictly on its population and the national consumption of lead. Baltimore City had about 0.75 percent of the nation's population at this time and 1,600-2,000 pounds of white lead represents about 1.2 to 1.5 percent of the nation's consumption of white lead. It may also be that urban populations consumed more white lead per capita and that Baltimoreans consumed more per capita (perhaps in part because of it the high homeownership rates).

deteriorates – peeling into flakes that children might ingest or crumbling into dust makes its way into the mouths of children through the air, hands or food. Under what conditions did lead paint deteriorate?

Lead paint had many attractive qualities, but more than any other was its durability. Lead is, of course, soft and pliable. This ductility and elasticity (as chemists put it) held true for lead as a paint pigment as well. Climatic changes caused building surfaces to expand and contract, but lead could usually roll with the punches. When quality lead paint was applied with skill, it was highly resistant to chipping and cracking. That was critical because chipping and cracking were not just the result of problems with paint, they were the beginning: They let in moisture that then exacerbated problems even more.[44]

But all paint deteriorates, and lead paint was no exception. Even under the best conditions – good paint, a good painter, and a good building – lead paint would deteriorate. Oil bound the white lead particles together into a paint film. More lead pigment would protect the oil, so heavy, pure lead paints would last longer than lighter, adulterated paints. But even in pure white lead paints, the oil would slowly evaporate, and the lead pigment would crumble off as dust.[45] White lead was notorious for chalking. The upside was that chalking left a surface that readily accepted another coat of lead paint.[46] But the dust created by chalking was, if not abundant, a highly bioavailable form of lead.

Many painters and paint companies, while acknowledging white lead's chalkiness, claimed that it would never peel. By "never," however, they meant something like "not in a reasonable time before re-painting." For exterior surfaces, that time frame was about four to six years, with some exceptional cases lasting more than a decade. Interior surfaces would last even longer.[47] However, if the surface did not get

---

[44] "What is Good Paint?" *The Carter Times*, August, 1923, 1-3.

[45] "Paint last just as long as the oil lasts," the Carter White Lead Company wrote. "What is a Good Paint," *The Carter Times*, August, 1923, 3; "Painting the North Side," October, 1925, 1.

[46] In paints that did not chalk and wear away, new coats of paint would build up and eventually crack or scale when they got too thick. "Paint Foundations," October, 1926, *The Carter Times*, 15. Especially a problem with a sub-par primer.

[47] One article suggested that more expensive white lead would last about six years, while a cheaper lead paint might last about four years. A.H. Sabin, "Comparing Paint Costs," *Engineering News Record*, January 6, 1921, 42. Sabin was a consulting chemist for the National Lead Company. An advertisement claimed that their white lead (presumably exterior) would last five to six years (two to four years more than "cheap paint."). Low Brothers Liquid Paint Advertisement, *The Literary Digest*, April 25, 1908, 618. One painter noted that when he re-painted houses from twelve years ago, there were no cracks or blisters anywhere. "From Our Readers," *The Carter Times*, February,

another layer of paint eventually, the loss of oil, along with the formation of small cracks, would allow moisture in, which could then accelerate chalking and could lead to peeling and flaking.[48]

Although marketers and home repair gurus boasted about lead paint's resistance to the elements, lead paint was not immune to weathering: Moisture; sun light; heat; freezing and thawing; snow and ice; abrasive windblown dust; smoke and dust – these things could remove oil, corrode paint film, and cause blistering, peeling, cracking, checking and flaking.[49] Moisture and heat were particular critical to the deterioration of lead paint. When moisture got under an elastic paint (i.e., white lead) and that moisture was heated – by ambient air, sunlight, or a house furnace – it would blister, and eventually it would peel.[50]

The micro-climates of building surfaces could also lead to paint problems. Surfaces that accumulated dew and frost, were near damp areas, or were prone to absorb moistures could cause peeling. Brick was notorious for its ability to absorb a tremendous amount of moisture.[51] Moisture was a serious

---

1925, 13. Tellingly, lead paint companies advertised that their paint would last "years." They weren't more specific in advertisements, and never (to my knowledge) claimed that it would last "decades."

[48] The formation of small cracks is called checking. Peeling is paint losing adhesion to surface. Flaking is the paint coating breaking down completely. Flaking was sometimes called "scaling." Flaking/scaling, peeling, chalking, cracking, blistering, and checking were distinct breakdowns (though they could co-occur or cause one another). Authors, painters, the public, and housing inspectors, among others, often mixed these terms up, however. Peeling, flaking and scaling were particularly used interchangeably. The differences are well laid out in Roy Edwin Coleman, *The Principles of Paint: A Treatise on the Principles of Paint* (Arco Company, 1915), 52–55. Far from being something lead paint never did (as white lead companies sometimes claimed), checking was a signature aspect of white lead. Checking could go on for some time without problem, in part because the fine cracks did not go all the way to wood at first. Sabin, *White-Lead*, 53. But eventually they would let moisture in, resulting in more problems.

[49] "What is a Good Paint," *The Carter Times*, August, 1923, 3; "Painting the North Side," October, 1925, 1.

[50] Coleman, *The Principles of Paint*, 53.

[51] Sometimes three sides of a building would be fine, and on the fourth side peeling lead paint resulted from painting on a surface with heavy dew or frost. Professionals made this mistake, the author suggested. J.G. Schmidt, "Some Points on Paints," *Collier's*, February 2, 1907, 65. In areas where the ground was damp, porch floors could absorb enough moisture to cause paint on floors to peel. "Painting Porch Floors," *The Carter Times*, February 1921, 13. See also "Porch Floors," *The Carter Times*, August, 1923, 16; "Painting Porch Floors," *The Carter Times*, May, 1921, 15; "Paint Peeling on Porch Floors," August, 1922, 16. Hollow outdoor columns were prone to blistering as a result of moisture. "Blistering Columns," *The Carter Times*, February, 1926, 22. A dry brick placed in a bucket would absorb a pint of water, the Carter Company contended, so just imagine how much it would absorb from a rainstorm or period of high humidity. "Brick Painting and Striping," *The Carter Times*, November, 1924, 1. Brick could absorb a lot of moisture and still seem dry. It had to be "bone-dry" to be successfully painted. Thus, some painters were skeptical of even trying to paint brick. "New Homes for Old," *The Carter Times*, March, 1920, 6. See also, "Prevent Paint from Peeling on Brick Walls," *739 Paint Questions Answered* (National Painters Magazine, 1904). Another problem was the bricks themselves could chip if they absorbed water that then froze. Albanis Ashmun Kelly, *The Expert House Painter: A Reliable Guide for the Experienced House Painter and Manual of Instruction for the Less Expert Workman ... Formulas Given for Various Paint Mixtures, Tests for Ascertaining Purity and Value of Materials, How to Choose and Combine Proper Colors in Their True Scientific Relations, Etc* (David McKay Company, 1920), 73.

problem for Baltimore's brick rowhouses. Not only could porous brick sop up a lot of exterior moisture, rain, it caused many problems for house interior as well. Brick wicked rain and snow from the outside to the interior of the house. Joints and cracks allowed humid air into the housing envelope, where it condensed on the interior of the brick, plaster walls, and other relatively cool surfaces. Articles in the *Sun* discussed problems with brick, including a case where "rain with a heavy wind [drove] water through the wall," wetting the plaster and paper inside. Lower quality rowhouses had no furring (and hence airspace) between the brick and plaster walls; these conditions invited moisture problems and could cause peeling paint.[52] Beyond brick, moisture could get into interior walls in a bewildering assortment of ways, including leaky roofs, gutters, faulty flashing around windows and chimneys, water pipes in the floor, moisture from basements, and so on.[53] Urban housing seems to have been especially vulnerable to lead paint deterioration. Although scientists who noted this did explain why, the foregoing suggests some reasons. Dense urban construction trapped moisture more easily than stand-alone houses in the suburbs or rural areas. However, scientific tests of paint were carried out in rural areas as part of land grant college research. Thus these studies over-estimated the longevity of lead paint for urban housing.[54]

Technique also mattered. Too few coats of paint could cause failure.[55] Brushing technique – how even or thick the paint was applied – affected peeling and blistering.[56] Improper treatment of the painting surface – not letting plaster or undercoats of paint dry, not adequately removing old paint, painting on

---

[52] "Aid to Ailing House," *Sun*, November 14, 1937, SH20; "Solving Problems of Humidity," *Sun*, October 19, 1958, C8; "Rain Penetrates Brick," *Sun*, March 24, 1957, 112; "Hints on Buying Old Houses," *Sun*, April 24, 1955, H1.

[53] The Carter Company regretfully informed one person that his basement walls were doomed to shed whatever paint was put on them since the builder had not waterproofed the basement walls with tar. "Ask Carter," *The Carter Times*, May, 1923, 15-16. "Attractive Store Fronts," *The Carter Times*, April, 1922, 1. The plethora of ways in which moisture could result in peeling paint were also noted to homeowners in Baltimore who had peeling problems. "First Aid for the Ailing House," *Sun*, November 8, 1936; "Handy Man," *Afro-American*, February 21, 1953, 2.

[54] On lead paint lasting longer in the country than the city, see Charles Snow, *Wood and Other Organic Structural Materials*, (New York: McGraw Hill, 1917), 382. Building density may also have made the discovery and repair of leaks and other problems more difficult in urban areas.

[55] For technique in general, see "A Dangerous Practice," *Afro-American*, September 29, 1906, 7. As the Carter Company like to say, paints jobs were "25% paint and 75% painter." Professionals recommended three coats of paint. "Blistering of Paint on New Floors," *739 Paint Questions Answered* (National Painters Magazine, 1904), 13.

[56] Paint applied without "vigorous brushing" would be uneven and the thicker parts would "wrinkle or peel." "Brushing on Paint," *The Carter Times*, August, 1923, 10. Paint coats that were too thick or heavy could cause blistering.[56] As could painting a glossy overcoat over a glossy undercoat. "Painting Houses to Stay Painted," *The Carter Times*, February, 1926, 3.

moist lumber – caused peeling and blistering.[57] Poor priming was a common cause of lead paint peeling.[58] Priming – whether good, bad or absent – was also important to lead paint poisoning because the underlying surface absorbed some of the primer or the paint if no primer was applied. This was especially true of plaster. Plaster like paint was prone to deterioration from moisture and otherwise easily broken and damaged. Old plaster, even if it contained no surface remnants of old lead paint (which it often did), was thus also a potential source of lead paint poisoning. Thus even "slum" dwellings that appeared to lack paint might hold very old lead paint in the porous plaster on their walls.

The mix of paint could also lead to deterioration. Too little oil caused cracking and scaling; too much could cause blistering, especially on re-painting.[59] Mixing pigments was another common cause of peeling.[60] Professional painters often made different mixes for different surfaces and exposures on the

[57] "Blistering Paint," *The Carter Times*, July, 1921, 15. "Painting Houses to Stay Painted," *The Carter Times*, February, 1926, 3. If a surface started to peel, all of the paint had to be removed before a new coat was put on otherwise the old paint would eventually fail, "taking the new paint with it." "Burning Off Paint," *The Carter Times*, July, 1924, 1. See also, "Peeling Paint," *The Carter Times*, January, 1922, 15; "Peeling Paint," *The Carter Times*, July, 1926, 21. As with plaster, when paint was applied quickly to new lumber that had not dried, blisters were "almost sure to form," and in time the paint would peel. "Why Paints Go Wrong," *The Carter Times*, October, 1921, 3. It was not evident how much moisture was in lumber. The wood would seem dry, but heat would draw deeper moisture out later. So painters needed to wait. Some articles suggested days, some said ideally months. In addition to moisture, painters needed to watch out for, and specially treat, resinous knots and pitchy boards. "Blistering," *The Carter Times*, July, 1926, 22.

[58] One article suggested that some painters mixed "all odds and ends" of paint for primers, setting themselves up for problems of blistering paint. "Preventing Paint Blistering," *The Carter Times*, April, 1922, 12. Yellow ochre, for example, was commonly used as a primer but caused peeling. J.G. Schmidt, "Some Points on Paints," *Collier's*, February 2, 1907, 65; "Scaling Paint," *The Carter Times*, November, 1924, 16. The Carter Company complained about professional painters using cheap primers like yellow ochre. "Why Paints Go Wrong," *The Carter Times*, October, 1921, 3. Pure white lead painted over an adulterated lead paint or primer could result in serious peeling. "Peeling Paint," *The Carter Times*, 92. As could painting over a water soluble paint. "Painting Over Water Paint," *The Carter Times*, July, 1926, 20. Dirty surfaces, such as those with oil, "the least trace of soap," remnants of wall paper or paper paste were also problematic. A. Ashmum Kelly, "Suggestions on Interior Decorating," *Painters Magazine*, September, 1915, 486. "Household Ideas," *Sun*, April 12, 1927, 12. Painters had to be cognizant of the specific type of wood. Some types of wood needed primer with a bit less oil and more turpentine, otherwise the paint would probably peel. Some types of pine and basswood, for example. "The Priming Coat," *The Carter Times*, January, 1922, 3; "Basswood Siding," *The Carter Times*, October, 1925, 3. Some, like the widely used southern pine, required special mixtures of white lead to avoid checking, cracking and peeling. "Painting Southern Pine," *The Carter Times*, July, 1921, 1.

[59] "Less Oil – More Service," *The Carter Times*, February, 1925, 11. The amount of oil needed was relative to how exposed the paint surface was. Painters could guard against an overly oily paint by adding turpentine (a "thinner" or "drier"), but many painters didn't do that because of the belief that the more oil the better and that turpentine just evaporated and added nothing to the finished paint coat. "Turps in Undercoats," *The Carter Times*, May, 1921, 14. Another "veteran painter" stated that the use of boiled oil would cause paint to blister. "Effect of Boiled Oil and Driers on Paint," *One Thousand More Paint Questions Answered* (National Painters Magazine, 1908), 69.

[60] The Carter Company, in fact, claimed that exterior peeling paint was, "in about every case," caused by mixing several pigments (i.e., white lead with non-white lead, but perhaps lead-based, pigments) together that "after

same house. Do-it-yourselfers did not have this knowledge and ready mix paint could not be calibrated to these variations.[61] Especially controversial and confusing was the debate over whether pure white lead gave the best performance or whether lead was best mixed with other chemicals, particularly zinc. Some argued white lead lasted longer, others that zinc oxide did, and some that a mixture of the two was best.[62]

Lead paint deterioration was a problem for professionals and amateurs. Magazines directed at painters, builders, building maintainers, paint dealers, and homeowners were full of articles that addressed these problems with lead paint. There was confusion about causes of paint failure and best practices. Paint companies often complained about the practices of painters that resulted in paint failures. In other words, while paint failure may not have been epidemic in professional paint jobs, it was not uncommon.[63]

Producers of white lead thus went out of their way to try to instill good painting practices, practices that could back up their claim that their paints would not "crack, scale or check." Houses painted under ideal conditions, and touched up at appropriate intervals, held serious peeling, blistering and cracking at bay (although they still would have sloughed off some poisonous white lead dust). But in

---

application, formed a hard and inflexible film" that couldn't expand or contract and eventually "let go its hold on the building." "What is Good Paint?" *The Carter Times*, August, 1923, 1-3. But elsewhere, the company claimed that the two most important causes of blistering or peeling paint were moisture and bad priming coats. "Why Paints Go Wrong," *The Carter Times*, October, 1921, 3.

[61] Even in a relatively uniform company town, different surfaces (some porous some hard) and environments (sun and shade) meant that a painter would have to make many different mixes in order to avoid blistering and peeling. "How One Mill Owner Solved the Paint Problem," *The Carter Times*, November, 1922, 11.

[62] "White-lead never comes off," unless there is a problem with the surface, one expert wrote, whereas zinc would scale off and needed to be mixed with lead to prevent this. Alvah Sabin, *White-Lead: Its Use in Paint* (Wiley, 1920), 32. "It is the opinion of those who have studied the subject closely that zinc oxide paint last longer and looks better than white lead," in addition to being non-poisonous, wrote Herbert Arnold, a painter from England. He also noted that some preferred a mixture of zinc and lead, or a lead base with two coats of zinc over the top. Arnold, *The Popular Guide to House Painting, Decoration, Varnishing, Whitewashing, Colour Mixing, Floor Finishing, Paperhanging, Etc., Etc* (Heywood, 1905), 18. "Twenty-five per cent of zinc in lead always lasts longer than pure white lead," one professional wrote in *The Master Painter*, October 1908, 9. Even the Carter White Lead Company suggested mixing in substantial amounts of zinc at times. *The Carter Times*, March 1914, 15. Scientific studies yielded conclusions that both mixes had liabilities. Lead, for example, was more susceptible to sudden changes in temperature and was "much less adherent" to surfaces and had a tendency to "blow up" (presumably meaning blister).

[63] Peeling exterior paint, and problems with trying to re-paint peeled paint surfaces were common. "Illinois State Convention," *The Modern Painter*, August, 1917, 38-39. In general, for questions about lead paint, both exterior and interior, that was peeling, blistering, cracking, scaling, and otherwise failing, see *The Carter Times* newsletter; *739 Paint Questions Answered* (National Painters Magazine, 1904); *One Thousand More Paint Questions Answered* (National Painters Magazine, 1908). For general comment on the cause of lead paint failure, see Kelly, *The Expert House Painter*, 231–43; Coleman, *The Principles of Paint*, 52–55; Gustave Whyte Thompson, *Painting Defects: Their Causes and Prevention; an Address* (Gustave Thompson, 1915).

a practical sense it was not true that "lead paint" – paint with lead in it – did not crack or peel. Adulterated lead paints cracked, scaled and peeled. It was not even true that high quality lead paint did not crack, scale or peel. Applied incorrectly, or in simply unfortunate circumstances (without knowing about moisture problems, for example) the pure white lead paint *would* blister and peel. Given that anything from the paint pigment, to the paint mix, to the pain application, to the painting surface, to the micro-climate, to the climate, to building failures could cause non-ideal situations, it does not seem that lead paint deterioration would have been rare.[64]

While many of these problems resulted from ignorance, confusion or bad luck, they also resulted from deliberate corner-cutting by producers, merchants, painters, and homeowners, landlords and renters. Paint adulteration, for example, was a major problem and a cause of deterioration.[65] Ready-mix paints were particularly hard to distinguish as pure or adulterated.[66] In addition to white lead substitutes, paints were adulterated with "dope oils," and later paint manufacturers added a variety of "inerts." Putatively, inerts improved the performance of the paint, but many argued that dope oils and inerts resulted in paint failure.[67] Beyond manufacturers, painters and merchants did not always have the customers' best interest

---

[64] Carter White Lead Advertisement, *Country Life*, February, 1908, 423. Not surprisingly, the Carter Company themselves argued that impure lead paint *would* result in "cracking, peeling or discoloring." Advertisement, *The Painters Magazine*, October 1922, 33. As noted, white lead was well-known for checking, in addition to chalking. But the checking was often very fine and slow to develop.

[65] The role of zinc aside, quality lead paint required the use of a substantial amount of pure white lead. That was expensive, at least in the short run. As a result, white lead was often adulterated with chemicals that unquestionably reduced its performance. "A Dangerous Practice," *Afro-American*, September 29, 1906, 7; "Good Colors For Houses," *Afro-American*, August 25, 1906. On adulterated paints deteriorating, see "How to Know Pure Paint," *Afro-American*, March 21, 1980, 7.

[66] Lead Industry Association, "Baltimore's City Government Specifies White Lead," *Lead*, 1938, 10-11, Hagley Library.

[67] Manufacturers used "dope oils" to replace more expensive linseed oil. Carter argued that these substitutes, which flooded the market in the 1920s, reduced the durability of paint. What is Good Paint?" *The Carter Times*, August, 1923, 1-3. "Inerts" included silica, barytes, and whiting pigments. These were cheaper than lead. Inerts were also introduced in the context of rising concerns about lead poisoning, offering a way to reduce lead content of paint. Manufacturers also argued they would delay the chalking of white lead. Pure white lead advocates, however, such as William White, the former president of the Master Painters Association, argued inerts were unnecessary to delaying chalking – tints added to lead paint could already do that. Moreover, inerts painted over old lead paint could be disastrous. When put on old white lead, the result was "often, and almost invariably… the utter peeling off of all the coatings down to the priming coat." The inerts acted like a "drawing plaster," and over a few years would destroy "both itself and all intervening coatings." William Wall, "Necessity of White Lead in the Painting Business," *The Painters Magazine*, March, 1922, 42.

in mind, nor did homeowners always act in their own long-term interests in terms of their investment and application of paint.[68]

Uneven Development: Slums, Suburbanization and Segregation

In the late nineteenth and early twentieth century, suburbanization, segregation and poverty contributed to systematic lead paint deterioration. In the 1890s, Baltimore's biggest and worst slum was heavily foreign-born and white. It was located in southeast Baltimore, with a population of about 18,000. Compared to other cities, the residents of Baltimore's slums had high ownership rates (about 20%) and the earnings were "quite up to the average earnings of the people generally at large." While the "most wretched conditions" characterized much of the housing – by which the report mostly meant lack of privies, ventilation and light – canvassers found few sick people. The housing was only slightly more crowded than the rest of the city.[69]

These factors point to a mixed picture of the lead paint risks on Baltimore's largest late nineteenth century slum. Relative affluence and high ownership rates may have meant that this slum housing might have contained some lead paint, in contrast to the big tenements of New York and Chicago or poor housing in rural areas. And generally poor conditions might have meant lead paint deterioration. If so,

---

[68] Painters may not have had an incentive to do the best job, when that might mean over a decade before a re-paint. Although a painters reputation for doing a lasting job could also be a business boon. See "From Our Readers," *The Carter Times*, February, 1925, 13. Painters were also held responsible in some cases for doing a poor job, resulting in blistering paint. "Painter is Responsible," *The Carter Times*, July, 1921, 14. Retailers, who would sometimes be reimbursed by paint companies if their customers paint peeled did not make an effort to give consumers good direction on painting. One complained, "My competitors sell the paint and give their customers license to pour it on or put it on during a rain, or mop it on with a rag." Louis Ott, "Is this a Dig in Your Ribs?" *American Paint and Oil Dealer*, March, 1917, 38. Homeowners, for example, did not always have enough patience to apply the right number of coats or to wait until a coat had properly dried before applying another one. "What is Good Paint?" *The Carter Times*, August, 1923, 1-3.

[69] In terms of present-day neighborhoods, this is roughly the area between Little Italy and Fells Point and Washington Hill to the north. Carroll Davidson Wright, *The Slums of Baltimore, Chicago, New York, and Philadelphia* (US Government Printing Office, 1894), 11–12. The black population was disproportionately under-represented in the slum – only about 4% of the slum population compared to about 15% of the total city population. Home ownership rates in Chicago, Philadelphia and New York were 10.2, 7.5 and 0.85% respectively (90). Ibid., 11–12, 18. On health, see Ibid., 19. Compared to Chicago and New York, Baltimore and Philadelphia had relatively low congestion. Baltimore had 7.7 people per dwelling in the slum and 6 per dwelling in the city. Philadelphia had similar numbers for its slums, but Chicago and New York were much higher. On a per room basis, the cities were closer aligned, but Baltimore still had the lowest congestion and New York the highest. Baltimore also had fewer buildings with many dwelling units (i.e. large tenements) compared to New York and Chicago. Ibid., 86.

these conditions would have primarily affected white, native-born Baltimoreans, since African Americans were under-represented in the slum and foreign-born residents did not tend to have children.[70]

The slums that developed in Baltimore in the late nineteenth century continued to be a focus of study in the twentieth century. The social worker Janet Kemp produced a detailed study of Baltimore's slums in 1907, looking at the Russian Jewish and Polish slums in east Baltimore and mostly black slums in west and south Baltimore. Dwellings had a variety of origins and took a variety of forms in these slums. They included single and two-family alley houses of modest origin. These were especially dominant in the black slums. In the white ethnic slums, many of the homes were on front streets and had been, as late as about 1870, home to "well-to-do" families. Some of these homes remained occupied by single families, others had been converted to multiple-family dwellings. Some of these houses had been small (six to eight rooms) and others large (eight to fourteen rooms). Although thousands of Baltimoreans lived in "tenements" by some definition, these tenements tended to be small – only about 15% of the buildings in slum areas were home to four or more families.[71]

The photos in Kemp's study showed that surfaces in slum dwellings were not devoid of paint. The original middle- and upper-class residents of these homes may have used lead paint, which could linger on surfaces and in plaster. Kemp also noted that while some houses were "glaringly shabby," others had recent coats of paint and "attempts at external decoration."[72] Kemp described many homes with wet walls and crumbling and broken plaster. Since ceilings often bore the brunt of leaky roofs, a steady rain of ceiling plaster onto beds, food and bodies was not uncommon. After a large chunk of plaster fell from the ceiling onto her bed at night, one Irish woman told Kemp, "Shure, honey, if it had fallen on me head

---

[70] Wright, *The Slums of Baltimore, Chicago, New York, and Philadelphia*, 26.
[71] Janet E. Kemp, *Housing Conditions in Baltimore: Report of a Special Committee of the Association for the Improvement of the Condition of the Poor and the Charity Organization Society* (Arno Press, 1974), 8, Appendix.
[72] Ibid., 13–14. Kemp did not elaborate on the type of paint, and while some of the paint in the photos looks to be whitewash (e.g., casein), other painted surfaced could be lead paint.

instead I'd never have ate another mouthful."[73] These studies of slums suggest that the possibility of some lead paint hazards, but it is difficult to conclude much more than that.

The slums of turn-of-the-century Baltimore show that parts of the city had already moved drastically away from the traditional organization of social space in which the wealthy and the poor lived together on the same blocks, the former on front streets and the latter in alleys. That organization still persisted in many neighborhoods. But in some, the low-income housing conditions had taken over the whole neighborhood. And newer peripheral residential developments were often comprised of detached homes with no alley homes. In the first two decades of the twentieth century, these peripheral developments – the suburbs – developed even more quickly. In the older urban core, less wealthy people filtered into older housing that was no longer desirable to more wealthy people, many of whom moved to newer neighborhoods, often in the suburbs. Middle-class neighborhoods became working-class. Slums got bigger. Much of this housing and neighborhood change was related to another increasingly powerful social force: institutions designed to segregate whites and blacks. These included neighborhood associations, racial zoning and the practices of realtors. Racism, white flight to the suburbs, the spread of slums, and the increasingly segregated nature of the older urban city were interwoven.

Suburbanization and segregation affected lead paint hazards and disparities. First, housing filtration – the movement of the relatively less affluent into the former homes of the relatively more affluent – often resulted in housing deterioration for a number of reasons. The homes were older. Landlords often chopped up single-family homes into multi-family units, creating lead hazards. When low-income residents had to pay relatively large proportions of their income to housing, they had less money to spend on housing maintenance. Especially when the rental market was tight, landlords could charge high rents and/or put less money into housing maintenance without losing renters. Exploitative housing conditions were particularly bad for African Americans, who, because of rising social segregation, had more limited options for housing. For their part, many low-income residents "doubled

[73] Ibid., 48–55. In general, housing congestion was a more serious problem in the White ethnic slums while dampness was a greater problem in the alley dwellings.

up" to help pay the bills, which put more wear and tear on homes. And a final issue was the uncertainty created in the housing market as a result of social segregation and the fusion of race to property values. White property owners who feared a loss of value in their property, or who could not find renters or buyers, often disinvested in their housing.

To put lead paint deterioration in its context requires looking at the broader forces that shaped suburbanization and social segregation. Some forms of peripheral urban housing development had always been a part of city growth, particularly in the United States where this peripheral land was cheap,[74] but suburbanization became even easier in the early twentieth century due to cheap transportation and the expansion of services.[75] Suburbanization also exerted a greater pull in the twentieth-century for several reasons. One reason was the was the synergistic relationship between the increasing demand for suburban living and the businesses that increasingly sought to profit from, and hence encourage, suburban living. As noted in Chapter One, some residents of the urban core moved to the suburbs in order to the escape from the smoke, noise and disease of the rapidly industrializing city. They also wanted to move to a place that had more green space and more space in general.[76] Although the rowhouse still dominated housing development in Baltimore in 1900, there was a palpable trend to detached housing in peripheral residential developments. In addition to the environmental push and pull factors, suburbanites also wanted social exclusion. They wanted to live in affluent, Anglo neighborhoods. Since the price of suburban

---

[74] European colonization had produced, through disease, war, starvation and forced migration, a large pockets of land depopulated of the native population that allowed colonial settlements to spread out with relative ease and at relatively low density (in comparison with European cities, for example). Pietro S. Nivola, *Laws of the Landscape: How Policies Shape Cities in Europe and America* (Brookings Institution Press, 1999), 4–5; Crosby, *Ecological Imperialism*; Paul Kelton, *Epidemics and Enslavement: Biological Catastrophe in the Native Southeast, 1492-1715* (University of Nebraska Press, 2007); Ned Blackhawk, *Violence over the Land: Indians and Empires in the Early American West* (Harvard University Press, 2009); Catherine M. Cameron, Paul Kelton, and Alan C. Swedlund, *Beyond Germs: Native Depopulation in North America* (University of Arizona Press, 2015).

[75] As discussed in previous chapters, these services include electric streetcar systems and utility services such as water, sewage, electricity and gas. As I discuss more in Chapter Five, another reason was the increasing availability and sophistication of automobiles and the institutions and infrastructures (laws, funding, roads) that supported their use.

[76] See, for example, the following discussions about environmental factors that yielded housing vacancies and drove people to the suburbs: Charles Morgan, "Another Protest Against the Auto Trucks of the Roland Park Company," (letter), *Sun*, June 26, 1913, 6; "Enlightened Sentiment of Baltimore Behind the Anti-Smoke Crusade," *Sun*, November 28, 1911, 6; "Why Not Clean Up the Streets in the Residential Sections So They Will Appeal to Persons Moving to the Suburbs?" *Sun*, October 3, 1910, 6.

homes took care of the class element, they were most interested in residential areas that excluded people based on ethnicity, especially Jews, and race, especially African Americans. Whether the desire was expressed in terms of importance of segregation for housing values, or as some paternalistic vision of what was best for people, or simply as blatant prejudice, the social segregation of the suburbs in this period was pervasive and usually explicit.

Developers did not wait for demand for suburban living to emerge. They cultivated it. They built planned, often highly speculative, developments and marketing them aggressively. One of the first of these in the nation was Roland Park, which opened in 1891. It was built with the help Frederick Law Olmstead's business and funded with British capital. Despite Baltimore's early foray into planned suburbs, the city lagged a bit behind some of its peers in suburbanization. But with the extension of electric trolleys to the area and the aggressive advertising of the Roland Park Company began changing that around 1900.[77] These advertisements touted both the social exclusion and the environmental amenities of the suburbs. Advertisement declared that "Protective Restrictions Have Made Roland Park" – that they have preserved property values, unlike the areas in the city such as Fulton and North Avenue and Broadway, which would have been saved had restrictions been in force.[78] These went alongside advertisements for Roland Park and Guilford that emphasized these as places to get away from the city's heat, dust and noise.[79]

Municipal politics both reacted to and drove suburban expansion. Baltimore City annexed the belt of suburban development outside its municipal line several times in the nineteenth century. These annexations were often controversial.[80] Nevertheless, the city successfully annexed county suburbs, including major annexations in 1888 and 1918. These annexations brought, if nothing else, a measure of

---

[77] "A Half Century of Roland Park," *Sun*, May 4, 1941, SM2.
[78] Roland Park Company, advertisement, *Sun*, May 16, 1915, 10.
[79] Roland Park Company, advertisement, *Sun*, May 3, 1914, 12.
[80] Those outside the city balanced the possibility of higher taxes, loss of political independence and the potential spread of urban problems – pollution, noise and so on – against the possibility of better services. Those in the city balanced the possibility of a larger tax base with increased costs from services to this larger area. City boosters wanted a bigger city, period. City politicians wanted to accrete political power; rural politicians wanted to curb the city's political power. And the question of annexation inevitably got into the legal weeds of constitutionality.

control to the city over developments that were physically and economically connected to the city. But they also had the effect of spurring even more suburbanization, because developers and affluent residents often figured that they could get both the benefits of the city and the county by building just beyond the municipal line.[81] So annexation wrought more metropolitan expansion and, in turn, yielded more spatial differential in social groups.

The rise of a new, powerful political force, neighborhood association, also drove changes in social space. In nineteenth century Baltimore, social segregation happened largely at the level of the city block. That meant that benefits could not accrue to social groups on the basis of neighborhoods. Put another way, affluent and middle-class residents were spread throughout the city. When they demanded services, those services came to neighborhoods that were socially mixed. The services and benefits were not equally shared there, but neither could they be exclusively hoarded by the dominant groups.[82] But new, peripheral housing developments afforded by transit and utility extensions were more socially exclusive. They were not built with the alley houses of the old city, which provided affordable housing to the working class. And working class people could often not afford transportation to get to and from these new developments. There was, however, always the possibility that that could change. Transportation costs would fall. Ageing homes would fall in value and perhaps be converted to multi-family units. Thus there was a need for "protection" against undesirable housing and groups, namely housing for the working class and poor and groups like African Americans and Jews. Similarly, there was a need for protection against undesirable uses, which included industry, transportation and other activities that would bring noise, pollution and unwanted groups to the neighborhood. On the flip side, as the city grew and spread out into new developments, there was a need for the extension of services. And residents of these

---

[81] Joseph L. Arnold, "Suburban Growth and Municipal Annexation in Baltimore, 1745-1918," *Maryland Historical Magazine* 73, no. 2 (1978): 109–128. For more on how suburbs balanced the costs and benefits of annexation and suburban autonomy, especially in regard to services, see Richardson Dilworth, *The Urban Origins of Suburban Autonomy* (Harvard University Press, 2005).

[82] In fact, it was not necessarily in the interest of dominant groups to exclude other groups in the same neighborhood from benefits, such as sanitary services. Joseph L. Arnold, "The Neighborhood and City Hall The Origin of Neighborhood Associations in Baltimore, 1880-1911," *Journal of Urban History* 6, no. 1 (November 1, 1979): 3–30.

new developments wanted the most modern services. These extensions of modern services were very expensive. And demand for services went hand in hand with objections to higher taxes. As a result, funding for services was scarce and there was an incentive to create neighborhood organizations that could fight for those resources.[83] These dual needs of neighborhoods thus resulted in the creation of neighborhood associations, which were often named "improvement and protection" associations. They arose in the late nineteenth century and became powerful and normal aspects of city politics in the twentieth century Baltimore. And they greatly reinforced the social segregation, and resource segregation, of the city.[84]

While neighborhood associations were generally competitive rather than cooperative, they did come together in in 1911 for a unified purpose: to endorse racial segregation. As mentioned in Chapter One, Baltimore was the first city to pass a residential racial segregation ordinance. The ordinance made sales or rentals to blacks in majority white blocks illegal, and vice versa. Many other cities followed Baltimore's lead on racial zoning. In 1917, the Supreme Court eventually declared these sorts of ordinances unconstitutional. But neighborhood property associations worked together with real estate interests to keep blacks out of white neighborhoods. They pressured realtors and sellers not to sell to blacks. And they often received help from newspapers who refused advertisements for the sale of white owned property to non-whites. These associations could also enjoin buyers or sellers in the case that they violated private covenants barring the selling of properties to African Americans or other minorities. Whites also used violence to intimidate or scare black residents out of neighborhoods. As a result, Baltimore became an increasingly segregated city (Figure 9).[85]

[83] Wards did not coincide with neighborhoods and city ward politics was embroiled in machine politics in a way that did not necessarily make ward representatives faithful fighters for resources in their wards.
[84] Arnold, "The Neighborhood and City Hall The Origin of Neighborhood Associations in Baltimore, 1880-1911."
[85] Ibid. Cities that had these neighborhood property associations included Los Angeles, Chicago, New York, Detroit, St. Louis and Washington. Clement E. Vose, *Caucasians Only: The Supreme Court, the NAACP, and the Restrictive Covenant Cases* (University of California Press, 1959), 250. Real estate boards created powerful rules to keep brokers in line. Rose Helper, *Racial Policies and Practices of Real Estate Brokers* (University of Minnesota Press, 1969), 220–21. On violence, see: Cynthia Neverdon-Morton, "Black Housing Patterns in Baltimore City, 1885-1953," *The Maryland Historian* 16 (1985): 41–56.

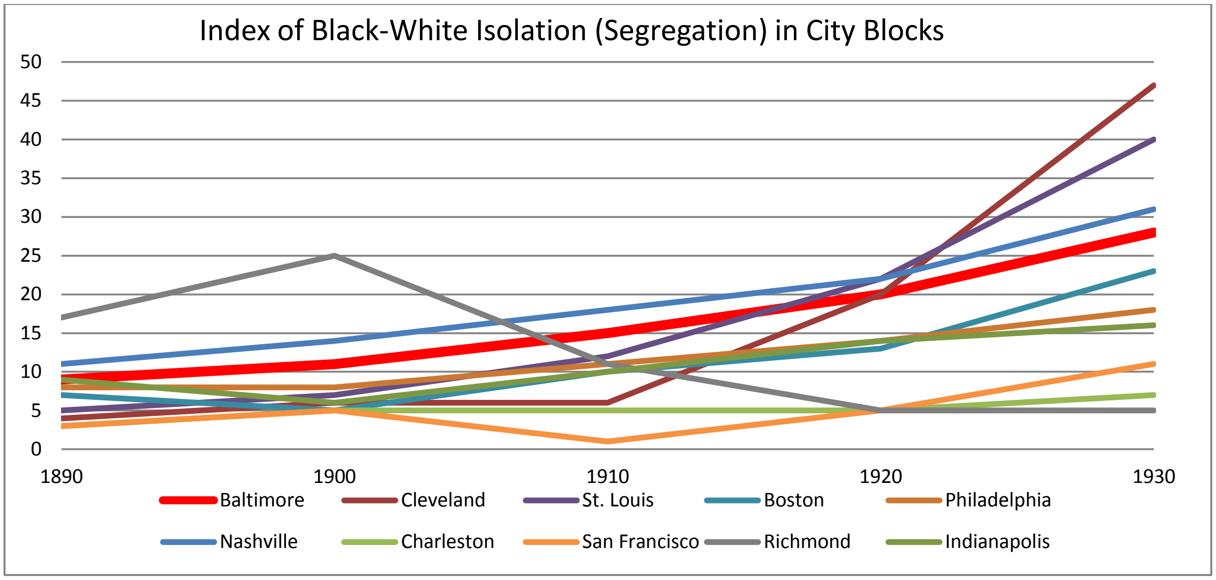


Figure 28: Index of Black-White isolation in several cities. The higher the index for a city, the more blocks it has that are primarily black or white. As the chart shows, most cities, including Baltimore, started off with low levels isolation and then increased segregation over the following decades. This was true of cities in general, not just those selected here. Baltimore was a typical city, starting off with low-level segregation that increased over time. **Source:** Cutler, Glaeser and Vigdor, Segregation Data, National Bureau of Economic Research, www.nber.org/data/segregation.html. **Graph:** Leif Fredrickson.

Throughout this period, from the late nineteenth century through the first decades of the twentieth, Baltimore, like other cities, yo-yoed from housing boom to housing bust, from tight housing markets to housing markets with many vacancies (Figure 10).[86] House building and vacancies were intertwined suburbanization and segregation, and all were tied to lead paint deterioration. Vacancy rates, for example, were relevant to lead paint deterioration for several reasons. Vacant homes, especially those on the market for a long time, were vulnerable to theft and vandalism. They were also liable to be neglected by their owners, especially if high vacancy rates pushed down the value of homes, giving owners less of an incentive, or fewer means, to invest in their buildings. On the other hand, very low vacancy rates indicated a tight housing market that could result in doubling up (or more) in housing and conversions of single-unit to multi-unit housing. Both housing congestion and housing conversion could increase lead paint hazards through extra wear and tear and remodeling. In addition, a tight housing market could allow landlords to charge excessive rents and/or neglect maintenance.

[86] Like other cities in North America and Europe, "long swings" of about eighteen years separated peaks of city growth. Sherry H. Olson, "Baltimore Imitates the Spider," *Annals of the Association of American Geographers* 69, no. 4 (1979): 557.

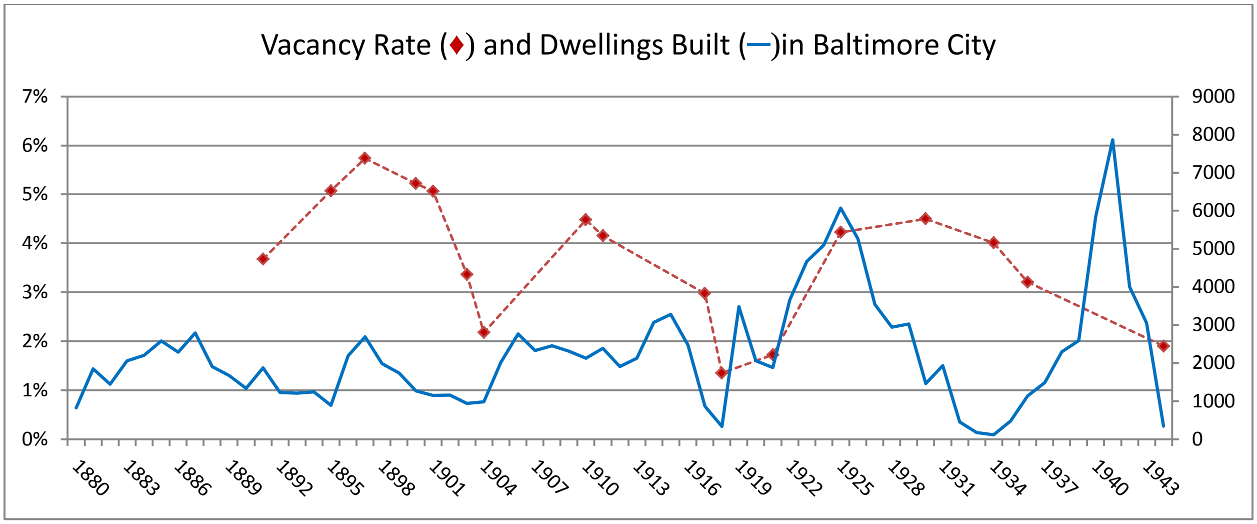


Figure 29: Vacancy rates (vacant dwellings per total dwellings) and dwellings built in Baltimore. The graph shows that vacancy rates and building fluctuated considerably over time. The timing of building was important to lead paint because many houses were built at times when lead paint was in high use in home building. Building was also related to vacancy rate, which was important to lead paint deterioration because high vacancy rates could lead to neglect of long-vacant houses and very low vacancy rates indicated a tight housing market, which could result in housing exploitation and congestion. (A note on dwellings built: The numbers from 1900 to 1944 are for dwellings built. The numbers from 1896 to 1899 are of permits for dwellings, which in most years are very close to dwellings built. The numbers for 1880 to 1895 are of permits for new buildings. Comparisons of other years show that about 86% of new buildings were dwellings, so I have reduced the numbers from 1880 to 1895 by that amount). **Sources for Dwellings:** Baltimore *Sun* various years; *Mayor's Message to Members of the City Council*, various years; *Journal Of the Proceedings of the First Branch City Council*, various years; *Report of the City Officers and Departments Made of the City Council*, various years; ; Commission on City Plan, *Redevelopment of Blighted Residential Areas in Baltimore; Conditions of Blight, Some Remedies and Their Relative Costs.* (Baltimore: Commission on City Plan, 1945). **Sources for Vacancies:** Baltimore *Sun* various years; Real Estate Board of Baltimore, *A Survey of Housing Conditions, Baltimore, Maryland* (Baltimore: Industrial Bureau, Board of Trade, 1921). **Graph:** Leif Fredrickson.

Baltimore's slightly unusual, and somewhat speculative, building boom during the depression of the late nineteenth century, along with the annexation of surrounding suburbs, which contained new housing developments, boosted the city's vacancy rates.[87] Vacancy rates for houses declined in the early 1900s, but not so much that housing costs rolled back Baltimore's reputation as an affordable place to live.[88] Around 1910, however, the city experienced its first public outcry over housing vacancies. The vacancy rate was lower than it had been in the late 1890s, but commentators laid the problem to a problem to a lack of demand rather than speculation-driven over-supply.[89] Suburban expansion effectively

---

[87] The annexed suburbs had a vacancy rate around 14% in the late 1890s, while the old city had a rate of only about 4.5%. "Building and Business," *Sun*, May 4, 1897, 4. On the speculative nature of building in the late 1890s, see "Demand for Houses," *Sun*, October 26, 1898, 12.

[88] "Baltimore As An Ideal Home City," *Sun*, January 4, 1908, 4.

[89] There was some debate about whether Baltimore's vacancy rate was "abnormal" in 1910. See "The Proportion of Vacant Houses in Baltimore is Not Abnormal," *Sun*, October 1, 1910. Baltimore's vacancy rate was about 4 or 4.5% in this period, which a housing expert from New York City said was normal or even low. Of course, these arguments beg the question as to how "normal" is defined, especially when housing supply and affordability is a matter of politics as well as markets. The way vacancy rates were calculated in the period discussed here – before the 1950s –

increased the housing supply for some people in the Baltimore metropolitan area. Meanwhile, dissatisfaction with urban environmental problems and the city tax rate pushed some residents out of the city.[90] Some commentators also argued that real estate agents and landlords in the city were neglecting their properties, which also drove people to look for housing elsewhere.[91] There had been a relatively tight housing market a few years before, so this neglect may have been real.

But much of the discussion about the vacancy rates at this time was bound up with the "negro invasion" of white neighborhoods, particularly in northwest Baltimore, roughly the neighborhood known as Druid Hill, where a number of African Americans had been slowly moving for decades.[92] Virulently racist letters to the *Baltimore Sun* argued that "dark-skinned noise-makers" ruined the accumulated wealth of families, whose loss was three times as much as the profit to the unscrupulous real estate agent who sold or rented to black families, when African Americans moved into white neighborhoods.[93] To white property owners, integration of neighborhoods was a threat to the depreciation of their homes, as was even the threat of integration, which was heightened by vacant houses that were a "standing menace" to nearby owners who feared they could be rented or sold to black people.[94] The fear of property depreciation may have caused owner-occupiers to disinvest in their properties, although as would be true of later rhetoric about "white flight," property devaluation did not inevitably occur when African Americans moved into neighborhoods.[95]

---

was different than how they are often calculated now, which is by separating renters and homeowners and excluding houses that are under construction or are considered uninhabitable.

[90] On tax rates, see "City Must Branch Out," *Sun*, October 29, 1910, 9, among others.

[91] One writer to the *Sun* said that a contributing cause to vacancies was the "disregard paid by real estate agents to the reasonable demands of tenants for repairs." "Building Associations to Control and Manage Property as a Remedy for Negroes in White Neighborhoods," (letter), *Sun*, September 15, 1910, 6. William Mariten & Company, an old real estate firm, similarly argued that vacant houses were the result of suburban development and the "dilapidated condition of many" homes in Baltimore. "5,655 Buildings Vacant," *Sun*, August 21, 1910, 16.

[92] William George Paul, "The Shadow of Equality: The Negro in Baltimore, 1864-1911" (Dissertation, University of Wisconsin–Madison, 1972), 388–400. White property owners' concerns about the "negro invasion," were based in both racism and fear of the loss of property value. "The Negro Invasion In Northwest Baltimore," (letter) *Sun*, October 24, 1907, 7.

[93] "Blaming Greedy Real Estate Men For Entrance of Negroes into White Neighborhoods," (letter), *Sun*, August 24, 1910, 6.

[94] "The Interests of the Many Should Be Considered," *Sun*, September 2, 1910, 6.

[95] For example, property devaluation had already occurred in some neighborhoods due to industrial nuisances. When the Pennsylvania Railroad laid tracks near Maryland Avenue, the resulting smoke and noise depreciated property

Baltimore's racial segregation law also resulted in housing deterioration, however, because white property owners were stuck hanging on to vacant properties (and paying tax on them) because they could not legally sell or rent to African Americans.[96] Northwest Baltimore did have unusually high vacancy rates compared to the rest of the city. They climbed from 3.9% in 1895 to 5.8% in 1910.[97] Ashbie Hawkins, the Baltimore lawyer who spearheaded the battle against the segregation ordinance, argued in the NAACP's *Crisis* magazine that the segregation ordinance was primarily a burden to white property owners, who ended up with "idle houses" whose value was being consumed in taxes, ground rents and insurance "waiting for white tenants who won't come" – because many were moving to the suburbs as Hawkins noted – "and colored tenants who are doubtful of about any attempt on their part to test the merits of the new segregation law."[98] In general, according to the Baltimore Builders Exchange, it was well-known that owners of vacant houses often neglected their properties. The Exchange relayed a typical anecdote, in which a prospective buyer visited a vacant home in Northwest Baltimore to find the walls needed papering and the paint was rubbed off the wainscoting, among other neglected features.[99]

One way realtors who midwived the racial transition of neighborhoods profited was by converting single-unit homes into multi-family dwellings and/or by charging higher rents to African Americans who were restricted in their choice of housing.[100] Conversion to multi-family units was

---

and drove out affluent residents. Other whites moved out, and when blacks moved in according to the realtor, property appreciated. William Chunn, letter to the *Sun*, reprinted in *Crisis*, November 1913, 335-336.

[96] "Race Law in Effect," *Sun*, September 26, 1913, 14.

[97] "104,090 Buildings," *Sun*, May 3, 1897, 10; "5,655 Buildings Vacant," *Sun*, August 21, 1910, 16.

[98] Hawkins said the ordinance was a "trifling concern" for most of Baltimore's African Americans because the city was full of mixed blocks where whites and blacks could both move to and live "until the end of time." More affluent African Americans who might be interested in living in upper class neighborhoods that were White, on the other hand, were leaving the "expensive luxury" of challenging the law to those who caused it (i.e., elite White politicians who pushed for the ordinance). Clearly, though, Hawkins thought the law onerous enough to challenge, probably because he and his law partner, George McMechen who served as the test case, were members of that more affluent class of African Americans who were eager to buy in more affluent neighborhoods. W. Ashbie Hawkins, "A Year of Segregation in Baltimore," *Crisis* 3 (1911): 27–30. Another black realtor, H.M. Burkett, similarly stated that the "real estate market for colored people is at a standstill, although there are hundreds of colored people ready and anxious to purchase. But where will they buy? The segregation ordinance, which was aimed at the colored people, has a matter of fact proved a boomerang and hit the white property owner harder than the colored purchaser." Neverdon-Morton, "Black Housing Patterns in Baltimore City, 1885-1953."

[99] "Spring Boom in Baltimore's Building," *Sun*, April 2, 1911, LS5.

[100] On multi-family units, see: "Blaming Greedy Real Estate Men For Entrance of Negroes into White Neighborhoods," (letter), *Sun*, August 24, 1910, 6.

especially prominent in less affluent areas, such as lower Druid Hill. Landlords in this area also increasingly neglected housing as more black Baltimoreans moved in. Heat and plumbing were inadequate, damp cellars caused moisture problems, and walls were in desperate need of repainting. Since these homes had not originally been slums, they may well have had lead paint in them and, as they deteriorated, became more hazardous sources of lead.[101]

War and Depression: Too Little Money, Materials and Housing

World War I and its aftermath further accelerated lead paint deterioration. The war brought large-scale migration to cities, which resulted in housing congestion and its corollary, extra wear and tear on housing. War-time rationing also limited materials, which slowed down housing construction and also made it more expensive, if not impossible, for owners to maintain paint in homes. Disinvestment in paint maintenance was somewhat path-dependent, because regular painting maintenance was far easier and cheaper than playing catch-up later on. Thus, lead paint deterioration continued after the war. Post-war economic recession as well as the continuing failure of housing construction to meet urban growth also contributed to post-WWI lead paint deterioration.

White lead consumption increased in the years leading up to World War I – perhaps prodded along by paint-industry funded "Clean Up, Paint Up" campaigns to beautify cities[102] – before plummeting to an almost twenty-year low in 1918. The cause was war-related rationing, which raised the price of lead paint and reduced its availability, and the result was long-term lead paint deterioration. People deferred re-painting or painted with inferior paints (including paints mixed with "inerts"). As a result, these homes were saddled with checking, peeling and cracking paint. Years later, in the 1920s, it was common for painters to find exposed exterior wood and cracking paint in homes that had not been re-painted since the

[101] Paul, "The Shadow of Equality," 388–400.

[102] City boosters and newspapers in southern cities, including Baltimore, embraced these campaigns. Baltimore paint dealers called for making the "city of homes," as Baltimore was sometimes known, the "city of beautiful homes." The campaign tapped into multiple Progressive reform ideas, including good governance, efficiency, sanitation and beauty. It is not clear just how much the campaign boosted painting, but its architects claimed victory and claimed it produced "unprecedented" paint sales. "The Denver Clean Up and Paint Up Campaign," *American Paint and Oil Dealer*, June 1913, 11; "Campaign Sweeps the Country," *American Paint and Oil Dealer*, April 1914, 14; "Unprecedented Paint Sales Result from the Clean Up and Paint Up Campaign," *American Paint and Oil Dealer*, August 1913, 11-12.

war. Houses could be brought back up to good paint condition, but this would require much more effort and cost because the heavily deteriorated or cheap paint would have to be completely scraped off. In addition, a proper re-painting would require three coats, not just one or two. Under pressure from owners who could not or would not pay this cost, however, many professional painters cut corners.[103]

World War I brought many other more general housing problems that would also have affected lead paint deterioration. People flocked to industrial cities like Baltimore for war-related work in numbers that the housing industry could not meet, especially with materials rationing. The war "seriously interrupted" housing in Baltimore and other cities, according to the U.S. Bureau of Labor Statistics, not just during the war but also after, when residential construction continued to lag behind housing needs. In Baltimore, before and after the war, there was considerable congestion and "doubling up" of families in housing and widespread-controversy over predatory rental prices and the cold-hearted eviction of tenants by speculators. Cities and housing experts called for the construction industry to focus more on affordable homes, but the industry went in the opposite direction.[104] Although housing construction in Baltimore did increase after the war, and the vacancy rate ticked up again (Figure 10), much of the new housing was the result of building in the suburbs annexed to the city in 1918.[105] These newer, suburban homes were not affordable or accessible to most of the working-class in the city, especially in economic depressions, such

---

[103] "War and Painting," *The Carter Times*, January, 1922, 4-5.

[104] In 1918, the BCHD reported that there was a large increase in population due to migration to Baltimore for work associated with the war. This happened in 1915, 1916, 1917 and "particularly" 1918. "Every available vacant dwelling, of which there were many in 1916, had by January, 1919, become occupied, and many private householders had sub-rented parts of their homes to newcomers. The boarding houses, apartment (sic?) houses and hotels were crowded." A large proportion of the new residents were unmarried men and women, but many were also married with families. BCHD *Annual* 1918, 10-11. "[R]ecent increases in rentals have resulted in the admission to the house of other families to help carry the burden of higher rentals." Doubling up was more common in rentals and owner-occupied houses. Baltimore's housing congestion was not as bad as other cities, but it still had localized problems, especially in the Jewish and foreign-born slums of east Baltimore and the Black slums wedged between Druid Hill and the downtown. The tight rental market also led to more multi-unit housing conversions. Real Estate Board of Baltimore, *A Survey of Housing Conditions, Baltimore, Maryland* (Baltimore: Industrial Bureau, Board of Trade, 1921). On evictions and predatory rents: "May Take over Houses," *Sun*, August 29, 1918, 8; "Few Houses to Rent," *Sun*, September 4, 1918, 14. In 1922, 15,000 families faced evictions. The court did not consider profiteering or landlord neglect of housing in allowing evictions; only the ability to pay the rent. "15,000 Families Facing Eviction Here This Year," *Sun*, February 19, 1922, 22. "Housing Conditions in Baltimore," *Monthly Labor Review*, 1921, 170-171.

[105] Thus the rate of increase in building was slower than it appears on the graph in Figure 29, since it is effectively comparing a smaller, pre-1918 city to a larger post-1918 city.

as the one that followed the war. After World War I, as a result of rising building costs and poor credit options for low-income homes, professional builders who had once spent considerable capital building affordable homes for the working class, shifted permanently toward building for the middle and upper class. Low-income housing, from WWI forward, primarily came in the form of older houses left behind by the more affluent classes. But these houses were often in bad condition already and there were often far too few of them (which drove up the price). Almost half of Baltimore's vacants, for example, were either badly in need of repair or had been abandoned. Thus there were not many "normal" vacants – old, well-maintained and affordable houses. Overall, building activity in the late teens and early twenties did not make up for the lack of building during the war, what building did happen was primarily for the more affluent, and what vacants remained were often in poor or completely unusable condition. These patterns were also reflected in white lead production, which reached its historical zenith in the 1920s, but most of which went to new housing rather than the maintenance of extant housing.[106]

Housing problems differed across racial, ethnic and class lines. Many African Americans moved to industrial cities such as Baltimore in and after World War I, where they met economic opportunity and also racism and segregation. According to some reports, black housing conditions in Baltimore in the early 1920s were not drastically different than those of whites with similar socioeconomic backgrounds.

---

[106] Of the 2,270 vacant houses in 1922, about 1,200 were new and up for sale; less than 1,000 were old vacant houses, many in bad repair and "virtually abandoned." There were only about 500 "normal" vacant houses (not new and not virtually abandoned) in existence (less than four-tenths of one percent), so "available vacant houses, therefore, except new houses for purchase, are virtually off the market." Families looking for a modest, small house had "not been supplied adequately during the past few years." The authors of the report argued that from the standpoint of "public interest" there should be some vacant houses available at all times (maybe 3 to 6%) for new couples, new immigrants to city, those moving up the social scale and in order to "prevent undue profits in the sale and leasing of residential property." From the authors' point of view, there was a shortage of some two to three thousand houses. Real Estate Board of Baltimore, *A Survey of Housing Conditions, Baltimore, Maryland*. In 1918, the average new dwelling in Baltimore cost $1,666, but in 1920 it cost $4,490. "Home Shortage Here 6,000, Survey Shows," *Sun*, July 27, 1921, 20. For lack of easy credit for low-income homes in Baltimore, see "Unemployed's Ranks Swell During March," *Sun*, April 7, 1921, 22. For the rise in the costs of housing construction in Baltimore over many years, see Commission on City Plan, *Redevelopment of Blighted Residential Areas in Baltimore; Conditions of Blight, Some Remedies and Their Relative Costs* (Baltimore, 1945). For the general rise in building prices, see Riggleman, "Variations in Building Activity in United States Cities." For general shift away from building low-income housing, see Richard Harris, "The Rise of Filtering Down The American Housing Market Transformed, 1915-1929," *Social Science History* 37, no. 4 (2013): 515–49. Over the 1920s, interior lead paint use climbed steadily upward. New homes, the expansion of apartment and office buildings, along with a preference for paint over wallpaper, sopped up much of the white lead production. Paul McIntosh Tyler, "Trends in White-Pigment Consumption" (U.S. Dept. of the Interior, Bureau of Mines, 1936), 2.

But three aspects of housing that had been evident before World War I and would persist after it, with large ramifications, were the disparities in rents paid by African Americans and the disparities in homeownership. First, even though the foreign-born and Jewish slums of east Baltimore were more congested than black slums, they had higher rates of homeownership.[107] This probably reflected the poor access African Americans had to credit for buying homes. Second, studies throughout the early twentieth century found that black tenants paid more for similar accommodations than whites did.[108] And finally black neighborhoods were usually in worse environments with worse city services than others.[109] In the following decades, these disparities in financing, rents, neighborhood environments and the general constriction of black housing options contributed to greater divides in housing conditions between black and white Baltimoreans. By 1925, the *Sun* reported that 100,000 black Baltimoreans were in need of decent housing. The problem went beyond the black slums, according to the *Sun*, because diseases originating in the slums could spread outside of them. While the *Sun* noted that the movement of black Baltimoreans into white neighborhoods would cause property devaluation, the paper also argued that property values would rise again, once the racial transformation was complete. But suggestions, even those framed in terms of benefits to the broader populace, did little to counteract the practices of housing segregation.[110]

Other buildings besides houses contained lead paint hazards, particularly schools. Historians of lead paint have paid little attention to schools, yet these were places of exposure for children as well. In addition, schools were often surveyed in much more detail than houses, giving insight into the use and condition of paint.

---

[107] Real Estate Board of Baltimore, *A Survey of Housing Conditions, Baltimore, Maryland*.

[108] "Negro Housing Situation in Baltimore," *Monthly Labor Review*, 1924, 164, which notes that African Americans paid "slightly higher" rates than Whites, but that housing quality and construction was virtually identical. Another study concluded that although African Americans had the lowest earnings of any racial-ethnic group, they paid very high median rents, amounting to 33% of median earnings. By comparison, other ethnic groups paid around 18% of their earnings, with Polish families paying only about 13%. A report from the U.S. Children Bureau's noted that it was "commonly believed that a negro tenant pays more than a white tenant for similar accommodations." Anna Rochester, *Infant Mortality: Results of a Field Study in Baltimore, Md., Based on Births in One Year* (DC: United States Children's Bureau, 1923), 43–44.

[109] This was the conclusion of the Women's Cooperative Civic League in 1920. Neverdon-Morton, "Black Housing Patterns in Baltimore City, 1885-1953."

[110] Ibid.

Nationally, lead paint was often used in public buildings, including schools, in the early twentieth century. A highly prescient 1914 article on lead paint poisoning written by Henry Gardner, the Assistant Director of the Institute for Industrial Research, broached the problem of deteriorating lead paint in buildings, including schools. Gardner was researching the problem of occupational lead poisoning. His conclusions about the danger of lead dust in the workplace, however, made him question how safe interior lead paint was. "Should we not exercise similar care [as we do in factories] in guarding against lead dust in our public buildings?" Gardner wrote. "Many tons of corroded white lead… were at one time applied to the walls and ceilings of school rooms and hospitals. The gradual disintegration of such paint would result in the formation of dried particles of white lead dust. The presence of such dust in the atmosphere of a room is very dangerous to the health of the inmates."[111]

Lead paint and paint deterioration continued as problems for schools after Gardner's warning. For building interiors, on the other hand, there was a shift toward using non-lead paints, beginning sometime around the nineteen-teens. Gardner and others' warnings about lead paint hazards may have helped this shift along. So might have some prominent advertisements for "lead free" (and "non-poisonous") paints in magazines for school administrators.[112] But while these concerns and advertisements demonstrate that the hazards of lead paint were hardly invisible, the hazards were either unknown or of low salience for those who built and operated schools. The shift to non-lead paints for interiors was probably more a matter of economics or preference than health. Still, intentions aside, the shift would have made a difference. But the shift was also clearly incomplete. People continued painting the interior surfaces of public buildings with lead. Exterior use of lead was even more common. Lead companies, for their part,

---

[111] Henry Gardner, "The Toxic and Antiseptic Properties of Paints," *Paint, Oil and Drug Review*, February 18, 1914, 10-16.

[112] There were others besides Gardner who sounded the alarm, even if that alarm did not seem to resonate very broadly. For example, When Gardner gave his paper at the annual meeting of the Master Painters and Decorators Association, a master painter from Rochester had also brought up this issue with the school board where "he had spread one and one half tons of carbonate on the ceilings of one of the schools." He worried the "almost flat" paint would deteriorate by the time of the next painting, powder off, and "prove deleterious to the health of the children." "People are being taught not to use lead carbonate on their houses; yet it was used on the schools." He noted his "protest was received very favorably by the School Board." "Thirtieth Annual Meeting," *The Painters Magazine*, March, 1914, 218. Advertisements in the *American School Board Journal* included: Keystone's Zinolin, a "non-poisonous," "no-lead" zinc paint for exteriors (April, 1916, 38); Patek's Egschelcote, an interior paint with "no white lead" (May, 1916, 41)

ramped up advertising for white lead in the 1920s, specifically targeting hospitals, nurseries and schools. And even when the use was discontinued, earlier applications of lead lingered on, ready to poison children when building deteriorated.[113]

Baltimore City used white lead in public buildings, including schools, at various times and these buildings, especially schools, often had serious problems of paint deterioration. A survey of Baltimore schools in 1921, for example, decried conditions in public schools, and noted that "paint peeling from the walls is a common site in Baltimore schools" (Figure 11). The report did not specify the type of paint used at the time, but it is clear the city used white lead in schools before and (as I detail in the next section) after the 1920s. Baltimore's schools thus posed a lead poisoning threat to children, just as housing did. And as in housing, class and race exacerbated inequalities. Schools in poor neighborhoods were particularly likely to be run-down, and black schools – schools were segregated by law in Baltimore until the 1950s – were chronically under-funded and in worse condition that white schools.[114]

---

[113] In terms of white lead use, Gardner believed that by around 1914, flatted white lead had "largely been abandoned for wall and ceiling decoration and its place has been taken by more sanitary leadless flat wall paints in prepared forms." Gardner, "The Toxic and Antiseptic Properties of Paints." On white lead marketing in the 1920s, including schools, see Gerald Markowitz and Donald Rosner, "'Cater to the Children': The Role of the Lead Industry in a Public Health Tragedy, 1900-1955," *American Journal of Public Health* 90, no. 1 (January 2000): 36–46. A 1918 article discussed standards for lead paint in schools, suggesting that it was widely used, although it is not clear if this was intended just for exterior use. *American School Board Journal*, March, 1918, 29-30. In Indianapolis, the school commissioners made it a policy to paint exteriors with white lead (45% lead pigment), while interior paint was zinc and lithopone and free from lead. "The Purchase of Paint," *American School Board Journal*, August, 1920, 51.

[114] In 1891, the city council rejected a law requiring the city to buy only paint manufactured in Baltimore. The law was deemed pointless, however, because "white lead and linseed oil" were not made anywhere else in Maryland. In other words, white lead was the only paint of considerable importance. "The City Council," *Sun*, May 27, 1891, 4. George Drayton Strayer, *Report of the Survey of the Public School System of Baltimore, Maryland, Volume I*, 1921, 22, 31–35, 81.

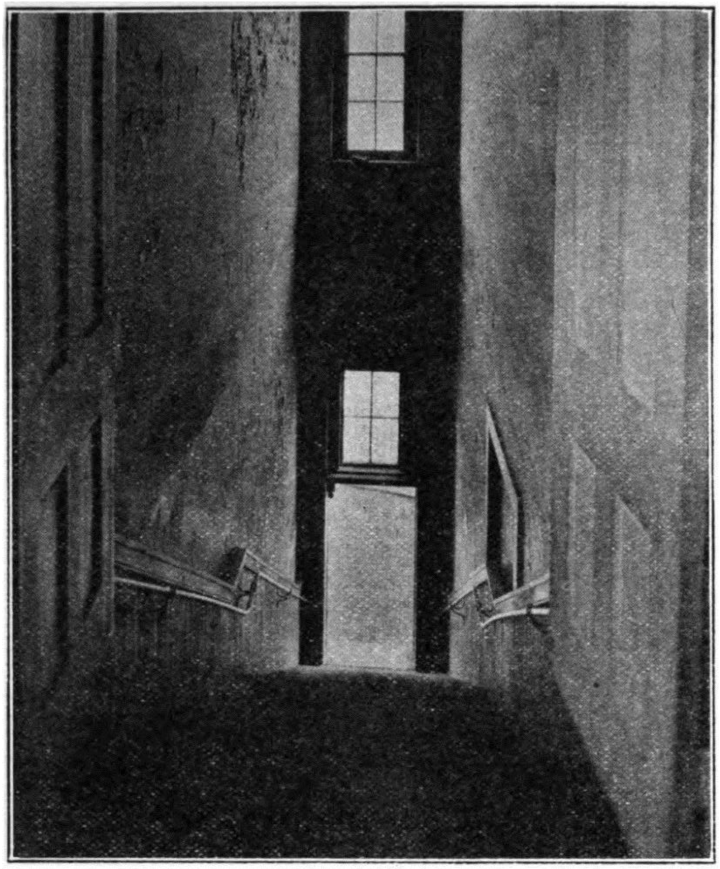


Figure 30: Photo of a Baltimore school stairway in peeling paint (top left of photo). The photo is from Carrollton Elementary School, a white school in poor, east Baltimore. **Source:** George Drayton Strayer, *Report of the Survey of the Public School System of Baltimore, Maryland, Volume I*, 81.

The Great Depression and World War II continued and recapitulated many of the problems of paint deterioration that resulted from World War I and its aftermath. During the Great Depression, white lead, and paint consumption in general, decreased greatly.[115] As in WWI, this meant that people were not re-painting on a schedule necessary to maintain paint or were using cheaper paints that deteriorated more quickly.[116] White lead manufacturers were keenly aware of and interested in these “paint-starved houses” (as they put it), and these companies took out advertisements in papers across the country warning that lack of re-painting would result in devaluation and perhaps foreclosure (Figure 12). But people had to

[115] R.L. Hallett and C.H. Rose, “Lead Pigments,” in Symposium on Paint and Paint Material (ASTM, 1935), 83.
[116] On the other hand, the unemployed continued to do productive work, including some housing maintenance. Out-of-work Black Baltimoreans, for example, spent some time repairing run-down homes “with old burlap, a dab of plaster, and a bit of paint.” “Baltimoreans Shall Not Want Bread,” *Afro-American*, December 17, 1932, 23.

prioritize food, heating and other immediate concerns over paint.[117] The economic strictures on paint investment during the Depression were followed by World War II, where metals like lead (and zinc and titanium) were rationed, making re-painting more expensive or difficult.[118]

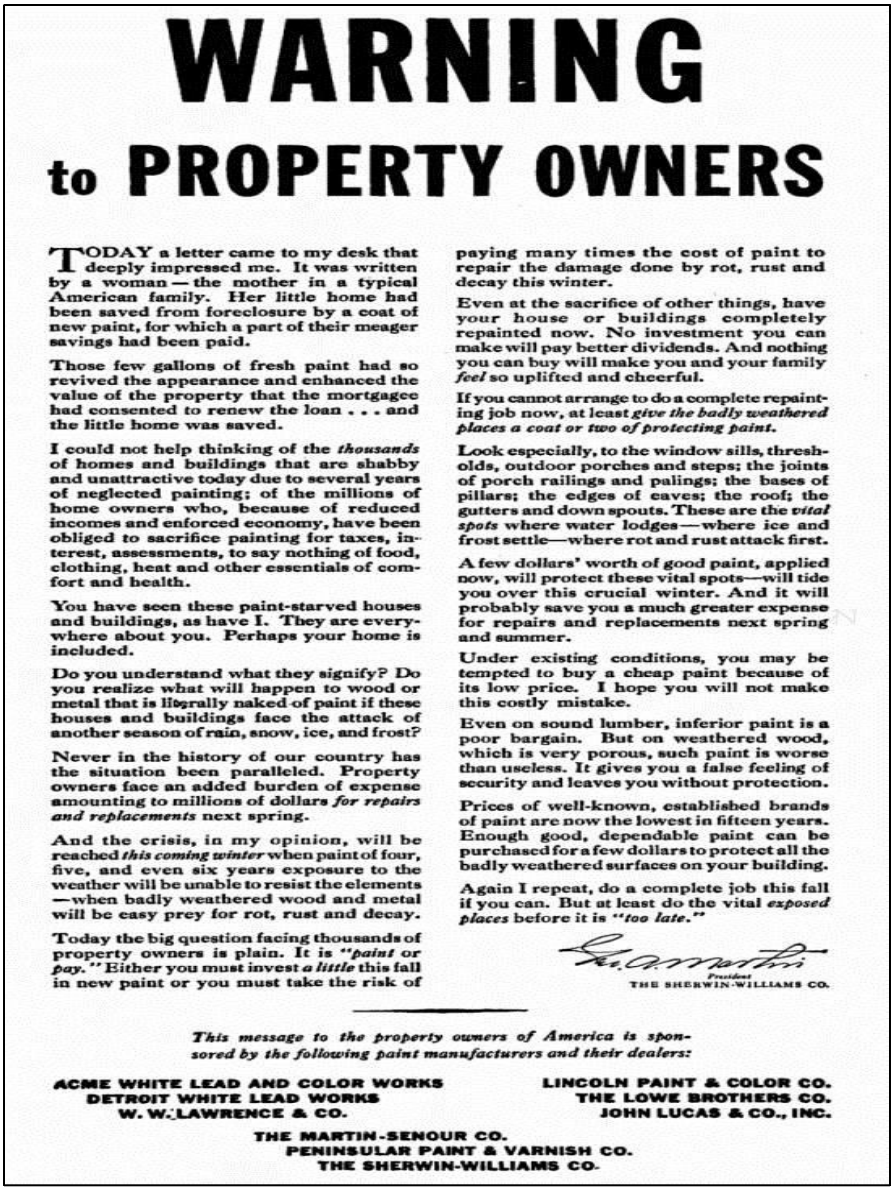


Figure 31: Sherwin Williams, along with many other manufacturers of lead paint, took out this advertisement in dozens (perhaps hundreds) of newspapers during the Great Depression. While self-interested, the advertisement reflects a real lack of investment in house painting and, by extension, paint deterioration. **Source:** Advertisement, *Sun*, September 15, 1932, 11; Advertisement, *Anaconda Standard* (the latter is source of the high quality image).

[117] Of course, paint companies argued that painting – in fact, the complete repainting of a house – be prioritized "even at the sacrifice of other things." Advertisement, *Sun*, September 15, 1932, 11; also in many other papers.
[118] A 1941 column stated that "a common springtime complaint is of the peeling of outside paint." "Aid to Ailing House," *Sun*, May 25, 1941, CS8. Lead paint was not specified, but it was the major paint used on exteriors. These paint problems were invariably attributed to persistent problems like moisture, rather than broader systemic changes in paint investment. But those explanations are not mutually exclusive.

More generally, the Depression exacerbated the over-use of housing, as economic hardship forced people to cram in to homes, and accelerated housing disinvestment and abandonment. By 1934 in Baltimore, for example, 15% of vacant row-houses had become unfit for occupancy. By 1936, the city government began entertaining ideas of what to do about that increasing number of tax sales from dilapidated houses it came into possession of.[119] Many houses were not abandoned even though their condition was deplorable, however, because the poor needed them for shelter. These poor housing conditions produced lead hazards in the form of inadequate or unclean energy sources for heating and cooking, as detailed in Chapter Two. But some of them also had lead paint hazards in them. One visitor to Baltimore, slum in the 1930s described the "cracked and peeling doors" on the brick slum houses in African-American neighborhoods.[120] Problems with slums yielded various calls for slum clearance, sometimes with a parallel call for public housing or some other measures to provide housing to the poor. Eventually, federal, state and local governments did pass various forms of legislation that created police powers and funding to clear slums and build public housing. These programs were not enacted until the late 1930s, and most of the building of public housing and slum clearance – variously called "urban redevelopment" and "urban renewal" – happened during World War II.[121] These programs are discussed more in subsequent chapters, but an important point here is that the housing surveys that accompanied slum clearance showed that houses in these slums did often contain lead paint.[122]

The Great Depression and World War II also contributed to lead paint hazards in schools. Schools, especially black schools, were starved of paint and maintenance, just as houses were. In 1930, the *Afro-American* surveyed Baltimore's black schools and found them in deplorable condition, with

[119] On vacants, disinvestment and doubling up in housing, see "Less than 4% of City Homes Now Vacant." *Sun*, August 5, 1934, 20. "Plan Offered to Curb Ills of Tax Sales," *Sun*, May 21, 1936, 24.
[120] Archibald MacDonell, *A Visit to America* (Macmillan, 1935), 84-85.
[121] The federal government's other major housing initiative in the 1930s sought to increase financing for homes by providing government-sponsored mortgage backing through the Federal Housing Authority. This program, as I discuss more in the following chapter, favored suburban, detached, single-family homes and was racially discriminatory. It helped White Baltimoreans get homes in the suburbs. Although only about 2.4% of home mortgages in the Baltimore metropolitan area received FHA insurance from 1935 to 1940, almost 10% of new homes did. Of these new homes, only 56% were located within the municipal boundary of Baltimore. FHA, *FHA Homes in Metropolitan Districts* (Washington: GPO, 1942), 75, 226.
[122] BURHA, *A Demonstration of Rehabilitation, Harlem Park, Baltimore, Maryland* (BURHA, 1965), Folder 36, Box 4, Series X, Baltimore Urban Renewal and Housing Authority Records (hereafter, BURHA), LLSC.

peeling paint, bare walls, and plaster that had to be removed because it was falling on children's heads.[123] Extreme peeling like this was not common for high-quality lead paint without moisture problems. But the paint could have been adulterated lead paint, or lead paint with "inerts" in it. The general disrepair of the buildings also suggests there could well have been moisture problems.

By the end of World War II, the situation was, if anything, far worse. A 1946, a survey of Baltimore's public schools revealed extreme deterioration. Interior painting had not been done in years. These schools suffered from a "spreading eczema of peeling paint" that was "eating at the walls of the new buildings as well as the old." In some schools, the paint had completely peeled off. Schools that had faired relatively well, such as the "modern" Western school, had virtually no rooms without peeling paint. Schools that had faired bad were extremely bad. At one African-American school, fifty percent of the paint had peeled off the walls. The piles of paint on the floor were so big that janitors had to use shovels to remove it. Many of these schools had not been painted since the late 1920s, and "virtually" none had been painted since 1939 (Figure 13).

Much of this deteriorating paint was lead paint. In 1937, the city government specified that many of its buildings be painted with lead paint. This included "a majority of City schools," which "are now being painted both exterior and interior with pure white lead and oil." Before this, the city had often bought "multi-pigment" paints, which probably meant a combination of lead, zinc and other chemicals. As a result of this policy, the city's consumption of white lead skyrocketed from 6,325 pounds in 1936 to about 100,000 pounds in 1938 and 1939.[124]

Based on the copious use of lead paint, the many ways in which that paint could deteriorate, and the systematic forces that contributed to deterioration, there were clearly many lead poisoning hazards in the environments of children that could cause lead poisoning in the in the early twentieth century. There is

[123] "Afro Survey Reveals Deplorable Conditions in Public Schools," *Afro-American*, August 30, 1930, A20.
[124] In 1937, the city purchased about 28,000 pounds of white lead. This article featured the Baltimore City Hospital, the Nurse Home at the Baltimore City Hospital, and the Municipal Office Building, all of which used lead paint on their interiors. Lead Industry Association, "Baltimore's City Government Specifies White Lead," *Lead*, 1938, 10-11, Hagley Library. "Multi-pigment" paints such as leaded zinc oxide contained 5 to 50% lead in this period. Tyler, "Trends in White-Pigment Consumption," 6. By comparison, post-World War II definitions of "lead paint" included any paint that was more than 1% lead.

thus good reason to believe there was a significant amount of acute child lead poisoning at the time. And there would have been an even larger swath of children who absorbed amounts of lead that would result in sub-acute lead exposure problems.

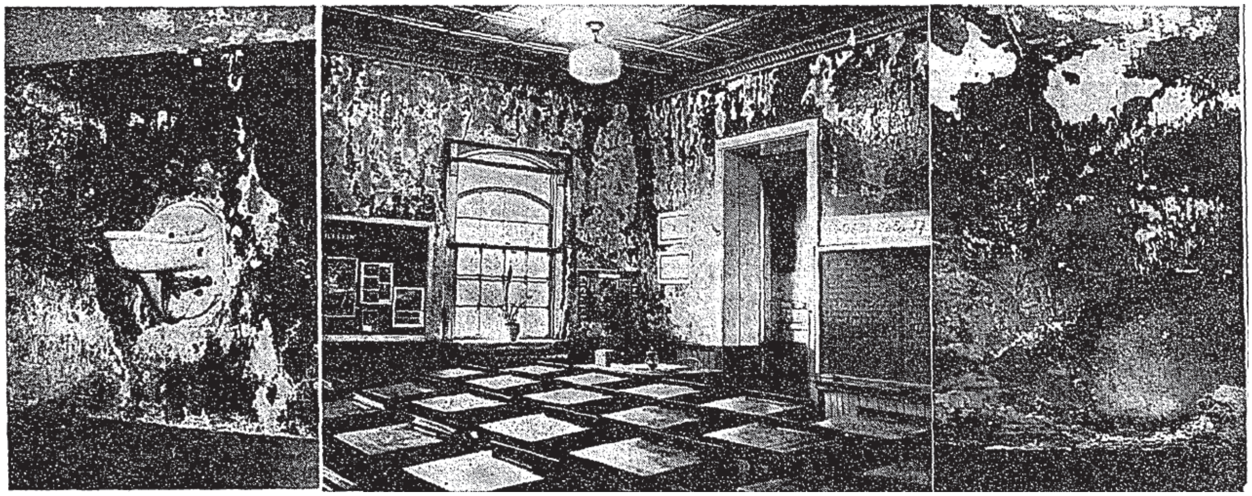


Figure 32: Paint peeling in Baltimore public schools in 1946. The extreme peeling illustrates the lead hazards created by the lack of investment in schools from the late 1920s to the early 1940s. **Source:** Baltimore *Sun*.

Public Health, Social Service, and Housing Surveys

There was little attention to child lead poisoning in medical publications, however, at least until the 1920s and 1930s. One possibility for why attention increased in those decades was that the factors discussed in the preceding sections combined to make housing deterioration especially bad, in turn greatly amplifying lead paint hazards. World War I seems to have been a particularly important catalyst. But while physicians increasingly detailed child lead paint poisoning, the cause of this poisoning was usually attributed to "pica," not deteriorating paint.[125] A seminal 1924 article by the physician John Ruddock described pica as "a craving for unnatural articles of food – a depraved appetite." Ruddock suggested that most children with pica developed this "morbid craving" out of an exaggeration of the "normal habit in young infants of invariably placing everything within reach of their mouths." Although pica was

[125] Physicians also continued to report on cases of child lead poisoning from new, wet paint. In addition to lead paint poisoning cases, there were a smattering of other cases from food, water, cosmetics, lead utensils and so on. English, *Old Paint*, 10–11.

generally harmless, ingesting toxic materials was obviously hazardous. As Ruddock noted, the child "lives in a lead world." Thus pica was quite concerning.[126]

The association of child lead poisoning with lead paint and pica was fortified over the 1920s and 1930s with other studies. The pica-lead poisoning nexus became a cornerstone of how the Baltimore City Health Department understood child lead paint poisoning in the 1930s.[127] In theory, deteriorating paint could act synergistically with pica by putting chunks of plaster and chips of paint at the fingertips of children with a compulsion to ingest non-food materials. That synergy was precisely the focus of the post-WWII public health science on child lead paint poisoning. Later in the twentieth-century, medical experts would shift the focus even more toward deteriorating paint, and they would call into question the rather loose definitions of "pica" and "normal" appetites.[128] But the literature from the twenties and thirties was neither critical of the concept of pica, nor did it connect the ingestion of lead paint to deteriorating housing. Instead, published reports of child lead poisoning detailed cases where children with pica gnawed intact lead paint off of cribs, furniture, toys, windowsills and walls. Even Blackfan's earlier cases fit this model, although he did not use the term pica.

The published literature, however, was not a random selection of diagnosed child lead poisoning cases, let alone a random selection from the population of children. The published articles on child lead poisoning represented the research interests of a very narrow class of medical professionals. Chapin, Putnam, Sinkler, Newmark, Blackfan, Thompson – these were all elite research physicians associated with elite institutions. So, too, were the leading lights on child lead poisoning in the 1920s and 1930s such

[126] The other, less common origin of pica, according to Ruddock, was individuals of any age who suffered from diseases and malnutrition. John C. Ruddock, "Lead Poisoning in Children with a Special Reference to Pica," *Journal of the American Medical Association* 82, no. 21 (1924): 1682–1684. Ruddock was a privately practicing physician and active member of the American Medical Association. See C. B. Pinkham, "Medical Licensure in California," *California and Western Medicine* 35, no. 3 (September 1931): 167–169.
[127] John M. McDonald and Emanuel Kaplan, "Incidence of Lead Poisoning in the City of Baltimore," *Journal of the American Medical Association* 119, no. 11 (1942): 870–872. BCHD, "Lead Poisoning in Children," *Baltimore Health News*, April 1937, 109-110; BCHD "Lead Poisoning Kills Children," *Baltimore Health News*, May 1939, 132-134.
[128] I discuss these issues in subsequent chapters.

as John Ruddock, Charles McKhann and Joseph Aub.[129] They picked cases for research that interested them, often pouring tremendous time into figuring out what was wrong with a patient in a particular case. Lead poisoning diagnosis was difficult, as most physicians who studied it acknowledged, particularly in children. Thus, the cases were not strange outliers of human illness that reached the attention of researchers. It was more the other way around. Amongst the mass of cases of human illness that were shrouded in ambiguous signs and symptoms, the cases studied by these physicians were the outliers that researchers took extraordinary time to decipher.[130]

To some extent, recovering what was really happening with that mass of children exposed to deteriorating lead paint is not historically recoverable. But there are places for explorations. One of these is in unpublished medical records, which historians of lead paint have relied on much less than published sources. An examination of child lead poisoning cases in Baltimore, for example, challenges one of the (as yet undisputed) arguments of some historians of lead: That there were no recorded cases of child lead paint poisoning from deteriorating housing before the late 1940s.

In Baltimore, hospitals did record cases of child lead poisoning that were connected to deteriorating housing.[131] In one case, an African-American boy was admitted several times to Johns Hopkins and diagnosed with lead poisoning after abdominal pains, vomiting, "night cries, apparently provoked by visual hallucinations," and paralysis of the legs. A social worker who visited the home found crumbling and scaling paint on the kitchen walls and ceiling was falling onto the floor, the kitchen stove, the table and into the food that the child ate. A laboratory test confirmed that the paint contained lead, and the report did not suggest any "abnormal" eating (and, in fact, stated that the child "does not chew his

---

[129] Ruddock, "Lead Poisoning in Children with a Special Reference to Pica"; Leon Morgenstern, "From Cardiology to Laparoscopy: John Carroll Ruddock, MD (1901-1964)," *Surgical Innovation* 12, no. 3 (September 2005): 185–86. Aub et al., *Lead Poisoning*; Charles F. McKhann and Edward C. Vogt, "Lead Poisoning in Children," *Journal of the American Medical Association* 101, no. 15 (1933): 1131–1135.

[130] In addition, what they were most interested in untangling was how lead poisoning affected patients – the mechanisms and outcomes – and how those effects could be distinguished from other diseases. They were not uninterested in how the exposure happened, but it was not the focus of research.

[131] For privacy reasons, citation of these medical records cannot include personal information, such as names, birthdates, patient numbers and birthdates. I have referenced them using general characteristics and admission dates, which should allow other researchers to find them if need be

bed").[132] In another case, a white, female toddler contracted lead poisoning when she ate plaster that was falling from the ceiling in a deteriorated house. In the kitchen, plaster was falling off a "large place" in the ceiling. In the living room and bedroom, the wall paper had torn exposing plaster. The toddler, according to the mother, had ingested some of this fallen plaster (but did not eat plaster directly from the walls).[133] And in another similar case, an African-American boy got lead poisoning from ingested plaster, which came -- "undoubtedly" according to the social worker – from a large hole in the ceiling plaster in the family bedroom. The house in general was in poor condition – "very damp," with peeling wall-paper, and plaster chips sprinkled on the floors and beds.[134]

At least one case of child lead poisoning from deteriorating housing was reported in the media. In 1929, the Baltimore *Sun* described a case of lead poisoning in a child who "lived in an old house in which the paint had been cracking from the walls for some time and falling on the floor." In the course of playing on the floor, the child "rubbed his fingers on the boards, then put his fingers in his mouth." Social workers urged the family to move, and the child did not get lead poisoning again.[135]

Just as with published case reports, medical records have problems of representativeness. For one thing, some people never become patients in the first place because they have inadequate access to medical care. This would have been true of poor people and particularly of African Americans, whose problems often went uninvestigated, untreated and unreported.[136] In addition, all of the issues with under-diagnosis mentioned in the first section of this chapter pertain to medical records. Medical experts struggled to differentiate lead poisoning from a variety of other diseases. One medical record from 1940, for example, contains a note from Louis Dublin, the vice president of Metropolitan Life Insurance asking for more information on a case of child lead poisoning. Dublin noted that it seemed that child lead

---

[132] Medical Record for Black, Male, Child, admitted October 1, 1925, in Johns Hopkins Medical Records, Phipps Building, Johns Hopkins Hospital (hereafter, JHMR).
[133] Medical Record for White, Female, Child, admitted June 29, 1939, in JHMR.
[134] Medical Record for Black, Male, Child, admitted August 21, 1942, in JHMR.
[135] The article did not discuss or suggest anything related to pica or abnormal child behavior. "The Doctors Helps the Needy Poor," *Sun*, September 1, 1929.
[136] According to Paul, some African Americans, especially new migrants from the rural South, were also afraid of hospitals. Paul, "The Shadow of Equality," 394–95.

poisoning "occurs more frequently among infants and young children than has generally been supposed, and that it would be a more prominent item in both morbidity and mortality records but for the fact that the condition is often unrecognized by physicians."[137]

Still, using medical records gives us a better sense of the diversity of lead poisoning diagnoses and causes than the highly-selective process that brought some of these cases into the published medical literature. The breakdown of child lead poisoning cases that I could find[138] from Johns Hopkins from the 1920 to 1942 shows that most cases in this period were either the result of children with pica chewing intact paint, or the cause was not identified.[139] However, a significant proportion of cases (4 out of 28, or 14.3%) also resulted from the ingestion of deteriorating paint or plaster (Table 1).

Causes of Child Lead Poisoning Listed in Johns Hopkins Medical Records, 1920-1942					
Child Lead Poisoning Cause	**Cases**	**% Cases**	**# Pica Indicated**	**# Pica Denied**	**# Pica Unknown**
Unknown	11	39.2	4	1	6
Chewed Intact Paint	10	35.7	10	0	0
Ingested Deteriorating Paint/Plaster	4	14.3	0	1	3
Lead-Acid Batteries	2	7.1	0	0	2
Ingested Fresh Paint	1	3.6	0	0	1
TOTAL	28	100	14	2	12

Table 1: Causes of child lead poisoning from a sample of Johns Hopkins medical records for the period from 1920 to 1942, and including a case mentioned in the Baltimore *Sun*. The table shows that most child lead poisoning cases in this period were either the result of children with pica chewing intact paint, or the cause was not identified. However, a significant proportion of cases also resulted from the ingestion of deteriorating paint or plaster. **Source:** Medical Records, Phipps Building, Johns Hopkins Hospital; Baltimore *Sun*. **Table**: Leif Fredrickson.

---

[137] Medical Record for Black, Female, Child, admitted August 8, 1940, in JHMR.

[138] These cases are not by any means the total number of child lead poisoning cases recorded at Johns Hopkins, let alone in Baltimore. There were dozens more cases of child lead poisoning from batteries, for example, as detailed in the last chapter. And, of course, the recorded cases are only a portion of the real number of cases. However, there is no reason to think that the cases I could find from the medical records at Johns Hopkins resulted in any sort of bias. Thus we can view them as a random sample of the cases. I have added to this the case of lead poisoning from deteriorating housing recorded in the *Baltimore Sun,* which was also a case from the Harriet Lane Home at Johns Hopkins. Removing this case does not change the argument here, but it would reduce the proportion of child lead poisoning cases from deteriorating housing from 14% to 11%.

[139] To give an example of the cases where medical experts did not identify a clear cause: Doctors at the Harriet Lane Home diagnosed an African-American girl with lead poisoning and encephalopathy. After being struck by an "angry man" the child had gone into convulsions and was admitted to the hospital. She had more convulsions, then stopped breathing and died. Lead lines on the gums and other signs indicated lead poisoning. But the medical report made no indication of the source of lead or any sort of abnormal appetite or pica. The child was from 17th Ward area – the area that African Americans moved into in the late nineteenth century as whites moved out to the suburbs. The area eventually became known as a "slum" as housing deteriorated as a result of impoverished tenants (most rented), crowding and exploitative housing practices. Thus while it is unclear what happened with this child specifically, the area fit the model that would become more prevalent later: Housing change and housing exploitation resulting in deterioration, which in turn exposed children living in this housing to lead hazards. Medical Record for Black, Female, admitted June 21, 1922, in JHMR.

Another indication that deteriorating housing was a significant source of child lead poisoning is that social workers seemed accustomed to the idea that deteriorating housing could be the source of lead poisoning. They looked for it when they visited the homes of victims of lead poisoning, and there is no indication that they were surprised that peeling paint or crumbling plaster could be a cause of lead poisoning. Similarly, when Miriam Brailey investigated the lead poisoning cases that were ultimately found to originate in batteries in 1932, she searched for “loose plaster.” The phrase “loose plaster” was cut from her account in Williams’ *JAMA* article on battery poisonings. But Brailey was clearly concerned that deteriorating walls, not just fresh or gnawed intact paint, could be a source of poisoning.[140]

Beyond the case published in the Baltimore *Sun*, there is little evidence of public discussion about child lead poisoning from deteriorating housing. On the one hand, this buried knowledge about the hazards of deteriorating housing did indirectly affect awareness about child lead poisoning in the 1920s and 1930s. They contributed to the rising number of child lead poisoning cases that Johns Hopkins physician Edwards Park began tracking. Park was instrumental in urging Baltimore City’s new health commissioner in the 1932, Huntington Williams, to take child lead poisoning more seriously.[141] Williams did take it seriously, especially after the battery burning cases, and the BCHD’s efforts to track and curb child lead poisoning in turn brought national awareness to the issue of child lead poisoning. On the other hand, the lack of public discussion of the dangers of deteriorating housing may have compounded the under-diagnosis of lead poisoning and hobbled pro-active public health measures and environmental regulations.

---

[140] Miriam Brailey, “A Account of Storage Battery Casings as a Source of Lead Poisoning,” (Draft, no date), in Folder Lead Poisoning from the Burning of Battery Casings, Box Restricted Material, GHW Papers, AMCM Archives. It is not clear who struck the phrase, but here is how this section appeared in Brailey’s draft as preserved in Williams’ papers: “Melrose and the mother denied the child’s access to fresh paint or plaster, and Melrose took the visiting doctor into every room of the filthy premises in order that possibilities of lead ingestion might be entirely covered. After a fruitless ~~search for loose plaster or enameled beds~~, Melrose bethought himself…” This wording, minus the struck-through words, is how Brailey’s account appeared in *JAMA*. Thus one of the more famous published papers on child lead poisoning in the 1930s nearly did include a reference that would have indicated medical experts were concerned about deteriorating housing. As published, however, the article gives the appearance that Brailey only conceived of fresh paint and plaster as a concern.

[141] “Lead Poisoning” and “Lead Encephalitis” cases, Patient Index Cards, Shoebox 21, EC Collection, AMCM Archives. On Park’s influence on Williams, see Fee, “Public Health in Practice.”

Why did the cases where child were poisoned by deteriorating lead paint not get more attention? Part of the reason is that deteriorating paint was apparently not as common a cause of lead poisoning as gnawing intact paint. This is not entirely satisfactory, though, since as noted above, awareness itself may have been an obstacle and there is plenty of evidence that deteriorating lead paint was not rare.

Two related aspects of child lead poisoning discovery and publicity are part of the reason that cases stemming from deteriorating paint did not get more attention. One is that they were probably not as interesting to physicians as cases that involved the strange behaviors of children with "abnormal appetites" for paint and exotic sounding conditions such as "pica." The other is that the medical experts who were primarily responsible for discovering cases where deteriorating housing was the cause of lead poisoning were not physicians. They were social workers.

Social workers were a new – and controversial – profession in the early twentieth century, one that filled an important niche in investigating the social and physical environments of patients, especially children and mothers. While the rise of pediatric medicine brought more physicians, nurses and hospitals – and their knowledge and technology – to bear on child diseases, it also shifted the emphasis toward a focus on biomedicine (disease in the body and therapeutic prescriptions) and away from a social and environmental emphasis on health. In the nineteenth century, children's hospitals had admitted poor and orphaned children on the basis of general need, rather than on the basis of having a specific disease. But that change in the late nineteenth and early twentieth century as hospitals increasingly sought to attack discrete diseases.[142] While the increasingly potent expertise and resources of hospitals made child lead poisonings more easily diagnosed in specific cases, the parallel development of social/public health expertise and resources to identify the causes and extent of child lead poisoning was far weaker. This blind spot was true even of public health departments, which also increasingly shifted toward lab

[142] Cynthia Connolly, "Late-Nineteenth and Early-Twentieth Century Pediatrics: The Development of a Specialty" (University of Pennsylvania, School of Nursing, n.d.), www.nursing.upenn.edu/nhhc/Welcome%20Page%20Content/Late%20Nineteenth%20and%20Early%20Century%20Pediatrics.pdf.

techniques to identify specific diseases and public health technology that was targeted at specific organisms or nuisances.[143]

Helping to fill the gap surrounding investigations of the patients social and physical environment, and in general bringing a more holistic approach to medical problems, were social workers and public health nurses. Social work and public health nursing emerged as professions around the turn of the century. They overlapped so much that they were often indistinguishable. Most social workers were nurses, usually trained in hospital work and were often public health nurses themselves. Even as these professions became more distinct in terms of their identity and training, the two professions were largely concerned with the same thing: Understanding people in terms of their behavior and their social and physical environment in order to prevent or ameliorate health problems. They made home visits, provided counseling and education, and served as links between patients and institutions, especially hospitals and public health departments. In 1907, Johns Hopkins created a social services department. It followed Massachusetts General Hospital, which created the first such department in 1905 – though Johns Hopkins claimed credit for the idea. Social workers at Johns Hopkins seem to have been public health nurses, and they emphasized not only the social environment but the physical environment of homes as a key to health care success.[144] While physicians devoted minimal resources to environmental conditions of the sick, there was a new profession that tackled this: social workers. As Margaret Brogden, Chief of Social Service for Johns Hopkins wrote in 1922, "The function of the social worker is to aid in medical

---

[143] For example, while the BCHD identified poor housing as a serious cause of tuberculosis, the BCHD did not think it could do much about the problem since there was not simple technological fix for the problem (as there was with, for example, water treatments that could kill typhoid). BCHD *Annual*, 1916, 48. For their part, the official public health experts – the public health departments – were in their own struggle for legitimacy and control over their profession. In the United States, unlike Europe, physicians had gained considerable autonomy in fee for service care and consequently made good money there. That made them less likely to pursue public health, again unlike in Europe. Furthermore, the 1910 Flexner Report recommended the reduction of medical schools along with better training. This reduced the supply of physicians in subsequent decades. Thus public health departments had trouble attracting physicians. Paul Starr, "Professionalization and Public Health: Historical Legacies, Continuing Dilemmas," *Journal of Public Health Management and Practice* 15, no. Supplement (November 2009): S26–30.

[144] "Where Medicine Fails: Social Worker Follows Up Dispensary Patients," *Sun*, October 29, 1907, 9; Margaret Brodgen, "Hospital Social Service," *Bulletin of the Johns Hopkins Hospital*, May, 1915, 201-204.

treatment and prevention of disease through investigation, reporting to the physician and adjustment of problems, both personal and environmental, which hinder or retard the process of recovery."[145]

Social workers struggled to gain legitimacy, despite increasing need for these services. Nursing was already a well-established profession in 1900 and had diversified into sub-specialties including public health nursing. World War I created more demand for nurses and spurred the profession on. Social work was a more tenuous profession.[146] The 1910 Flexner Report on medical education called into question whether social work really was a separate profession, or just a trumped up form of clerical work that assisted in the discharge of patients from hospitals.[147] As a result, social workers and hospitals pressed for more rigorous standards and training and for the creation of professional associations. At the same time, nursing programs incorporated more public health training in their curriculum.[148] Passage of the Shepard-Towner Act in 1921 and the Social Security Act in 1935 brought more need social workers. And as urban populations grew, hospitals looked for ways to treat more patients without building more space for hospital beds. Dispensary and outpatient services filled this need, and social workers were well-suited to these services. The result was that in the 1920s and 1930s, social workers and public health nurses became an increasingly skilled and important aspect of health care and public health.[149]

Nevertheless, the imperiousness of physicians and the prejudice against women kept these professions from getting full respect. The founder of social work at Massachusetts General, Dr. Richard Cabot, anticipated that physicians would act with hostility to the idea that social workers were telling them something they could not figure out themselves, particularly regarding the social context of their

---

[145] Margaret Brogden, *Handbook of Organization and Method in Hospital Social Service* (Norman, Remington Company, 1922), 15.

[146] "American Nursing: An Introduction to the Past," www.nursing.upenn.edu/nhhc/Welcome%20Page%20Content/American%20Nursing.pdf.

[147] Sophia F. Dziegielewski LCSW PhD, *The Changing Face of Health Care Social Work, Third Edition: Opportunities and Challenges for Professional Practice* (Springer Publishing Company, 2013), 54–55.

[148] V.L. Ellicott, "Public Health Lectures in Baltimore," *The American Journal of Nursing* 28, No. 1, January, 1928, 27-29.

[149] "7,033 Patients Treated," *Sun*, February 11, 1915, 12; "Hopkins to Extend Its Social Studies," *Sun*, May 6, 1923, 15; Alice Sundberg, "Fifty Years of Public Health Nursing City Health Department: 1905-1955," Baltimore Health News, October-November 1955, 168-171

patients. Physicians "will resent this indignantly," Cabot wrote. Physicians at Johns Hopkins initially barred social workers from medical wards, for example.[150]

The dismissive attitude toward social workers can be glimpsed in the way the Baltimore City Health Department responded to one of the cases of child lead poisoning mentioned earlier. In that case, a five-year-old black boy contracted lead poisoning. The child was first admitted in October, 1925 and then was admitted several more times when he continued to have lead poisoning symptoms. After the second admission, Isabelle Dyer, a social worker from the Harriet Lane Home at Johns Hopkins, visited the house where she saw peeling paint that was falling onto the cook stove, the table, the floor and the dinner table. Dyer collected a sample of the paint and had it chemically tested. It was positive for lead. Dyer then contacted the Baltimore City Health Department to inform them of the public health hazard. The BCHD wrote back stating that they had sent an investigator to the house – a man with "much experience with paints" – who made a "careful examination of the coating on the walls of the aforetold premise" and found that the wall covering was "water color and not paint containing lead." In other words, the BCHD investigator's visual inspection of the paint was taken over Dyer's chemical test. The BCHD did not act, except to ask for updates on the situation. In the following months, the boy was admitted three more times for lead poisoning. Within a few years, the child, who had "enjoyed perfect health until he was five years old," could only speak two words, was emotionally disturbed, and was being kept in a locked room with barred windows by his caretaker (his aunt) due to violent outbursts.[151] The Harriet Lane Home appears to have been in fairly frequent contact with the BCHD. They contacted the Health Department in at least one other case, in 1942, with a concern that deteriorating housing posed a lead poisoning hazard.[152] But the BCHD did not publicly discuss deteriorating housing as a source of child lead poisoning until 1948.

---

[150] Cabot quoted in Neil F. Bracht, *Social Work in Health Care: A Guide to Professional Practice* (Psychology Press, 1978), 10–11.

[151] Frederick Hempel, Assistant Commissioner of Health, to Isabelle Dyer, December 30, 1925; Hempel to Dyer, May 19, 1926; Directory of Harriet Lane Dispensary to Hempel, May 24, 1926; Medical Record for Black, Male, Child, admitted October 1, 1925, in JHMR.

[152] Martha Bett (social worker at Harriet Lane Home) to George Schucker (Director of Environmental Hygiene, BCHD), October 14, 1942. The BCHD acknowledged receipt of the letter, but little else. Medical Record for Black, Male, Child, admitted August 21, 1942, in JHMR.

Conclusion

Although our knowledge of the extent of child lead poisoning and its relation lead paint and deteriorating housing in the period will always be limited, the evidence presented in this chapter suggests a middle road between the "silent epidemic" and "anti-silent epidemic" arguments of historians of lead paint. Lead paint was widely used and there was probably widespread deterioration of housing that exacerbated lead paint hazards. As I argue in the next chapter, these conditions worsened dramatically after World War II (consonant with the arguments of the "anti-silent epidemic" camp), but these conditions were not rare (in contrast to what "anti-silent epidemic" authors have suggested). White lead was widely used, and not only in middle-class and wealthy homes (as some historians have suggested). The housing of the very poor is more difficult to establish. In some cases it contained little or no lead paint. In other cases, the poor filtered into housing that had been owned by more affluent people. This was especially true of poor African Americans. One surveyor of black housing in the 1930s found that "less than 150 houses in the whole of Baltimore had been built originally for colored occupancy," which meant that black Baltimoreans had largely been housed in "hand-me-down, deteriorated white residences."[153] In this way, African Americans and the poor inherited deteriorating white lead. It is possible that some poor families who owned their own housing also used lead paint.

Although white lead was indeed a long-lasting paint in theory, there were many common causes of deterioration that could happen at any stage, from the initial type of paint produced, to mix and application of paint, to the type of surface, the condition of the building, and the building's micro-environment. Broader patterns of housing and settlement shaped housing deterioration and, by extension, lead paint deterioration. Major shifts in the class and race occupying Baltimore's neighborhoods began in the late nineteenth century and accelerated in the twentieth-century. Suburbanization and racial discrimination drove these changes. The uncertainty in housing that attended racial change, as well as the conversion of more affluent housing, single-family housing to housing for the poor and for multiple

[153] This quote is from the CPHA, describing the survey of Dr. Ivan E. McDougle in 1935. CPHA, "Memorandum on Negro Housing in Metropolitan Baltimore," typewritten (August 1944), Plaintiff's Exhibit 110, American Civil Liberties Union of Maryland Records (hereafter, ACLU), LLSC.

families, resulted in housing deterioration. World War I provided a major shock to housing, cutting off materials for basic maintenance and yielding housing congestion in cities. Cities did not fully recover from this shock (i.e., produce enough extra housing) before another shock, the Great Depression, caused more housing deterioration due to lack of investment in housing. So while lead paint hazards from housing deterioration existed before 1945, they also changed over that period, accelerating during and after World War I.[154] Historians may argue over what constitutes a "significant" or "epidemic" amount of child lead poisoning – which partly depends on the definition of "lead poisoning" itself – but child lead poisoning from deteriorating housing, and thus child lead poisoning in general, was evidently not rare.

Since much of the evidence presented here is based on Baltimore, a legitimate question is whether the conclusions here are generalizable to other places. The short answer is that the conclusions probably hold for relatively large cities in the United States in the early twentieth century. Building cycles, suburbanization, racial discrimination, the housing effects of World War I and the Great Depression were not unique to Baltimore. Baltimore did have a very high home ownership rates. Many low-income families owned their homes and the poor generally lived in single-family or small multi-family homes rather than massive tenements. This may have made Baltimore homes, including low-income homes, somewhat more likely to contain lead paint. One historian has suggested that these aspects of Baltimore's

[154] Beginning in the 1920s, analysts of housing patterns in the U.S. increasingly documented the out-migration of affluent residents to new places and the in-migration to these older neighborhoods of residents with less money. This pattern was called "succession" or "filtering." The filtering concept gained momentum in and after the 1930s, affecting housing policy and incurring empirical and theoretical debates about whether filtering led to better housing for the poor, as the real estate industry argued, or whether the poor ended up in highly deteriorated, old housing, as most urban social scientists eventually argued. The crucial point here is that there was nothing special or uncommon about poorer people moving into the houses of the more affluent over time and thus ending up in places that had lead paint that could deteriorate. To the extent that the theory of "filtering" only suggested that poorer people tended to move into the housing of formerly affluent people, "filtering" was never a controversial idea. Social scientists, not to mention many others, recognized it as a common fact of urban development (at least from the 1920s on). On the other hand, another component of "filtering theory" was the argument that poor people improved their housing situation by filtering up. The real estate industry often promulgated this theory, which was consistent with their promotion of increasing the private housing market and fighting off the creation of public housing. The idea that filtering led to better housing for the poor, however, was vigorously rebutted on theoretical and empirical grounds by urban social scientists from the 1930s on. See Martin Boddy and Fred Gray, "Filtering Theory, Housing Policy and the Legitimation of Inequality," *Policy & Politics* 7, no. 1 (January 1, 1979): 39–54. For the history of filtering concept, see Richard Harris, "'Ragged Urchins Play on Marquetry Floors': The Discourse of Filtering Is Reconstructed, 1920s–1950s," *Housing Policy Debate* 22, no. 3 (June 1, 2012): 463–82.

housing made it unique and can account for its very high reported rates of child lead poisoning.[155] To test this hypothesis, we can compare Baltimore to a very similar city: Philadelphia. Like Baltimore, Philadelphia had high home ownership rates. It also had similar rowhouse architecture to Baltimore and, for a while, a ground rent system. So by this hypothesis, Philadelphia (which had a larger population than Baltimore) ought to have recorded a similar amount of child lead poisoning cases as Baltimore. Between 1931 and 1940, Baltimore City recorded 49 cases of child lead poisoning. In the same period, the entire state of Pennsylvania (including Pittsburgh, another city similar to Baltimore) recorded only 18 cases of child lead poisoning.[156] It thus seems much more likely that it was medical knowledge and awareness that was driving patterns of recorded child lead poisoning cases, not something unique to the housing in cities.

This last point brings us to issues of medical and historical knowledge. Medical historians, including historians of lead paint poisoning, have argued about the extent to which the published medical record on diseases reflects the reality of disease at any given time, both in terms of the numbers reported and in terms of a correct understanding of the disease (i.e., its causes, symptoms, effects and so on). Some historians of lead have argued that the published medical record on lead poisoning was basically accurate before 1945. Physicians missed some diagnoses, as they always do, but the number of cases (very few), the type of cases (mostly children who gnawed paint), and the lack of certain types of cases (from deteriorating housing) essentially reflected reality. Other historians have argued the opposite: that the medical record on lead poisoning, at least before 1945, is predominantly a social construction. Part of the reason for these divergent views is the vast chasm between the circulation of a highly poisonous substance, white lead, and the apparently very rare cases of poisoning from it, as indicated by the

[155] John Burnham suggests that Baltimore was an exceptional city in terms of a high number of lead paint poisoning cases, but it is much more likely that New York City, which Burnham draws on for evidence (or lack thereof) of lead paint in poor housing, was exceptional. Many urban and housing historians have singled out New York City's massive tenements as exceptional. See, for example, Michael B. Katz, *In the Shadow Of the Poorhouse: A Social History Of Welfare In America* (Basic Books, 1996), 177. Even in New York City's tenements, though, Burnham's research shows that there was a little lead paint. Burnham, "Unraveling the Mystery of Why There Was No Childhood Lead Poisoning."

[156] For comparisons of child lead poisoning cases in cities and states, see McDonald and Kaplan, "Incidence of Lead Poisoning in the City of Baltimore." Similarly, Michigan recorded only three cases of child lead poisoning from 1931-1940. Like Baltimore and Philadelphia, Detroit had very high home ownership; see Olivier Zunz, *The Changing Face of Inequality: Urbanization, Industrial Development, and Immigrants in Detroit, 1880-1920* (University of Chicago Press, 2000), 152–53.

published medical record. But this chasm is made smaller by other evidence First, most physicians who studied child lead poisoning believed their own understanding of the phenomenon was inadequate. Second, part of the reason lead paint poisoning, particularly poisoning due to deteriorating housing, has not been visible is that scholars have focused on the published literature and they have focused on the writings of one type of health expert: physicians. But if we look to unpublished writers other experts – public health nurses and social workers – we find more evidence of deteriorating housing causing lead paint poisoning. In addition to the importance of archival sources, these unpublished medical records show the important role of social workers in identifying causes of lead poisoning, and the way that their knowledge of lead poisoning was marginalized at the time, due to their gender and profession, and the way that that marginalization has been carried over into historical study.

Chapter 4 – White Lead and White Flight: Suburbanization, Inner City Lead Paint Hazards, and Slumlord Capitalism in Baltimore

After World War II, reports of child lead poisoning cases exploded in Baltimore. Reported cases spiked several times in the early 1950s, and then rose precipitously in the late 1950s (Figure 33). In 1958, ten children died from lead poisoning and physicians diagnosed 133 more with the disease. It was a "new record high," the Baltimore City Health Department (BCHD) reported, "more than twice the annual number of cases reported in recent years." And, as the BCHD's director Huntington Williams noted, this did not even include the "many cases that we do not know anything about, especially the mild ones."[1]

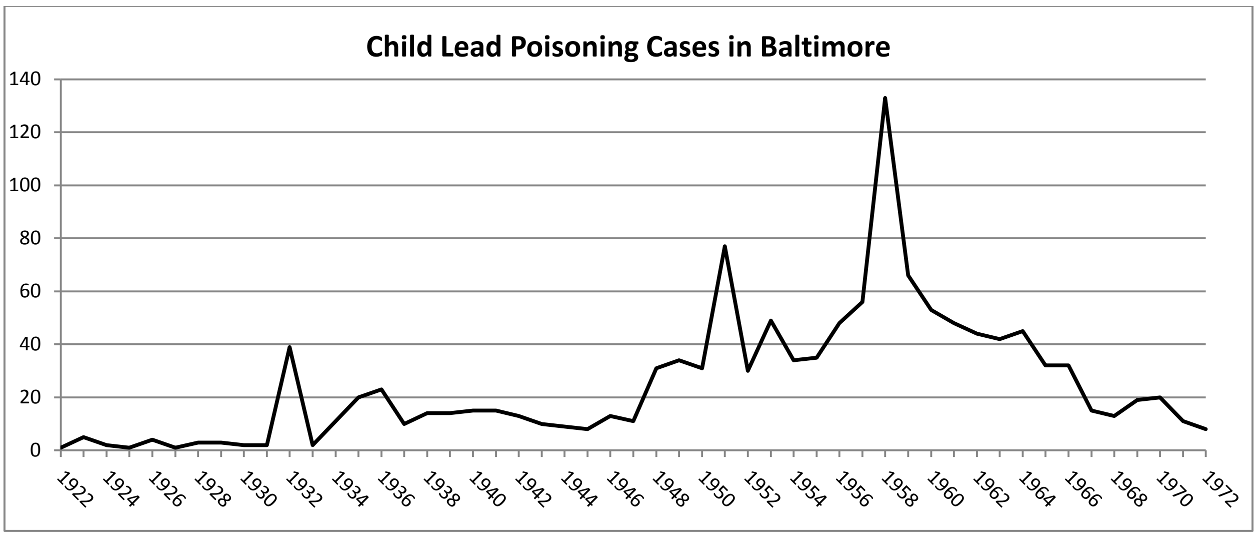


Figure 33: Child lead poisoning cases in Baltimore. Cases peaked from the late 1940s to mid-1960s. The spike in the early 1930s is from the lead battery burning cases. **Sources:** Patient Index Cards, Shoebox 21, Edwards Park Collection, AMCM Archives; BCHD *Annuals* 1932-1972 and BCHD, *Vital Statistics*, 1979-1989, in Maryland Room, Enoch Pratt Library. **Graph:** Leif Fredrickson.

What caused this spike in child lead poisoning? An alarmed city health department went to work trying to figure that out. When nurses and building inspectors visited the houses of lead poisoning victims, they found families living in deteriorated homes. In addition to problems with sewage, garbage, and rats, many of these residences had peeling paint and crumbling plaster. Children easily ingested this lead-infused material. The BCHD also found that the homes were overwhelmingly rentals, some of which landlords had converted from single-family to multi-family units. The buildings were old and built at a

[1] Baltimore City Health Department (BCHD), "Baltimore's Health Record for 1958," *Baltimore Health News*, February-March, 1959, 105-106, in MR, Pratt.; Williams to Snyder, March 5, 1962, in Folder Lead Paint Poisoning Prevention Program 1954-1962, Box 3.3-3.4, Series III, GHW Papers, AMCM Archives.

time when lead paint had been heavily used. Housing conditions were crowded. The tenants were mostly African American and their homes were located in places the city deemed “blighted” or “slum” areas.[2]

The BCHD accurately described the major shifts and conditions in housing in the city, but its analysis did not delve deeply into the causes of housing deterioration. What were the key dynamics of post-war housing decline? Was deterioration an inevitable result of poorer residents moving into formerly affluent housing? Did deterioration only happen *after* poorer groups moved in? Were inner city landlords who rented to these new groups operating on similar business model as other landlords, or was there something different about their property management that made housing deterioration more likely?

Since the influential Chicago School of urban sociology in the 1920s, there has been a powerful tendency to see inner city decline and housing deterioration as a natural part of metropolitan development. Drawing on ecological theory, these sociologists believed that the poor would eventually “invade” older, middle-class neighborhoods. The middle-class would move out of those centrally located neighborhoods, into newer neighborhoods further from the city center. Taken over by the poor, the formerly middle-class housing would then inevitably decline into blight and slums. Many scholars and practitioners of urban development perpetuated this narrative, including Baltimore’s city planners who, in the post-war era, depicted blight as a creeping force, spreading “outward from the City’s core in all directions in finger-like extensions” – a “pincer movement” – that threatened to “engulf” the city.[3] Urban historians have done much to counteract the naturalistic narrative of inner city decline, focusing especially on housing discrimination and the pernicious effects of urban redevelopment and highway building.[4]

---

[2] BCHD, “Lead Poisoning Killed 83 Children,” *Baltimore Health News*, August-September, 1951, 113-114, MR, Pratt; “Lead Poisons 57 Children in City: ’51 Record Reveals 9 Deaths; Most Cases in Slum Areas,” *Sun*, October 15, 1951, 26.

[3] Jennifer S. Light, *The Nature of Cities: Ecological Visions and the American Urban Professions, 1920–1960* (Johns Hopkins University Press, 2014), 25–35, 43–46, 73–74. BURHA, “Community Renewal Program,” 1966, 14, in Folder 2, Box 10, Series XII, in BCDP Records, LLSC.

[4] Sam Bass Warner, *The Urban Wilderness: A History of the American City* (University of California Press, 1995); Gwendolyn Wright, *Building the Dream: A Social History of Housing in America* (MIT Press, 1983); Hirsch, *Making the Second Ghetto*; Sugrue, *The Origins of the Urban Crisis*; Self, *American Babylon*; Connolly, *A World More Concrete*; Mark H. Rose and Raymond A. Mohl, *Interstate: Highway Politics and Policy Since 1939* (Univ. of Tennessee Press, 2012); Andrew R. Highsmith, “Demolition Means Progress Urban Renewal, Local Politics, and State-Sanctioned Ghetto Formation in Flint, Michigan,” *Journal of Urban History* 35, no. 3 (March 1, 2009): 348–68.

This chapter adds to this literature by showing the dynamics that linked suburbanization to inner city lead paint deterioration.[5] In doing so, I highlight several important dynamics that have received little attention, including white homeowner disinvestment and the role of equity in rental market. And I make an argument for viewing "slumlord capitalism" as a distinct variant of capitalist investment, one that has parallels with the over-exploitation of other resources.[6]

Three housing dynamics rooted in race-based mass suburbanization propelled inner city housing deterioration from the 1940s to the 1960s.[7] The first dynamic was *uncertainty* in the housing market. In the post-war years, old aversions to racial integration and the tethering of race to property values combined with rapid suburbanization and blockbusting to destabilize neighborhoods. White property owners, uncertain about the future of their homes, disinvested in them. Among the first sacrifices was painting. The second characteristic, related to uncertainty, was the *devaluation* of inner city housing that opened the door for slumlording. Low prices allowed investors to snap up houses and cram them with black renters. But low and declining home values also meant that these new owners had little hope for profit from the equity in their homes. Thus they traded in the long-term sustainability of their house investments – i.e., they neglected maintenance, with re-painting near the bottom of the list – for short term profits on rent, a business model I call "slumlord capitalism." The third dynamic was the combination of *discrimination* and *exploitation* in the housing market. Black owners and renters paid more for the same quality of housing as whites. Thus they had less money to spend on maintenance.

[5] Historians of lead paint have done surprisingly little to put housing deterioration in the context of metropolitan development and public policy. The most prominent social histories of lead paint poisoning, for example, do not even mention redlining. Fee, "Public Health in Practice"; Warren, *Brush with Death*. Another one recapitulates the naturalistic narrative, describing how "former middle-class neighborhoods evolved into slums." English, *Old Paint*, 103.

[6] For historians who engage with nexus of capitalism, housing and landlords/slumlords, see Connolly, *A World More Concrete*, 7–11. Satter, *Family Properties*; Taylor, "Back Story to the Neoliberal Moment"; Kahrl, "Capitalizing on the Urban Fiscal Crisis Predatory Tax Buyers in 1970s Chicago."

[7] For studies of inner city housing problems that consider some of these dynamics, see Michael A. Stegman, *Housing Investment in the Inner City: The Dynamics of Decline; a Study of Baltimore, Maryland, 1968-1970* (M.I.T. Press, 1972); D. Harvey et al., "The Housing Market and Code Enforcement in Baltimore," *Baltimore Urban Observatory*, 1972; U.S. Department of Housing and Urban Development, *Abandoned Housing Research: A Compendium* (GPO, 1973); Public Affairs Counseling, *The Dynamics of Neighborhood Change* (GPO, 1975); William G. Grigsby, Morton S. Baratz, and Duncan Maclennan, "The Dynamics of Neighborhood Change and Decline," Research Report Series (Department of City and Regional Planning, University of Pennsylvania, 1983).

Slumlord capitalism was exploitative and predatory, but it was also unsustainable. Neighborhood change and devaluation happened at different times in different neighborhoods, but in general the process occurred in neighborhoods close to the city center. Eventually the systematic exploitation, lack of financing, and housing deterioration led to further devaluation and, in some cases, widespread housing abandonment. Some slumlords made millions of dollars; others made modest amounts. Some found themselves with worthless properties they could not give away. But in virtually all cases, slumlording systematically mined the housing stock of the city. Viewing houses as a resource, rather than merely a commodity, slumlord capitalism was analogous to the overharvesting of trees or the unsustainable use of agricultural land ("soil mining"). Slumlords acquired their capital stock (houses) cheaply thanks to massive white flight to the suburbs. But instead of maintaining their capital, they spent it down and reaped the short-term profits.[8]

Because most professional landlords lived in the suburbs, those profits flowed from the inner city to the suburbs, where they helped sustain suburbanites in an environment that was less polluted and more green than the inner city. Thus money and environmental harms flowed in opposite directions – and in opposite directions than the history of cities and the environment have usually suggested they do – with health and wealth accumulating on the periphery and poverty and pollution accumulating in the core.

From Crowded War Housing to the Suburban Explosion

World War II was a tumultuous time for the Baltimore region. National war needs whipped industrial production into a gallop. Factories soaked up all the labor in the city they could, and then drew in even more laborers from surrounding areas. Employment at Bethlehem Steel tripled in a matter of years. But the city's housing stock and infrastructure could not keep up with the breakneck pace of in-

[8] For the history of thinking about housing as a resource, see Light, *The Nature of Cities*. Some housing analysts refer to housing as a resource to distinguish it from a commodity. See Peter Marcuse and David Madden, *In Defense of Housing: The Politics of Crisis* (Verso Books, 2016). This is similar to the Marxist distinction between the "use value" and "exchange value" of housing. See David Harvey, *Social Justice and the City* (University of Georgia Press, 2010), 153–90. For logging, see P.W. Hirt, *A Conspiracy of Optimism: Management of the National Forests since World War Two* (University of Nebraska Press, 1996), xliv. For soil mining, see Donald Worster, *Dust Bowl: The Southern Plains in the 1930s* (Oxford University Press, 2004), 253. The ecological economist Eric Zencey takes this analogy from the opposite end, arguing that our use of natural resources is akin to the way slumlords managed housing. Eric Zencey, "Slumlord Nation," Center for the Advancement of the Steady State Economy, June 11, 2013, at steadystate.org/slumlord-nation, retrieved November 12, 2015.

migration. War rationing made the supply of building materials scarce**.** The dearth of vacant rentals and the uptick on single rooms for rent suggested a serious housing shortage. Despite some suburban and public housing developments, new housing could not meet rising demand.[9]

As a result of scarce housing and crowded conditions, housing prices went up while housing quality deteriorated. This was especially true for black people. Restrictive covenants hemmed them in. White people vigorously protested public housing for them. As a result, an area of about one square mile was all that 90,000 black Baltimoreans had to live in. Packed into housing, crowd diseases – such as meningitis – ran rampant. Job discrimination also kept black people from being able to afford quality housing, especially as the short supply of housing allowed landlords to raise rents even as housing quality declined.[10]

This neglect resulted in more hazardous lead conditions. Tenants complained that landlords raised rents while neglecting repainting for years and refusing to fix falling plaster. In cramped housing, this usually meant lead-infused particles showering food, utensils and children's beds. In 1942 a child living in a house with 18 other people in east Baltimore got lead poisoning under precisely these conditions.[11] The city's residents clamored for more and better housing. An unprecedented torrent of home building in the suburbs did follow the war. But it was not for everyone.

A combination of new and old factors pushed and pulled post-war suburbanization. The continuing desire to escape urban disamenities – disease, pollution and noise – and secure racial and ethnic homogeneity made suburban living attractive. As before the war, people also believed these new living arrangements would secure their property values. But suburbs were now within reach of a much larger swath of the population. With the rising affluence and falling inequality in wealth after WWII – the

---

[9] U.S. Congress, *National Defense Migration: Part 15*, *Baltimore Hearings* (GPO, 1941), 5889–5985, 6072.
[10] Ibid.
[11] One woman reported her landlord raised her rent despite not having painted the place in four years. Another noted that the landlord raised the rent all the while rain filled up her cellar and plaster fell from the ceiling on the bed where her little girl slept. A third woman complained that her rent was raised and that the landlord would not fix the wallpaper peeling off the walls or the plaster falling from the ceiling. Ibid., 6250–52. East Baltimore case: Medical Record for Black, Female, Child, admitted March 18, 1942, in JHMR.

"Great Compression" as some economists call it – the suburbs were no longer primarily for the upper-class.[12]

Post-war affluence was critical to the suburban boom, but so, too, were government policies that facilitated and incentivized home buying, especially in the suburbs. During the Depression, Congress created the Federal Housing Authority (FHA) to insure mortgages lent by private institutions. This helped prop up home construction and ownership during the Great Depression. After that, it was less a prop than a propeller, especially as the FHA liberalized its policy, reducing the required down payment and increasing mortgage terms from 20 years in 1934, to 25 years in 1938, and finally 30 years in 1948. The Servicemen's Readjustment Act of 1944 (the GI Bill) provided similar government backing from the Veterans Administration (VA), but with even more liberal terms.[13]

Homeownership increased in the Baltimore region, but it was the type of home and home location that constituted a major change. Homeownership rates had always been high in Baltimore, even among the working class. This was due in part to Maryland's unique ground rent system, whereby homeowners rented the land underneath their homes. That reduced the upfront cost of home buying. In addition, the classic Baltimore home, the rowhouse, was small and cheap to build – and hence to buy. Stacked closely together with little surface area, rowhouses also had cheaper utility bills.[14] But the FHA and VA policies did not favor home buying or building in the inner city. They geared their policies toward new, single-family detached homes. In any city, new construction was not likely to be a major source of housing for buyers in the old urban core, and much of the housing in the urban core was not detached. In Baltimore in particular, the rowhouse also did not meet the FHA's minimum width requirements. So what had once been a boon to home ownership – small homes packed together – became a liability.[15]

---

[12] Claudia Goldin and Robert A. Margo, "The Great Compression: The Wage Structure in the United States at Mid-Century," *The Quarterly Journal of Economics*, 1992.
[13] National Commission on Urban Problems, *Building the American City: Report of the National Commission on Urban Problems to the Congress and to the President of the United States* (GPO, 1968), 96–103.
[14] Belfoure and Hayward, *The Baltimore Rowhouse*; Hoffman, "The Role of Government in Influencing Changes in Housing in Baltimore," 126.
[15] Kenneth D. Durr, *Behind the Backlash: White Working-Class Politics in Baltimore, 1940-1980* (University of North Carolina Press, 2003), 223.

The FHA graded areas of the metropolitan region from low to high risk for lending. Their risk manuals guided what areas would be eligible for lower interest loans (because the government would absorb some of the risk of the private lender). The FHA graded places on the factors mentioned, but also on others, including the presence of black people. FHA maps and documents for cities have not usually survived, but Homeowners Loan Corporation (HOLC) maps have. HOLC was a sister agency of the FHA that also graded lending risk. HOLC mapmakers colored the worst graded areas red, and the practice of denying loans, or giving ones with worse conditions, became known as “redlining.” FHA maps were similar to HOLC maps, in part because both agencies relied extensively on local realtors and lenders for their information.[16] HOLC redlined the inner city while the suburbs of the city received the best grades (green and blue) (Figure 34). As with the FHA, race was highly salient for HOLC. The detrimental influences listed for redlined west Baltimore, for example, were: “Obsolescence. Negro concentration. Excessive Ground Rents in many cases.”[17]

[16] Amy Hillier has made a strong argument that the HOLC maps were not responsible for redlining. Instead, they reflected “redlining” that had already been going on at the local level. The FHA probably influenced HOLC maps more than vice versa, but Hillier suggests the HOLC maps are probably a reasonable proxy for how the FHA and local mortgage companies construed lending risk. Amy E. Hillier, “Redlining and the Home Owners’ Loan Corporation,” *Journal of Urban History* 29, no. 4 (2003): 394–420. For more on HOLC, the FHA and the suburbs, see Jackson, *Crabgrass Frontier*.
[17] HOLC, Form for Area Description D-4, from Robert K. Nelson, LaDale Winling, Richard Marciano, Nathan Connolly, et al., “Mapping Inequality,” *American Panorama*, ed. Robert K. Nelson and Edward L. Ayers, accessed October 14, 2016, dsl.richmond.edu/panorama/redlining.

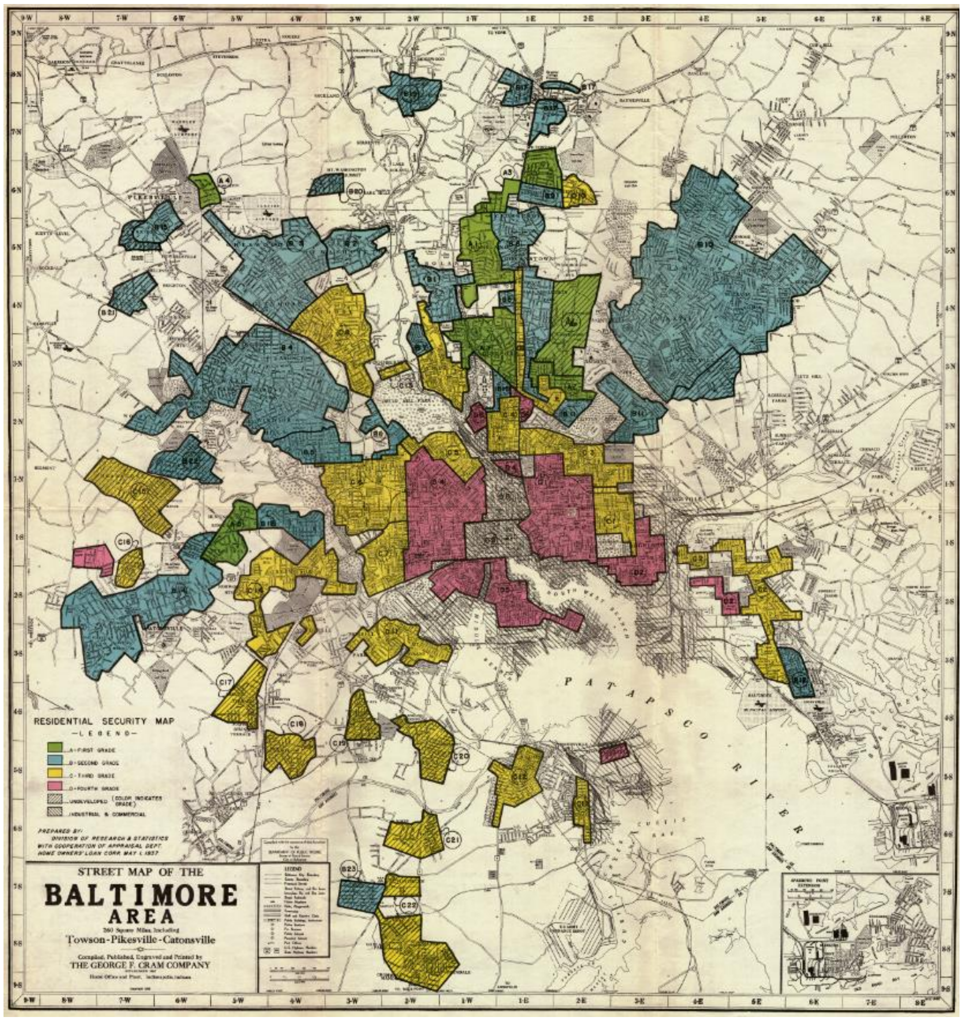


Figure 34: A Homeowners Loan Corporation map from 1937, which graded different areas of the metropolitan area in terms of lending risk based on factors including race. The riskiest areas, according to HOLC, were the red areas. Identifying these areas as such could cordon them of from considerable lending capital – a process that has become known as "redlining." **Source:** HOLC, "Residential Security Map – Baltimore Area," (1937), MA Collection, MESC, jscholarship.library.jhu.edu/handle/1774.2/32585.

In addition to redlining, the FHA helped suburban developers create racially restrictive covenants in the 1930s and 1940s. Eventually, however, the NAACP challenged these covenants. A case from St. Louis, *Shelly* v. *Kraemer*, made its way to the Supreme Court in 1948. Baltimore native Thurgood Marshall represented the plaintiffs. At the same time, Baltimore's Mount Royal Protective Association filed a brief as an amicus curia, arguing that segregation in Baltimore had prevented riots and that it was "utterly untrue" that "restrictive covenants in Baltimore has resulted in forcing the large negro population to congregate in districts of sub-standard housing and inadequate public services."[18]

[18] There were several major restrictive covenant cases and the Mount Royal Protective Association filed as an *amicus curia* for all of them. Vose, *Caucasians Only*, 197–98, 280.

The segregationists lost the battle, but the war was not over. *Shelly* v. *Kraemer* made racial covenants unenforceable, and the FHA stopped using racial homogeneity as a factor in grading areas. But covenants were still legal, if not enforceable. Likewise, it was still legal for lenders and realtors to discriminate on race or ethnicity. Surveys of Baltimore in the 1950s found that 84% of rental firms either would not rent to black tenants or would only rent to them in black neighborhoods. Eighty-two percent of realtors would not sell to black buyers or would only sell to them in black neighborhoods. And 39% of lenders either refused business with blacks or limited financing to blacks in black neighborhoods.[19] At the national level, well into the 1950s, the FHA continued to work with discriminatory lenders, developers and realtors, while some of its top administrators defended housing segregation.[20] Reports also indicated local discrimination in Baltimore's FHA and VA.[21] Locals used other methods to maintain the color line as well. White residents terrorized black families that tried to move into higher quality neighborhoods and housing, sending them back to deteriorated housing conditions.[22]

As the attempts of black families to move to the suburbs show, it was not just economics that kept African Americans out of the suburbs. In fact, it seems to have been discrimination – public and private, legal and extra-legal – that most severely limited the options of potential black suburbanites. Studies

---

[19] Commission on Interracial Problems and Relations, *An American City in Transition; the Baltimore Community Self-Survey of Inter-Group Relations* (Baltimore, 1955), 62–63, Pullen Collection, LLSC.

[20] Freund, *Colored Property*, 209–10.

[21] When the Baltimore FHA acquired repossessions, it sold them to realtors in areas where the properties were located – a practice that helped keep the real estate market segregated. More explicitly, a broker for the VA in Baltimore told a Black family inquiring about a VA-repossessed home that it was "not available to colored." As a result, the family was forced to use an installment contract – a highly exploitative lending instrument described later – to buy a similar VA-repossessed house for more money. U.S. Commission on Civil Rights, *1961 Commission on Civil Rights Report: Housing* (GPO, 1961), 68, 74.

[22] In a Baltimore suburb in Anne Arundel County, a Black family experienced a "siege of terror and harassment," that included rocks and beer bottles thrown their windows, a steel-tipped arrow shot into their house, and the intentional flooding of their basement. That family weathered the intimidation, but others did not or did not even try. White neighborhoods also combined intimidation with bribery to keep Black residents out. In one case, a "middle class white community in the northern part of the city" collected money to buy back a home recently purchased there by a Black family. The Black family decided to sell, in part because they had already been driven out of a White community and were worried about their children. The ended up back in "seriously dilapidated" housing, neglected by the landlord and Bureau of Building Inspection. This White neighborhood association and several others started funds to preemptively buy houses that might be sold to Black residents. "Neighborhood Association Buys out Negro Purchaser," *BNI Newsletter* (no date, circa 1965), Box 1, Series III, Baltimore Neighborhoods Incorporated Records (hereafter, BNI Records), LLSC. White attempts to bribe their White neighbors or prospective Black buyers were usually ineffective. "What Happens When Neighbors Pay Money to Forestall Racial Change?" ca. 1959-1965, Folder 18, Box 2, Series III, BNI Records, LLSC.

found that large percentages of Baltimore's black residents could have afforded to buy homes or rent in the county suburbs.[23] Thus it was not until the passage of the 1968 Fair Housing Act, which made housing discrimination illegal, along with other changes in practice and policy, that black suburbanization happened on a large scale.[24]

Before that, suburbanization was characterized by two key factors: it was massive and it was white. Between 1940 and 1950, population in the metropolitan area outside the central city increased at seven times the rate of the inner city. In the same period of time, housing in the metro area outside of the municipal boundary increased by 30.6%. Within the city's boundaries, housing increased by 17.5%, but almost all of this lay in the outer, suburban part of the city.[25] White people composed the vast majority of suburban developments, both within and outside of the municipal boundary. Government policies clearly played a strong role. The FHA and VA insured 63% of the 20,477 owner-occupied homes built in the area between 1946 and 1950. But government programs provided much less financing for black home ownership. The FHA/VA only insured 15.5% of the 7,723 Non-White owner-occupied single family homes in 1950.[26] These disparities continued through the 1950s. In 1961, the Baltimore FHA office reported that of 68,000 units it had insured, only 2.5%, were for Non-Whites. Of those Non-White units,

[23] In the Baltimore metropolitan region, Black suburban population increases in 1960 were minimal. A study of the metro region in 1971 found that 67% of Black City families could afford housing in the suburbs and 60% could have afforded to rent at the median suburban price. BNI, "A Study of the Economic Potential of Baltimore City Black Families for Living in the Suburban Baltimore Area," June 1972, Folder 29, Box S3B-B3, Subseries B, Series III, ACLU Records, LLSC.

[24] There were African Americans living in the suburbs before this and there were some suburbs that were majority African American. See Andrew Wiese, *Places of Their Own: African American Suburbanization in the Twentieth Century* (University of Chicago Press, 2009). But racial discrimination made the pre-1970s suburbs especially white.

[25] Hoffman, "The Role of Government in Influencing Changes in Housing in Baltimore," 127–38. For where new housing was built in the city, see the map "Age of Housing," in BURHA, "Community Renewal Program," 1965, in Folder 2, Box 10, Series XII, BCDP Records, LLSC. The map shows the older housing stock in the inner city and newer stock on the periphery of the city. A significant amount of development happened within the municipal boundary in the post-war period (represented here by categories 1940-1959 and 1960-1965). Defined on the basis of their architecture, density, land use and relation to the city, these new developments were suburbs – suburbs in the city limits. Consonant with insuring more homes in the suburbs, the FHA insured more new homes than existing homes. Of the 28,130 homes it insured in the Baltimore metropolitan area between 1935 and 1950, 21,479 were new construction. Federal Housing Authority, *FHA Homes in Standard Metropolitan Areas 1950 – South Atlantic Division* (GPO, 1952).

[26] The VA backed 1,089 Non-White homes in 1950, the FHA only 113. Hoffman, "The Role of Government in Influencing Changes in Housing in Baltimore," 127-38.

only 300 were for home-owners. The remainder were rental units, mostly built under a program (Title VI) for low-cost "war housing."[27]

While the suburbs bloomed, the inner city wilted. Census data from 1940 to 1950 indicated deteriorating housing in the city, but different housing criteria in the two censuses do not allow a clear quantitative assessment.[28] Beyond these numbers, however, journalists, activists, neighborhood groups, politicians, city bureaucrats – among them, the Baltimore City Health Department and its investigation of deteriorating lead paint problems – all attested to the plummeting quality of inner city housing.

Uncertainty: White Flight and Flighty Markets

The expansion of the suburbs catalyzed the decline of inner city housing. Rapid white flight to the periphery begat a corrosive inner city housing market. The unprecedented rate and scale – measured in both numbers and geographic space – of post-war suburbanization, combined with racial-exclusivity and the anchoring of property values and lending risk to race, made inner city housing markets volatile. Sales of homes in the inner city increased dramatically in the post-war period. But at the neighborhood level, rates of selling could rise and fall rapidly within a few years. Related to this volatility was uncertainty about the price homeowners would get for their homes – if they could sell them at all. If they did sell, homeowners often sold to investors, including professional speculators, who turned around and sold the homes again relatively quickly. Volatility, uncertainty, and transient ownership all conspired to disincentivize housing maintenance, including that related to lead paint.

Baltimore's long history of residential segregation set the stage for white flight and post-war housing market woes. Baltimore was the first city to enact a municipal law segregating housing by race in 1910. A number of cities copied it, but the Supreme Court declared it unconstitutional a few years later.

[27] U.S. Commission on Civil Rights, *1961 Commission on Civil Rights Report*, 61.
[28] There was "little or no change in structurally deficient housing" in this period, which was around six or nine percent depending on the inclusiveness of the measure. But since the city also demolished many substandard units in slum clearance in this decade, eliminating many substandard homes, other houses that had been structurally sound must have fallen into disrepair to keep the percentage constant. Hoffman, "The Role of Government in Influencing Changes in Housing in Baltimore," 131–32. Census measures of substandard housing did not include many aspects of housing deterioration, including peeling or flaking paint. A much larger percentage of homes had these problems, but since there were no surveys of lead paint problems before the early 1960s, one cannot compare numbers. The fact that housing in general was getting worse, however, indicated that lead paint problems were also getting worse.

Private restrictive covenants then took up the baton of segregation, along with intimidation and discriminatory lending and real estate practices.[29] But the *Shelly v. Kraemer* decision, while not outlawing covenants *per se*, did undermine them, breaching one of the institutional walls of housing segregation.

At the same time, the black populations of cities swelled. But discrimination and low-income excluded this population from the boom in new housing.[30] Between 1940 and 1957, only 6,000 new housing units became available to black people; most of these were public housing. Unsatisfied with these conditions, black residents sought more and better housing in formerly white neighborhoods.[31]

While maintenance of the color line in the inner city became more precarious, the expansion of the automobile, highways, and the subsidization of suburban housing through the FHA/VA produced another route – and another scale – of segregation. White people no longer had to labor to maintain the color line in small neighborhoods; they could move out to the suburbs where discriminatory practices were even more effective.[32]

In many Baltimore neighborhoods, white people quickly sold off their homes at the first sign of black neighbors and "almost invariably" moved to the suburbs,[33] either because they did not want to live by black people or because they feared the devaluation of their property. However, there was nothing inevitable about the decline in property values or the impossibility of racial integration in neighborhoods. Baltimore Neighborhoods, Inc. – an organization formed to fight white flight and its destabilizing effects – spread evidence of neighborhood integration without declining property values (or the spread of

---

[29] Garrett Power, "Apartheid Baltimore Style: The Residential Segregation Ordinances of 1910-1913," *Maryland Law Review* 42 (1983): 289; Arnold, "The Neighborhood and City Hall The Origin of Neighborhood Associations in Baltimore, 1880-1911"; Durr, *Behind the Backlash*.

[30] Baltimore City Planning Commission, "Housing: Dwellings and Neighborhoods," March 10, 1967, 2, in Folder 1 Housing, Box 1, Series VII, BCDP Records, LLSC.

[31] Southern Regional Council, "Neighborhoods: Where Human Relations Begin," February 1967, 29, Folder 1, Box 1, Series X, Greater Baltimore Committee Records (hereafter, GBC), LLSC.

[32] Health and Welfare Council, "Study of Baltimore Neighborhoods, Inc." June, 1965, 5, in Folder 34, Box 4, Series III, Health and Welfare Council of Maryland Records (hereafter, HWC), LLSC.

[33] The "almost invariably" quote is from Sidney Hollander (Windsor Hills Improvement Association), Ellsworth Rosem and Melvin Sykes (Ashburton Area Association) to Charles Buck (Greater Baltimore Committee), July 2, 1958, Folder 4, Box 1, Series I, BNI Records, LLSC. Hollander was a prominent market researcher and the Greater Baltimore Committee was a powerful association of downtown business elites. Hollander and the other who wrote to Buck formed the kernel of Baltimore Neighborhoods Inc.

"blight").[34] Sociologists did not always find that "White flight" drove neighborhood change.[35] But the fact was that in much of Baltimore's inner city and old suburbs, rapid racial change resulted from discrimination and fear of lost property values. Decades of segregation had melded race to property values, and so integration threatened the homes – the accumulated life wealth – of white people. This all depended on, and re-affirmed, the social construction of race and its connection to property values, but the threat to any individual white home owner was real.[36]

In addition to the Supreme Court vitiating one of the legal tools of segregation, another phenomenon accelerated neighborhood change: blockbusting. Blockbusting was a practice where realtors sold (or pretended to sell) a house to a black buyer in a white neighborhood in order to trigger panic selling. Waves of anger and fear were followed by quick sales and white flight. From the mid-1940s to the mid-1960s, aggressive realtors busted the city from the inside out. Neighborhoods swung rapidly from all white to all black. Speculators picked up formerly white homes at a huge discount, then sold them for a profit to black homeowners or to rental investors. If automobiles, affluence and federal policies opened up the flood gates to a massive exodus to suburbia, blockbusting crashed into neighborhoods like a tsunami pushing people out. Together, these things rocked real estate markets, creating volatility, uncertainty and transience in inner city housing markets (Figure 35).[37]

---

[34] Baltimore Neighborhoods, Inc. (BNI), "Origins of Baltimore Neighborhoods, Inc." unpublished report circa 1958, 1-1-8;" The Myth of Property Value," *BNI Newsletter*, April 1971 Box 1, Series III; both in BNI Records, LLSC.

[35] See "Down Goes Another Myth," in Ibid.; Harvey Molotch, "Racial Change in a Stable Community," *American Journal of Sociology*, 1969, 226–238.

[36] On the nexus of race and property values, see Freund, *Colored Property*. On White property owners' fears of losing their accumulated wealth, see W. Edward Orser, *Blockbusting in Baltimore: The Edmondson Village Story* (University Press of Kentucky, 2015).

[37] United States Commission on Civil Rights, *Hearing before the United States Commission on Civil Rights. Hearing Held in Baltimore, Maryland, August 17-19, 1970* (GPO, 1971), 93–96; Orser, *Blockbusting in Baltimore*. From the Work Bench," *Afro-American*, October 18, 1958; "Baltimore's Changing Neighborhoods," *Sun*, November 23, 1958; "Blockbusting in Baltimore," *Sun*, January 26, 1969.

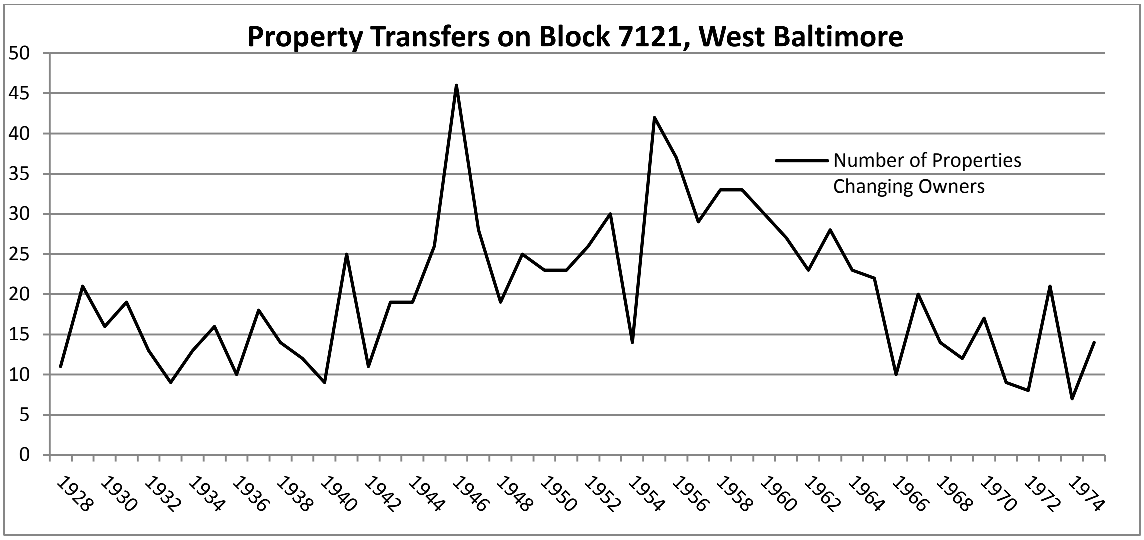


Figure 35: The number of properties changing ownership on one city block in west Baltimore (Block 7121, one of many blocks that underwent rapid racial change and had homes with lead paint violations). The graph shows the tremendous increase in property turnover from about 1945 to about 1965. It also shows the volatility of that period, as turnover increased rapidly, then fell rapidly, then rose again rapidly. **Source:** Data compiled from Baltimore City Block Books, Baltimore City Superior Court, available at mdlandrec.net. **Graph:** Leif Fredrickson.

White flight allowed more black home ownership and greater black residential mobility.[38] Some black blockbusters, in fact, claimed blockbusting was a civil rights mission.[39] But the rapid re-segregation of white people to the suburbs produced a chaotic market that was not conducive to maintaining housing values or health for black residents.

Housing deterioration, however, began before homes switched from white to black, from homeowner to rental, and from higher-income to lower-income. This is an important point, one that historians rarely recognize, and one that helps us avoid the inclination to see deterioration as an outcome of residence by a new race, class or tenant group. The mere threat of neighborhood change undermined investment and maintenance in homes. In 1952, the *Sun*'s home improvement advice column suggested that homeowners ascertain whether "slum encroachment" or the spread of "blight" was "imminent" before investing in major capital improvements on their home. Homeowners should also consider whether "long-time residents" were "getting out and buyers of a distinctly different type" – the *Sun*'s evasive phrase for black people – were taking their place.[40] Many white homeowners seems to have come to same conclusion wihtout this advice. With the threat of "householders of a different type" moving in, the *Sun*

[38] Hoffman, "The Role of Government in Influencing Changes in Housing in Baltimore."
[39] Pietila, *Not in My Neighborhood*.
[40] "Renovate or Move? Factors to Weight," *Sun*, September 20, 1953, RE1.

noted, "the original occupants of houses often defer[red] maintenance, quit periodic painting and repairing," and failed to keep up other aspects of the property.[41] One resident blamed the downward slippage of property values on white owners who shirked maintenance on their homes in the face of impending racial change. "[I am] not as afraid of integration as I am of disintegration," said Edward Lackie, vice president of the Windsor Hills Improvement Association, said.[42] Other observers noticed that when residents of blockbusted neighborhoods decided to sell they lost interest in maintaining their property. "Lawns grow. Property deteriorates," an anti-blockbusting activist bemoaned in 1958.[43] Crucially, one of the reasons white homeowners disinvested in their homes was because they had good options to move somewhere else – the suburbs. Suburban opportunity thus pushed homeowners to view their homes through the prism of market value.[44]

Real estate speculators were happy to snap up these homes, however. They held them for a short period of time and had little incentive to keep them in good shape. The point was to make a relatively quick turnaround, not invest.[45] Because white flight from neighborhoods was so rapid, the homes in a block busted neighborhood temporarily glutted the market, even for the expanding black housing market. "Desirable homes which cannot be sold either to White or Negro home owners simply deteriorate," noted members of home owners associations.[46] West Baltimore, in particular, was a site of intense blockbusting,

---

[41] "Older House Can Give Good Return for Price," *Sun*, September 14, 1952, C16.

[42] "Owners Told Not To Panic," *Sun*, January 17, 1957, 15. Lackie was clearly concerned about integration, however. His point seems to have been that if white residents allowed their properties to deteriorate, they would be awash in black residents. Black migration was like a flood, Lackie said, and "flood runs downhill."

[43] "Dilemma Has No Color Line," *Baltimore News-Post*, August 22, 1958, clipping in Folder 4, Box 1, Series I, BNI Records, LLSC.

[44] In one letter, a writer argued that blockbusting brought in "indigent transient whites" who then neglected housing producing "prominent eyesores." I have not seen this reference to whites movement into blockbusted neighborhoods before. But the upshot of the letter was that, as property values declined as a result of blockbusting, "responsible residents [would] begin to question the wisdom of continuing to maintain the sizable expenditures required to keep large homes in good repair. Heartsick and disgusted, too often they unwillingly join suburban throngs." Helen Lucas, "Block-Busting," (letter), *Sun*, August 24, 1955, 14. More generally, as this and other articles noted, homeowners drew back from housing investment when they believed that the value of their homes was threatened. Threats could come from black integration, undesirable commercial or industrial uses, highways, and lack of city services, among other things. "Renovate or Move? Factors to Weight," *Sun*, September 20, 1953, RE1. For commercial and industrial threats to property and property disinvestment, see "An Assignment to Revise Baltimore's Zoning Laws," *Sun*, 1950, 14, and

[45] "Shortage of Homes in Area Foreseen," *Sun*, August 4, 1957, A31.

[46] Hollander et al. to Buck, July 2, 1958, Folder 4, Box 1, Series I, BNI Records, LLSC.

speculation, and neighborhood instability, as well as a site of violations of Baltimore's 1951 law requiring the removal of hazardous lead paint in homes (See Figure 38 for a map of lead paint violations).[47]

In some cases, it is possible to document the way lead paint problems followed on the heels of blockbusting and housing instability. In 1950, one property in west Baltimore was listed for white buyers at the beginning of the year, but by the end of the year, after passing through the hands of a few realtors, it was listed for black buyers. When that happened, the ground rent went up – an indication of the sort of price gouging that went on with captive markets. After going to another realtor, advertisements for the place became increasingly desperate. Eventually it was sold to an African-American family, who were eventually cited for lead paint violations (perhaps due to having a boarder).[48] In another case, a property went through the hands of several speculators and slumlords before ending up in the ownership of a poor black family. The owner before the black family was Dupont Realty, which was owned by Morris Garbis, a notorious slumlord. It is very likely that the house was in poor shape before the family moved in.[49] In 1959, the man's infant son had to be admitted and treated at the hospital for lead poisoning. The Health

[47] According to the computer-aided number crunching of an anti-slumlord group, Activists, Inc., "a handful of speculators supported by a small number of financial institutions were responsible for the injustice" of blockbusting Edmondson Village (west Baltimore) and Montebello (north Baltimore). "Project: Stop Housing Exploitation!" Letter from Activists, Inc. to "friends," November 1969, Folder 6, Box 1, Series VII, BNI Records, LLSC.

[48] In April of 1950, realtors listed a home in west Baltimore for sale under the "suburban" section in the *Sun* – which was a code for "White." In May, it was still listed as "suburban" and also as a "real bargain." In September, it had switched hands to another realtor – David Tilghman, who happened to be president of the Baltimore Real Estate Board – and was listed under the "city" listings for a "colored GI." As soon as the listing was advertised for Black people, the ground rent went up from $60 a year to $78 a year. In 1951, a different realtor was listing the property, with a note that said, "Must be sold. Price reduced." In 1957, yet another realtor held the property, and it was finally listed as sold. The new owner was an African-American steelworker (and GI), along with his wife and three children. The following year, the man was cited for a lead paint violation. Later, the property was abandoned or defaulted on, and it was on the auction block in 1972. Classified listing from *Sun*: April 16, 1950, 46; May 5, 1950, 30; September 28, 1950, 30. On Tilghman, see "Organized in 1858,", April 16, 1950, MT26, April 1, 1951, S12; April 26, 1951, 30; October 1, 1972, M44. On steelworker: "Real Estate Transfers," January 27, 1957, A21; "Lucky Says Driver after He and 4 Riders Get Out Alive," February 28, 1959, 1; 1940 Census and Army Enlistment Records. On the *Sun*'s practice of using "suburban" as a code word for white, BNI, "Analysis of February 18th Sunday *Sun* Real Estate Advertisements," undated report, Folder 2, Box 1, Series VI, BNI Records, LLSC.

[49] From 1948 to 1951, the property switched hands between three different realtors, finally ending up in with the Dupont Realty Company. Classified, *Sun*, September 15, 1948, 33; March 6, 1959, S14; July 7 1951, 14. The realtor in 1949 was Crane & Crane (a realtor and developer of suburban areas as well, see *Sun*, "Group Buys 527 Homes in Arundel," *Sun*, May 17, 1959, C1). Dupont Realty had a long history of housing violations ("Guilty in Rat Infestation Case," *Sun*, August 3, 1949, 18), and was one of the most egregious violators of lead paint regulations (Folder "Lead Paint Poisoning Tabulation of Lead Paint Notices, 1956-62," in Box Restricted Material Pulled from Series III, GHW Papers, AMCM Archives.

Department issued the father a violation for the paint, and the sanitarian visited him five times, but the father of five said he could not afford to have the work done. The city fined him $10.[50]

Devaluation: The Rise of Slumlord Capitalism

Related to volatile and uncertain market conditions was large-scale property devaluation. As Baltimore Neighborhoods, Inc. (BNI) had argued, there was nothing inevitable about the integration of neighborhoods that led to the devaluation of property. In fact, careful studies found that property devaluation was not related to integration, but to the re-segregation of neighborhoods from virtually totally white to totally black.[51] As BNI put it, "For the most part, homeowners fled from an imaginary threat or became the victims of their own prejudices."[52] In other words, belief in integration-induced property devaluation was a self-fulfilling prophecy. It was self-fulfilling for two reasons: Belief in devaluation made actual devaluation, at least temporarily, a reality. More permanently, belief in devaluation led to lack of housing maintenance, resulting in a material devaluation of the housing stock.

BNI's efforts came up against the hard reality of mass, race-based suburbanization. BNI favored open housing, but it also wanted neighborhood stability. Although blockbusting opened up new neighborhoods to black residents, it caused instability, devaluation and housing neglect. Speculators also exploited black homebuyers. But while BNI opposed blockbusting, it saw "open housing" (non-discriminatory housing markets) in the suburbs as vital to ending white flight. Indeed, BNI feared that open housing in the city without parallel open housing in the suburbs would only exacerbate white flight. While it pushed, unsuccessfully, for open housing in the suburbs, BNI tried to educate and organize White city residents to resist blockbusting and white flight.[53] But most Baltimore homeowners were unwilling or unable to countenance neighborhood integration. A few neighborhoods carried out semi-successful efforts to integrate without housing devaluation or deterioration, but, as BNI put it, "the

[50] "Father is Fined for Poison Paint," *Sun*, April 1, 1959, 23; "Child Poisoned, Father Fined $10," *Afro-American*, April 11, 1959, 18.
[51] Homer Favor, "The Effects of Racial Changes in Occupancy Patterns upon Property Values in Baltimore," unpublished report, 1960, in Folder 35, Box 1, Series VI, BNI Records, LLSC.
[52] BNI, "Racial Changes in Residential Communities," no date, Folder 13, Box 2, Series III, BNI Records, LLSC.
[53] BNI Minutes, April 26, 1965, Box 1, Series 2; BNI, "Bulletin," 1960, Folder 4, Box 2, Series III; all in BNI Records, LLSC.

stability of one neighborhood or a group of neighborhoods will mean nothing if the basic problems of diffusion of the Negro community throughout metropolitan Baltimore is not met head on."[54]

It was not. As noted earlier, open housing did not come to the suburbs until the 1970s. Many neighborhoods in Baltimore's older urban core thus underwent rapid racial change and white flight, especially from the mid-1950s to the mid-1960s. White flight caused the devaluation of the properties in those neighborhoods, which in turn caused the devaluation of properties in established black neighborhoods because it temporarily flooded the black housing market. At the same time, redlining choked off lending to the inner city. Redlining contributed to downward pressure on home prices and cultivated a market in cash for homes that ballooned in the 1950s (Figure 36).[55]

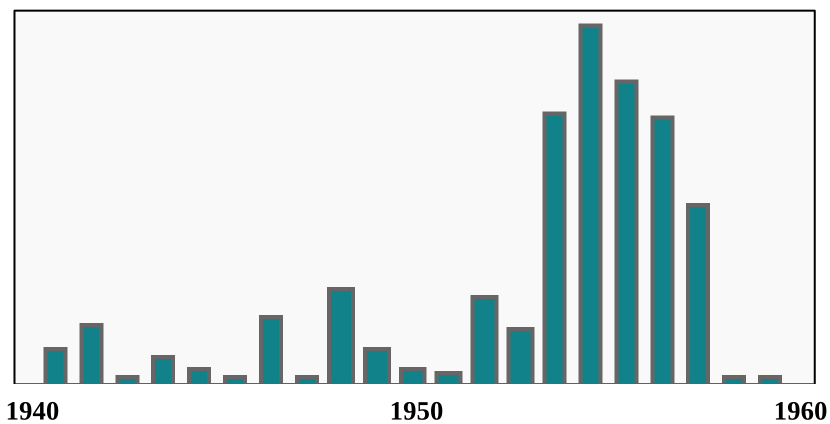


Figure 36: Search results for "cash for homes" in Baltimore *Sun* classified section, 1940-1960. The peak is at 1955. The period from the mid-1950s to the late 1950s was the peak of blockbusting. **Source:** ProQuest Search Engine for Baltimore *Sun*. **Graph**: Leif Fredrickson.

Speculators bought some of these devalued homes in blockbusted neighborhoods to sell to black homeowners. But slumlords also bought homes in these neighborhoods, as well as homes in established black neighborhoods that had been devalued. Slumlords were not new to Baltimore, but news coverage suggested that their role in housing greatly expanded in the post-war period. How and why did that

[54] BNI, Memo "Baltimore Neighborhoods, Inc.," no date, Folder 8, Box 1, Series I, BNI Records, LLSC.
[55] The shift to cash sales after blockbusting is evident, for example, in Figure 4 above, which shows that there were two spikes in property transfers in the post-war era. One right after the war, and one when the block was busted in the mid-1950s. During the three years around the first spike, mortgages outnumbered cash payments (deed transfers) by 30%, but in the three years around the second spike, cash payments outnumber mortgages by 30%. Data compiled from Baltimore City Block Books, Block 2171, Baltimore City Superior Court, mdlandrec.net.

happen? What drove slumlord investments and practices, and how did those investments and practices affect lead paint hazards?

Characterizations of slumlords, not to mention the label itself, were contentious. Colorful stories of big-time, unscrupulous slumlords filled newspapers. The media, tenants and activists commonly portrayed slumlording as highly profitable. For their part, "slumlords" usually rejected the label (although some clearly did not care), and they often complained that the media misrepresented them as greedy and uncaring when they (the slumlords) were just making an honest living and, in fact, were the only ones willing to provide housing to the very poor. In some cases, the media and politicians supported the claims of slumlords and, more broadly, they supported landlords who they considered legitimate businessmen, but who tenants saw as slumlords.[56]

These contentious characterizations led researchers to study inner city landlords in more detail in the 1960s and 1970s. Baltimore was an exceptionally well-studied city in this regard. Historians, as noted, have not written much about landlords.[57] Part of the reason for this is they are not easy to study. Slumlords were a diverse group, and not particularly open to scrutiny. Many operations were side businesses. And for business and legal reasons, they often used small, fleeting corporations. These difficulties plagued research at the time as well, but several in-depth studies did help elucidate the slumlord phenomenon.

The fundamental question about slumlording was whether it was qualitatively different from other types of landlording. Following from this question were a number of questions about its profitability, the character of slumlords, and slumlording's relationship to inner city decline.

One of the key conundrums of slumlording was this: If slumlording was so profitable, why did investors not flock to get in on it? Slumlords, of course, were investors. But in a broader sense, real estate investors and banks did not see the inner city as a promising site for investment. For example, David Harvey led a team of Johns Hopkins researchers that found that Baltimore landlords did not consider the

[56] "Profiteering in Slums and the Real Estate Board," *Sun*, April 18, 1948, 12.
[57] Connolly, *A World More Concrete*.

inner city a good place for investment relative to more peripheral and suburban residential areas (Figure 37). But the researchers also found that the rate of return on rentals – the monthly income minus the monthly expenses – was about 13% in the inner city, while rentals outside of the inner city only garnered about 8.5%.[58] Why would landlords not see the inner city as a good investment given those profit margins?

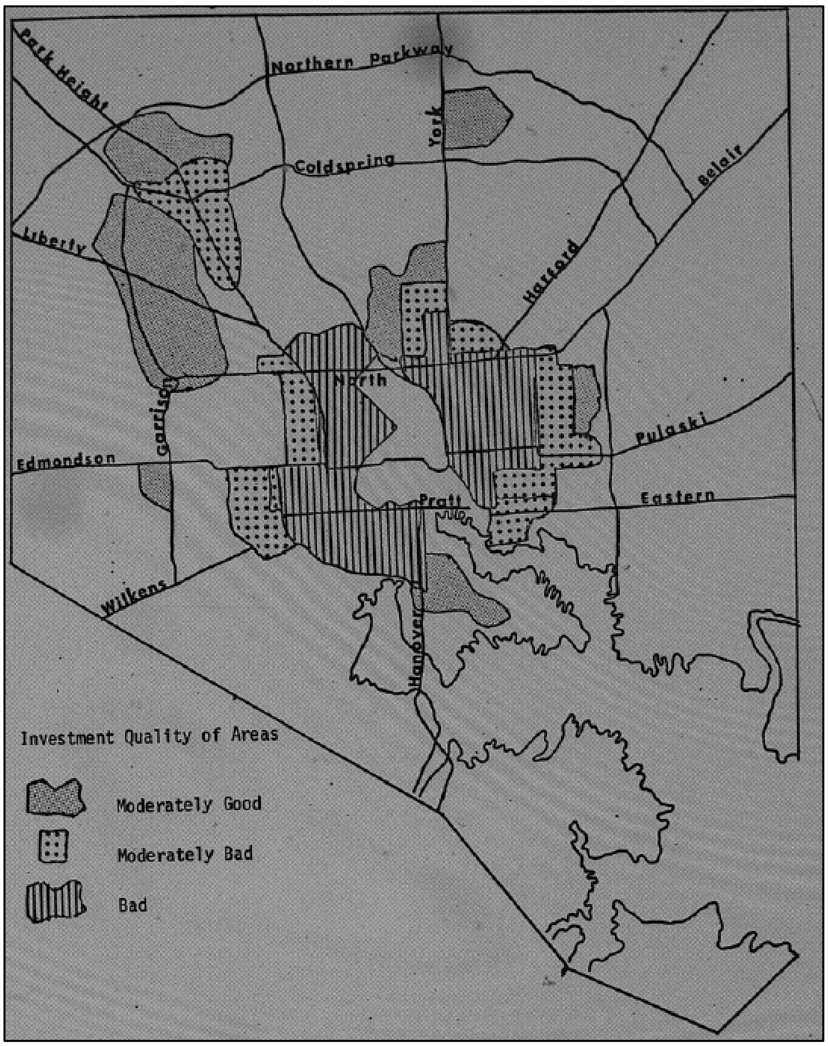


Figure 37: Promising areas for rental investment according to Baltimore rental investors (a composite of four evaluations). As the map shows, landlords did not consider the inner city, particularly the black neighborhoods in east and west Baltimore, to be good investment areas. But this begged the question as to why these were poor investment areas if profit margins on rental were so high there. **Source:** Lata Chatterjee, "Real Estate Investment and Deterioration of Housing in Baltimore" (Dissertation, Johns Hopkins University, 1973), 54.

---

[58] Much of the research was based on Lata Chatterjee's dissertation. The team also included the famous geomorphologist Gordon Wolman, son of the famous sanitarian Abel Wolman. Lata Chatterjee, "Real Estate Investment and Deterioration of Housing in Baltimore" (Dissertation, Johns Hopkins University, 1973); Harvey et al., "The Housing Market and Code Enforcement in Baltimore," 6.35.

Part of the confusion arose from the focus on *rental* profit margins, which did not take home equity into account. As the Johns Hopkins researchers showed, even though landlords in middle or upper-class areas made smaller profit margins on their rentals, they owned highly valuable, appreciating houses. Years later, these landlords could sell their houses for a nice profit. They could also leverage their equity and invest in something with a higher rate of return than the interest on their mortgage payments. Equity, the researchers found, was the more important factor in real earnings for landlords. That produced understandable confusion since profits from rental investments were putatively about rent. But the average returns to equity for "good investment areas" (outside the inner city) of about 23%, versus the average returns to equity of about 5% in the inner city, drowned out the apparent advantage that slumlords had in rental profit margins over suburban landlords. Post-war inner city housing had little or no equity. It was often depreciating or expected to depreciate. Thus for these inner city properties to be attractive investments, they had to be very cheap, for investors could expect little or no return on their equity investment down the road.[59]

The combination of blockbusting, redlining and suburbanization greatly devalued inner city properties and thus created the conditions in which slumlording not only *could* grow, but in a way *had* to grow. These factors made slumlording possible and probable at the same time. Massive suburbanization was at the root of these issues. As the Hopkins researchers noted, "rapid suburban growth means… a fall in inner city house prices." As prices continued to fall, or were expected to fall, the inner city landlord would "see no logical reason to decrease current income by maintaining properties, thus decreasing current earnings."[60] While all landlords, and home owners for that matter, might cut corners on maintenance, they also knew that serious negligence would harm the value of their property. But for the slumlord, the main and perhaps only value was in rent, so the only reason to maintain properties from an economic point of view was to keep them rentable and to comply with housing codes. The latter was often not very compelling, however.

[59] Harvey et al., "The Housing Market and Code Enforcement in Baltimore," 6.30-6.31.
[60] Ibid., 8.14.

In addition to equity, there were other reasons slumlording was less profitable than rental profit margins indicated, as both Harvey's group and another researcher, Michael Stegman argued.[61] The main reason was that while analyses usually included maintenance costs, they did not include management costs, which were harder to calculate. Stegman found that slumlords operated on many different scales, with wide differences in experience and efficiency in management. Slumlords with only a few properties, or with limited experience, were often not long for the business. Because, as noted, slumlording was all about profiting off current cash flow (rather than equity), short-term shocks to that cash flow – unexpected repairs, vandalism, the flooding of the rental market from blockbusted neighborhoods – could easily overwhelm small or amateur investors. Some amateur investors, for example, jumped at the chance to scoop up dozens of low-priced rentals, only to find that they had placed all of their eggs in one basket when temporary shocks to the rental market or housing abandonment cut into their monthly profits.[62] In other cases, landlords owning a few properties barely eked out a profit on their rentals. When money got tight, they sacrificed the quality of their rental and, by extension, the environmental health of their tenants. Several of these type of landlords ended up with lead paint violations. These violations stressed the financial situation of the landlords, but the consequences for children and their families living in these homes were far worse.[63]

---

[61] It is worth noting that Harvey and Stegman were largely in agreement on how inner city landlording worked, even though Harvey was a Marxist and Stegman was an orthodox public policy analyst. They came to different conclusions about what to do, with Harvey arguing for more tenant control and Stegman arguing for assistance to landlords to help them manage properties better. But their analysis of the real profitability of landlords was not in great conflict. Harvey went on to publish about landlords and housing markets from a Marxist point of view, including a famous article that drew on his and his colleagues' detailed studies of housing markets in Baltimore. David Harvey, "Class-Monopoly Rent, Finance Capital and the Urban Revolution," *Regional Studies* 8, no. 3–4 (November 1, 1974): 239–55.

[62] Stegman, *Housing Investment in the Inner City*, 27–48. BNI leveled the charge of incompetence, among other charges, against one of the premiere slumlords, Morris Garbis. But Garbis is a good example of a slumlord who was competently and calculatingly negligent. "State Agency Gives Garbis Reprimand," *Sun*, February 1, 1961, 36.

[63] For example, one African-American woman had been willed a house form her father in west Baltimore. The woman moved to east Baltimore (Rosemont/Coppin State) with her children and grandchildren (she was a widow), and mortgaged the house to help buy another house. She needed the mortgage money to buy the new house, and needed the rent from the house to supplement her wages. However, the houses violated many codes, including having peeling lead paint. But she could not afford repairs. The court was sympathetic, but said the house would have to be sold, premises vacated, or repairs made. "Agency Aids Homeowner," *Sun*, April 30, 1958. In a different case, a woman who lived in suburban Pikesville rented out a multi-family home in the inner city. It had been left to her in 1956 by her husband, who was killed in a robbery of his grocery store. But the place was dilapidated, with peeling lead paint and many other problems. In 1960, inspectors reported her and she faced a fine and jail sentence if

More efficient management kept slumlords from failing out of the business, but it did not mean that these landlords did not cut corners on serious matters of housing quality like lead paint. Robert Seff and his son-in-law, Howard Offit, ran one of the biggest, longest-lived rental businesses in the city.[64] In the 1940s, their operation rejected an English Professor who wanted to rent in a predominantly white neighborhood because the professor was black. But they soon got into the business of renting and selling to low-income black Baltimoreans. Seff and Offit's business was not one of the businesses that commonly came up in newspapers for egregious housing violations. Seff was a major donor to charitable causes. Offit was an active member of community boards and in 1959 was elected president of the Property Owners Association of Baltimore, the city's main landlord association. Offit started Echo House in the 1960s, an attempt to educate and assist his poor tenants in housing issues that gained national attention as a softer approach to tenant-landlord disputes. But Seff and Offit's business was also the most frequent violator of lead paint laws from 1956 to 1962, according to the BCHD.[65]

Other slumlords had a much less polished image. Another repeat lead paint violator, Morris Garbis, did little to hide his flagrant greed, spurning housing codes and taking fines in stride as the cost of business. The Housing Court described him as "the most constant and persistent violator of housing laws in Baltimore." Garbis's business skyrocketed in tune with the peak of blockbusting in Baltimore. From the 1940s to the early 1950s, Garbis had only a few listings in the *Sun* classifieds each year. In 1954 he had only seven; in 1955 he had 280, sometimes with multiple listings on the same page. He had over one hundred listings in the following three years, before his numbers declined. Although it is not clear how

---

the repairs were not made. She claimed she was working on them, that she needed time to get more money, and that she had already mortgage the rental house and her own house in the suburbs to get $3,500 toward repair costs. But more were needed. The paper quit following the story, so it seems likely she came up with money and was not sentenced. "3 Teen Agers Get Life Term for Murder," *Sun*, March 14, 1956, 38; "Housing Case is Postponed," *Sun*, May 4, 1960, 29; "Woman Must Pay Fine or Go to Jail," *Sun*, September 9, 1960, 40.

[64] The rental businesses they owned were named the Property Service Company and the R&S Construction.

[65] "Glenwood Ave. Home Barred to Prof. Because of Pressure Exerted by Whites," *Afro-American*, October 12, 1946, 15; "We Pay Cash for Homes," classified ad, *Sun*, June 10, 1964, 46; "Vacant-Colored," classified ad, *Sun*, January 6, 1950, 22; "Robert Seff Dies At Home," *Sun*, December 17, 1955, 16; "Offit New President of Property Owners," *Sun*, January 13, 1959, 15; Helen Henry, "A Social Service Idea that is Paying Off in Two Ways: Echo House Has Not Only Benefited Its Landlord Creator but His Tenants Also," *Sun*, September 26, 1965, SM4. For lead paint violations, see Folder "Lead Paint Poisoning Tabulation of Lead Paint Notices, 1956-62," in Box Restricted Material Pulled from Series III, GHW Papers, AMCM Archives.

wealthy Garbis was, his large holdings and his penchant for taking Housing Court fines in stride suggest he was not squeaking by. Garbis was the target of BNI's first attempt to pressure slumlords by filing a complaint with the State Real Estate Board. But, despite 45 convictions related to health and housing laws in the Housing Court and three in criminal court, the State Real Estate Commission refused to revoke Garbis's real estate license for the odd reason that his convictions stretched back "over a long period." Eventually the Board did suspend his license, but this suspension, along with many more citations for housing violations, did not halt Garbis until he was sent to prison for brokering real estate without a license. Two days after his sentence, he was again on the Housing Court docket for racking up violations at a house that included flaking paint.[66]

When the problem of inner city housing came up, slumlords blamed tenants. Offit, for example, fought hard against progressive reforms in the housing code and in tenant-landlord law while trying to educate tenants – because he believed deterioration was a tenant issue.[67] Landlords were particularly likely to blame tenants for child lead poisoning, which they argued was a behavioral issue, not an environmental one. Sidney Sakols, for example, was a professional landlord and repeat offender of lead paint in housing laws in the 1950s and 1960s. Still a landlord in the 1990s, Sakols blamed the parents for

---

[66] "Real Estate Man is Fined $50," *Sun*, February 7, 1958, 26; "Garbis Gets Fined Again," *Sun*, November 10, 1960, 18. Garbis's criminal violations included collecting money on the sale of house that he had already sold through a land installment contract. "Grand Jurors Hold Garbis," *Sun*, October 21, 12. In 1960, Judge Robert Sweeney of the Housing Court rejected Garbis's claim that his residents with land installment contracts were responsible for housing code violations. "Garbis Is Fined $200, Calls Housing Court Prejudiced," *Sun*, September 30, 1960, 11. When under investigation from the Real Estate Commission, Garbis claimed Sweeney had reversed his position that the buyer was not liable for code violations, thus he should get less blame for earlier convictions, which he said would no longer hold up. The court seems to have largely ruled against Garbis in his land installment contract cases, but the fact that these could be continually challenged and drawn out went to the heart of exploitative vagueness of the LICs. "State Agency Gives Garbis Reprimand," *Sun*, February 1, 1961, 36; "Housing Court Fine is $1,800," *Sun*, May 30, 1962, 18. For classified listings, I searched ProQuest *Baltimore Sun* classified listings. One of the ways Garbis got around fines was creating small corporations that, if they racked up considerable fines, he would simply abandon and nothing could be done to collect from them. Jay Apperson, "Motives of 'Slumlord' Baffle Housing Officials, *Sun*, August 8, 1994, articles.baltimoresun.com/1994-08-08/news/1994220096_1_garbis-baltimore-real-real-estate. Although Garbis's activity was long-lived, the peak of his landlording was in the 1960s. After that, the size of his business declined and he shifted more to brokering real estate rather than renting. Longevity in the business, in other words, was not a reflection of the sustainability of slumlording in general, which tended to undermine the resources it profited from.

[67] Frank Somerville, "Sondheim Urged to Stay at Post," *Sun*, December 17, 1961, 32; "Housing Code Hits Opposition," *Sun*, April 21, 1966, A15. When tenants showed responsibility in Offit's Echo House program, he was more likely to provide them with "fresh paint and paper." Henry, "A Social Service Idea," SM4.

the child lead poisoning that happened in his rentals, and implied he stopped renting to families with children due to child lead poisoning (which was illegal).[68]

Slumlords were diverse and slumlording was a diverse business. Some cared about their image, others did not. Some cared about their tenants, others did not give a damn. There were many amateurs, but the professionals held most of the properties. Some slumlords made big profit margins on small investments; they were not wealthy. Others invested big and managed their businesses efficiently, making them millionaires. But for all the differences in scale and profitability among slumlords, a fundamental dynamic melded them. Investors buying into properties with little or no long-term value in the real estate market had to make big profit margins on their current cash (i.e. rental) income. That meant disregarding maintenance. Slumlord's initial investment in cheap properties of declining value pushed them to devalue their properties even more. This was slumlord capitalism. Since painting was one of the more expensive components of housing maintenance, and since landlords, tenants and housing officials sometimes saw it as relatively superficial, it was one of the common casualties of disinvestment. In Baltimore 1969, for example, tenant complaints about paint and plaster neared the top of the list for inner city housing problems (third out of twenty).[69] Thus even in houses that had only a few other maintenance issues, lead paint exposure could have been quite serious.

In addition to disinvestment in particular houses, slumlording contributed to the rising problem of inner city housing abandonment. Before WWII, Baltimore and other cities often wrung their hands about housing vacancies. Too many vacancies meant tax losses, too few meant housing congestion. But *abandoned* houses – vacant houses that were essentially unwanted and often uninhabitable – were not a problem. After WWII, housing abandonment bubbled up to a serious issue, becoming a rolling boil by the 1970s. Many people left the city for the suburbs, but the question that arose was why people remaining in the city did not fill these vacated houses, especially considering that much of the occupied housing

---

[68] For lead paint violations, see Folder "Lead Paint Poisoning Tabulation of Lead Paint Notices, 1956-62," in Box Restricted Material Pulled from Series III, GHW Papers, AMCM Archives. Interview with Sidney Sakols, December 7, 1997, Folder 11, Box 1, East Baltimore Oral History Project, LLSC.

[69] Tenants only listed "Drafts" and "Roaches" more often than "Paint and Plaster," which tied with "Too Hot in Summer." Stegman, *Housing Investment in the Inner City*, 184.

remained congested. In 1961, the city took its first steps to try to crack down on slumlord abandonment. It also started to focus surveys and studies specifically on the problem of abandonment.[70]

The city's findings were not auspicious. In 1964, Baltimore had 4,152 vacant homes, about 30% of which were in good condition and about 30% that were in poor or very poor condition. The rest were in "fair" condition, meaning they needed work and thus could easily have lead paint issues. In the next year, the total number of vacant houses declined to 4,059 – probably due in part to the annual demolition of hundreds of houses through urban redevelopment and highway building – but the percentage of good houses fell to 16% while the percentage of poor and very poor houses rose to 52%.[71] By 1973, the proportion of good houses in the vacant stock, now at 4,600, had fallen by half again, to 8%.[72]

At the root of abandonment was the problem of poor equity in inner city housing, with all its connection to race-based mass suburbanization, blockbusting and speculation. Slumlording further contributed to devaluation through disinvestment in maintenance. This disinvestment may have been calculated negligence, or what was called "milking," or it may have been the more general outcome of investors who had to make their money on current cash flow rather than the long-term value of their properties.[73] The final straw for many of these houses was what was often referred to as "vandalism" but which in practice was often theft. It was poor people in communities with high unemployment stealing, and often stealing from a class of people they saw as exploiting them. In any case, the cost of fixing

---

[70] James Keat, "Council Gets Stiffer Plan to Condemn Empty Houses," *Sun*, April 11, 1961, 26; Frank Somerville, "Vacant House Status Held City Problem," *Sun*, May 12, 1963, 48.

[71] BURHA, "Second Vacant Residential Structure Inventory," May 1965, 9, Folder 22, Box 4, Series X, BURHA, LLSC. Housing demolition: 1964 was a bit of a lull for urban renewal demolition, but there was still some going on. Francis Kuchta-File to Ottavio Grande, Memo: Monthly Progress Report, January 1965, Construction-Demolition Division, January 28, 1965, 1-5, Folder 1965 Jan-June, Box 8, Series II, BRG 48 (Department of Housing and Community Development), Baltimore City Archives (hereafter BC Archives).

[72] "Small Decline in Vacant Houses," *Sun*, April 11, 1973, A14.

[73] The question of housing abandonment was often simply an extension of the question about slumlords, their profitability and the scale of the enterprises. Glen Claytor of the National Urban League argued that small-scale, unprofessional entrepreneurs, not large-scale slumlords, usually dominated neighborhoods undergoing abandonment. These owners had little ability to affect the situation, which was the result of a broader system of "racial economics," in which the landlord "plays but a few solo bars in a well-orchestrated symphony of prejudice and bigotry." Glenn Claytor, "To Be Equal: The Urban Cancer of Abandoned Housing Must Be Stopped," *Afro-American*, May 1, 1971, 4. According the *Sun*, most of the dilapidated, abandoned homes in 1964 belonged to owners who had several such properties. This suggested, the paper wrote, that the city was "up against the absentee slum landlord who 'milks' a house of all he can and puts nothing back into maintenance." "Vacant Houses," *Sun*, March 14, 1964, 12.

vandalized or burglarized houses did not make sense for slumlords and they abandoned the properties. In some cases, this was drawn out for years, with slumlords refusing to pay taxes or seriously neglecting maintenance while continuing to collect rents.[74]

Exploitation and Discrimination

When Baltimore launched its Housing Code Enforcement Committee in 1945, Thomas Waxter, director of public welfare for the Baltimore City Housing Authority, warned that it might be for naught. "All this enforcement will not be much good to the low-income groups unless you subsidize housing," Waxter said. "Those groups cannot afford the houses they are getting and they will make slums out of good houses."[75] Waxter was right that housing affordability would be a problem. But the housing deterioration he anticipated was more so the result of exploitation and racial discrimination in rents, housing prices, mortgages and contracts, that left black Baltimoreans paying more for the same level of housing that white Baltimoreans received. By 1966, Baltimore's Urban Renewal Agency recognized that the consequence of this "imbalance" was that African Americans had less "consumer income available for home maintenance and improvements [have] been limited."[76] Among other things, that meant that they suffered more from lead paint hazards.

[74] U.S. Department of Housing and Urban Development, *Abandoned Housing Research*; Stegman, *Housing Investment in the Inner City*, 63–66. The consistent use of the term "vandalism" is misleading because it gives the impression of young kids or anti-social people destroying houses for fun. Some of that certainly happened, but newspaper articles were more likely to discuss theft from these houses. Thus, anti-vandalism bills were aimed at trying to put an end to the trade in stolen house fixtures. Understanding that "vandalism" was often theft of expensive fixtures also helps us understand why this could become so expensive for owners to fix. It was not just broken windows, but the gutting of the most valuable house materials. "Vandalism Losses Rise," *Sun*, March 24, 1957, 34; Frank Henry, "Baltimore's Hit-And-Run Vandals," *Sun*, July 9, 1961, FA1; "Aimed at Vandals," *Sun*, October 2, 1970, A12. Finally, when people, particularly tenants, did aim to damage property, rather than steal, they often did so because they felt exploited. One frequent complaint of tenants to BNI was that they did not get their deposit back. (With the help of BNI, they often prevailed in getting the deposit back, suggesting this complaint had a basis). Believing they would not be fairly reimbursed, some apparently vandalized their rental before they left. See for example, BNI Board of Directors Meeting Minutes, January 6, 1969, 2; February 3, 1969, 2; March 3, 1969, 3; in Box 1, Series II, BNI Records, LLSC. More generally, the landlord, and especially the landlord's property, was one of the main interfaces aggrieved African Americans had with a broader system of oppression. Vandalism was one way of expressing anger at that system. Frances Fox Piven and Richard Cloward, *Poor People's Movements: Why They Succeed, How They Fail* (Knopf Doubleday Publishing Group, 2012), 20.

[75] "Housing Code Group Forms," *Sun*, September 12, 1945, 10.

[76] BURHA, "Community Renewal Program," 1966, in Folder 2, Box 10, Series XII, BCDP Records, LLSC.

One way for investors in inner city rentals to increase profits was to defer maintenance. Another way was to increase rents. The tight rental housing market for African Americans provided ideal circumstances for landlords to jack up prices. Since landlords did neglect houses, maintenance that would defend against lead paint deterioration (re-painting, weatherizing and so on) often fell to tenants. But if tenants had to spend more on rent, they had less to spend on maintenance.

A study by the city in 1950 showed census tracts that were predominantly black had higher median rents, despite being more deteriorated, more crowded and worth less on the market. A few inner city census tracts were at the bottom of the barrel for both median value and rent. These were mostly black, but included a few white census tracts as well. Outside of these tracts, the pattern was that white tracts in inner city Baltimore (to the south, southeast and southwest of the CBD) were in the bottom tier for median rent and in the second tier for median housing value, while the reverse was true of the black inner city tracts. (Although a few black tracts were in the second tier for both rent and value). As noted above, the mismatch between the market value of houses and their rents was important to the rise of slumlording. But it also meant black tenants paid more for the same housing or worse housing.[77] Similar studies of rents in 1960 also found that African Americans paid more for the same quality of housing, were over-represented in deteriorating housing, and were much more likely to pay a large percentage of their income (35% or more) toward rent. The disparities in housing quality for the same rent payments were particularly pronounced outside of the lowest tier of rent payments. Lead paint hazards thus threatened middle-class black renters more than their white counterparts, while the hazards for the poorest black and white renters were more similar.[78]

---

[77] Housing Authority of Baltimore City, *Baltimore's Housing Situation in Charts* (1954), Frances Loeb Library, Harvard University.

[78] BURHA, "Rent and Housing Conditions by Race, Baltimore, Maryland, 1960," Folder 19, Box 4, Series X, BURHA Records, LLSC. The convergence of the housing situation for the poorest White and Black residents was evident in 1950 as well. African Americans payed virtually the same for rock-bottom "slum" housing as Whites did in 1950 (median gross rents were 38.56 and $38.48). "A Census Survey of Rents in Slum Areas," *Sun*, May 2, 1950, 12. One remaining disparity was the Black slum housing was more crowded than White slum housing, which may have contributed to lead paint hazards independently of housing condition. Nevertheless, this convergence is interesting in light of contemporary studies that, using rich spatial data, have found a black-white gap in blood lead levels, except at the lowest socioeconomic levels, where it disappears. Heather Moody, Joe Darden, and Bruce

Black home buyers also paid more for similar housing. A study by BNI found that speculators bought homes in neighborhoods being block busted for below market rate, and then sold these same homes for higher than market rates to African Americans. That is, speculators sold them for more than their pre-blockbusting sale prices would indicate they were worth – around 10 or 20 thousand dollars more in today's currency.[79] But getting a price was just the beginning. Because of discriminatory lending practices, black homebuyers had to settle for higher rate loans and second mortgages. Banks and other lenders who stated openly that race was a factor in loan considerations or the loan process were rare. However, 92% refused to answer a survey question asking whether non-White borrowers were as good a credit risk as white borrowers. And some lenders believed it was their job to decline loan applications to black buyers who wanted to purchase in white neighborhoods.[80]

Thus many black Baltimoreans could not even get approved for relatively unfavorable traditional home loans. Desperate to own their own homes, they entered into land installment contracts. In these contracts, the buyer paid a "rent," which included the principle, interest and other bills and fees. Only when the renter paid off the principle did they gain title to the property (as opposed to at the beginning with a traditional loan). Installment contracts were not inherently shady. Middle class people furnished their homes and kitchens with them. But their use in the black housing submarket was mercenary. Professional speculators as well as professional landlords trafficked in installment contracts. These contracts were a way to get around both rent control and interest rate limits. Installment payments (often called "rents") were exorbitant, sometimes twice the fair rental price. In addition, the contracts allowed sellers to reclaim property for small missed payments. Thus families who had paid thousands of dollars into their dreams of homeownership could lose everything as a result of temporary hardship. Sellers could reap huge profits. They jacked up prices on acquired properties by an average of 80%, rented/loaned them

---

Pigozzi, "The Racial Gap in Childhood Blood Lead Levels Related to Socioeconomic Position of Residence in Metropolitan Detroit," *Sociology of Race and Ethnicity* 2, no. 2 (April 1, 2016): 200–218.

[79] BNI, "Final Report: Changes in Cost of Homes with Change in Racial Occupancy, White-Negro, in Four Blocks on Longwood Street, Baltimore, Maryland," unpublished report, no date, Folder 47, Box 1, Series VI, BNI Records, LLSC.

[80] Vernon Stone, "Bank Financing of Minority Housing," 1961, Folder 74, Box 1, Series VI, BNI Records, LLSC.

for exorbitant costs, and in some cases took repossession of them to resell. The seller, as the *Sun* put it, "cannot possibly lose."[81] Because of the exploitative terms of these contracts, the buyers/sellers had little money to spare for maintenance. One mother and daughter who signed a contract had to pour 60% of their earnings into payments, for example.[82]

Misinformation and pernicious legal ambiguity also saddled these transactions. Realtors used installment contracts to sell run-down houses to unknowledgeable buyers, an aspect the Maryland legislature sought to ameliorate by requiring a "certificate of minimum condition" with the contracts.[83] The contracts also muddied which party had claim, control or responsibility for the property, including housing maintenance. From the late 1940s and into the 1960s, sellers/landlords denied that they were responsible for housing code violations in contracted houses. If they did maintenance, they added the cost to the buyer/renter's bill. Early on, the courts decided it was the responsibility of the tenant/owner, but later in the 1950s and 1960s they put more responsibility on the realtor/landlord. This waffling kept responsibility uncertain and kept enforcement of regulation at bay.[84]

For all these reasons, installment contracts indirectly caused lead poisoning. Both the explicit and ambiguous parts of the contracts shaped the practices of the sellers and buyers, whose actions, or lack thereof, pried lead particles from the walls and ceilings of houses. Installment contract homes often

---

[81] Before 1951, sellers could simply evict the buyer, repossess the house and keep all the money paid into it. A 1951 law put more strictures on this process. The law gave buyers the opportunity to pay off their debt before losing their house. But this was not usually possible because they had been sold a house at a price that was not commensurate with the market. Rather than do that, the seller usually offered to give the buyer some small amount of money and the seller would reclaim the title. Odell Smith, "Slick Speculators: Few Home Buyers Know Rights under 1951 Law," *Sun*, December 15, 1954, 28. To get around interest rates ceilings, installment purveyors simply raised the principle (the price of the home) in the contract. This was not as easy to do with a traditional loan, where the bank vetted the value of the home. Odell Smith, "Small Clique Turns 'House-Selling' Business into Get-Rich Scheme," *Sun*, December 13, 1954, 30. For 80%, see Maxine Mitchell, "Contractual Exploitation: A Case Study of the Contract Buyers League in Chicago." (Thesis, Massachusetts Institute of Technology, 1973), 42. Mitchell challenges the idea that the risk of high default rates legitimized the "inflated prices and oppressive contract terms" of the LIC, because these defaults were quite rare and were based on erroneous ideas about indicators of credit risk for low-income people (page 47).

[82] Odell Smith, "Small Clique Turns 'House-Selling' Business into Get-Rich Scheme," *Sun*, December 13, 1954, 30.

[83] "Home Repair Bill Planned," *Sun*, January 20, 1955, 12.

[84] "Ruling Affects Owners of Record: Housing Violation Corrections Decreed Their Responsibility," *Sun*, August 1, 1951, 28; "Responsibility Shifted in Making Slum Repairs," May 20, 1952, 10; "Slick Speculators: Few Home Buyers Know Rights Under 1951 Law," *Sun*, December 15, 1954, 38; Smith, "Slick Speculators: Few Home Buyers Know Rights Under 1951 Law," *Sun*, December 15, 1954, 28; "Land-Installment Contracts Argued Before House Group," *Sun*, February 23, 1955, 32.

showed up in news articles about housing violations, including lead paint problems. The shadowy nature of the contracts makes it difficult to get good data on them. Local governments did not usually record them. One Baltimore study from 1955, however, found that 53% of 347 black homeowners had signed these contracts.[85] In official statistics, government agencies usually listed land installment contracts as rentals. Thus some of the "rentals" that the Baltimore City Health Department identified as culprits for lead paint hazards were probably installment contracts. In newspapers, land installment contracts showed up frequently alongside mentions of lead poisoning and lead paint violations.[86] Herbert Kaufman a well-known slumlord and speculative contract seller, under the telling corporate name "Standard Liquidators," chalked up lead paint violations.[87] Morris Garbis, for his part, claimed that 80% of his convictions on housing violations were from his land installment contracts, not his rentals.[88]

People and Places: The Geography of Slumlords and Lead Poisoning

Mass, race-based suburbanization was a major driver of inner city housing uncertainty, devaluation, and exploitation, and, by extension, lead paint deterioration. But there was another connection between suburbanization, housing deterioration, and lead paint problems: Most of the owners of properties with lead paint violations lived in the suburbs. The Baltimore City Health Department tracked where lead paint violations had occurred and who owned those houses. Mapping the records of these violations, a total of 570 from 1956 to 1962, can show us a lot about how policies and markets shaped the distribution of financial and environmental costs and benefits in the post-war metropolis.[89]

---

[85] Commission on Interracial Problems and Relations, *An American City in Transition; the Baltimore Community Self-Survey of Inter-Group Relations* (Baltimore, 1955), 54, Pullen Collection, LLSC.

[86] In 1955, the Housing Court convicted two realtors who dealt in land installment contracts, one from the suburb of Ashburton and one from the suburb of Cross Country, of violating health laws in two houses on the 1200 block of North Spring Street. "2d Trials Denied in Health Case," *Sun*, April 26, 1955, 24.

[87] On Kauffman's contracts, see Odell Smith, "Suit is Filed in House Deal," *Sun*, December 19, 1954, 17.

[88] Garbis's claim may have been part of his strategy to avoid responsibility for violations because the aforementioned contention over housing maintenance responsibilities under installment contracts. "State Agency Gives Garbis Reprimand," *Sun*, February 1, 1961, 36; "Housing Court Fine is $1,800," *Sun*, May 30, 1962, 18.

[89] This is a complete set of lead paint violations from this time period with the exception of five addresses I could not identify and three addresses that are not pictured on the map. These three addresses are for landlords in areas outside the map frame. Two are to the south, in suburbs of Bethesda and Hyattsville. The third is from Gibson's Island, now a gated community that is the most affluent zip code in the country.

The Health Department's data suggests that blockbusting, redlining and slumlording all contributed to lead paint violations. The BCHD recorded a substantial number of lead paint violations in neighborhoods that transitioned, via blockbusting, from white to black in the 1940s, '50s and '60s (the striped grey and light grey areas on the map in Figure 38). Violations in these neighborhoods that transitioned in the post-war period reflected the deterioration that resulted from housing uncertainty, speculation, and exploitation. But the vast majority of lead paint violations in this period were located in neighborhoods that had been black or low-income for some time (the dark grey areas). Thus redlining and the rise of slumlording in places that were already black before WWII were probably the cause of the bulk of increased lead paint hazards in the post-war period. These patterns challenge the narrative put forth by some historians of lead that the increase in child lead poisoning cases in the 1940s, '50s and '60s primarily reflected poor families moving into formerly wealthy homes or black families moving into formerly white homes. That may have happened in some cases, but most of the cases are concentrated in areas that had long been black and poor.[90]

[90] For these narratives, see English, Old Paint; and John C. Burnham, "Unraveling the Mystery of Why There Was No Childhood Lead Poisoning," *Journal of the History of Medicine and Allied Sciences*, 60 (2005), 445-477.

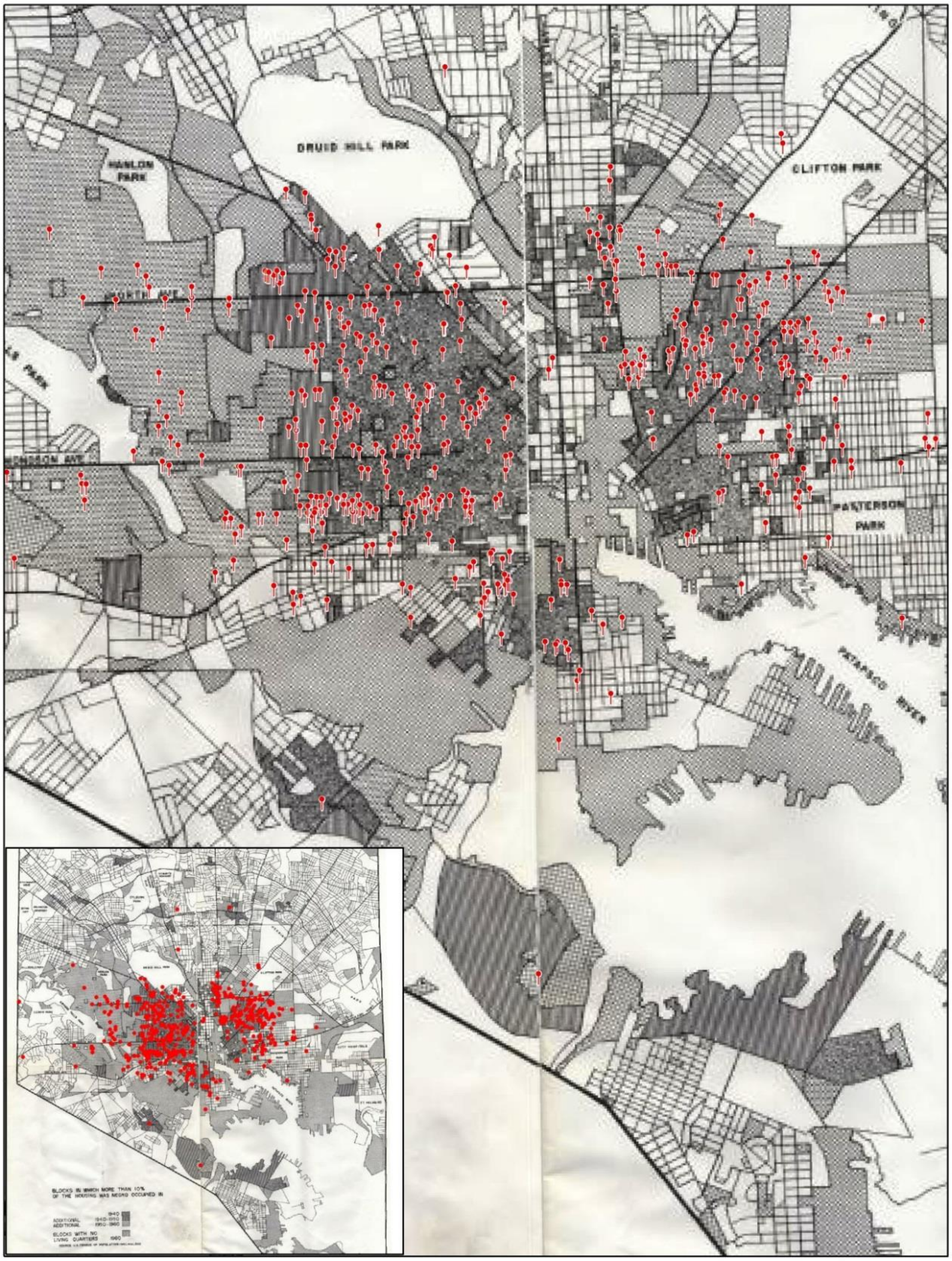


Figure 38: Houses with lead paint violations in Baltimore, 1956-1962 overlaid on patterns of black residence. The map shows that most lead paint violations (red dots) were located in neighborhoods that already had many black residents in 1940, but some of the violations are also in more newly black areas. The base map shows changes in the percentage of black residents in census blocks in 1960s. Dark grey blocks = more than 10% black residents in 1940; Dark grey stripes = more than 10% black residents in 1950; Light grey = more than 10% black residents in 1960. **Sources**: Folder "Lead Paint Poisoning Tabulation of Lead Paint Notices, 1956-62," in Box Restricted Material Pulled from Series III, GHW Papers, AMCM Archives; James Rouse and Co., "Areas of Negro Residence in Baltimore," in Folder 25, Box 1, Series VI, Baltimore Neighborhoods Inc. Records (hereafter, BNI), LLSC. **Map**: Leif Fredrickson.

Lead paint violations were concentrated in the inner city, but the map shows that a substantial number of the landlords/owners responsible for these violations were also located in the inner city (Figure 39). About 13% were at the same address, meaning they were either owner-occupiers or they rented out rooms in their home. Another five percent were located very close to the address where the violation happened, within a few houses or blocks. These were presumably people who owned a few apartments together or owned another home in their neighborhood. They may also have been relatives.[91] These landlord dots are small, meaning they had only one violation – and probably did not own much more than a few properties. Many were likely black homeowners who took on boarders in order to afford the (relatively expensive) terms of the mortgages or installment contracts.

An additional 100 landlords had addresses located in the inner city, but were not located near the properties where the violations occurred. Most of these were businesses address (hollow icons on the map). But some were probably much like the group just described – individuals who owned a rental or two as a way to make ends meet. These types of landlords often had few resources to maintain or rehabilitate the properties they bought or came to own.

[91] For example, one man was convicted of lead paint violations for the home he owned nearby where his son and grandchildren lived in "Child Lead History of 3 Cases in One Home…" Folder Lead Paint Poisoning Cases 1931-1932, Box Restricted Material Pulled from Series II, GHW Papers, AMCM Archives.

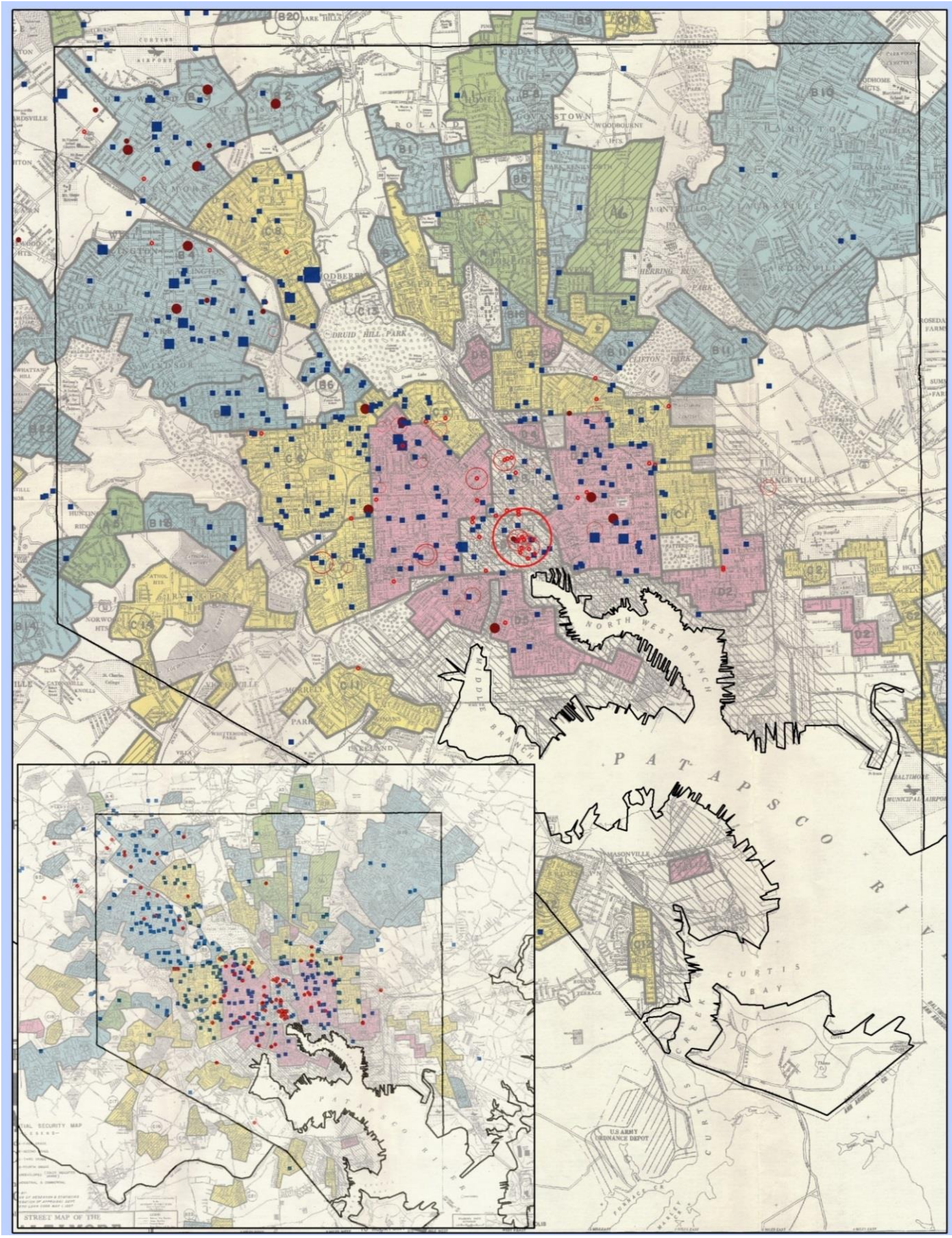


Figure 39: Landlords with lead paint violations 1956-1962 with HOLC risk map. This map shows the suburban location of landlords with lead paint violations and the correlation with government mortgage backing. Size of icon = Relative number of lead paint violations; Red/circle = Professional landlords; Blue/square = Not professional or unidentified. Hollow icons = Not a home residence. **Sources:** HOLC, "Residential Security Map – Baltimore Area," (1937), MA Collection, MESC; Folder "Lead Paint Poisoning Tabulation of Lead Paint Notices, 1956-62," in Box Restricted Material Pulled from Series III, GHW Papers, AMCM Archives. **Map**: Leif Fredrickson.

The rest of the landlords, about 65%, were scattered throughout the metropolitan area. Some worked from home (solid icons), but larger ones usually had an office. Many offices were located in the Central Business District, or in the corridor to the north of the CBD, but some were also located in the neighborhoods where they held rentals. Those who worked from home lived in the suburbs, and those who worked in an office in the inner city or CBD usually lived in the suburbs as well, whether that was in the county or in the outer ring of housing developments in the municipal boundary. Some of the landlords who had been around for a long time, however, lived in what was essentially an older suburban transition zone between the inner city and the relatively new suburbs that were on the periphery of the city.

The biggest source of violations came from professional landlords (red icons are professional landlords and larger icons represent more violations). It is likely that some of the landlords that I could find no information on were also professional landlords (and thus should be red rather than blue). But it is clear that significant number of these suburban landlords were not professionals. They were individuals who had decided to invest a little in inner city rentals. A Baltimore *Sun* article suggests that non-professionals may also have taken advantage of reduced property values to invest in housing just as slumlords did. As blockbusting, residential change, and housing deterioration picked up speed around 1952, the *Sun* noted that the devaluation of property due to the "*en masse*" change in neighborhoods could provide a "good investment for the average person." The type of investment the writer of the article had in mind was buying a house on the cheap, fixing it up, and living in it. Or perhaps living in it and also renting part of it out. [92] But some Baltimore suburbanites took the investment opportunity in another direction by becoming small time renters of dilapidated houses. Unlike newspaper stories about professional slumlords and penniless inner city home owners, the housing violations of these landlords rarely made the papers. But they made up a good portion of lead paint violators, as the records of the Baltimore City Health Department indicated.[93]

[92] "Older House Can Give Good Return for Price," *Sun*, September 14, 1952, C16.
[93] One example of this was a suburban couple from Baltimore County. The man was a wholesale drug salesman, originally from Baltimore City, who bought a split level house with his wife in the freshly hatched suburban development of Milford Mill in 1956. In 1959, the couple bought another property. It was a little rowhouse in the

We can view the maps in Figure 38Figure 39 as visualizations of the flow of money, capital and environmental hazards, as well as the way public policy structured those flows. Government insurance helped whites buy homes in suburban areas around the inner city (the blue and green areas on the HOLC map), while cutting off investment funds for housing in the inner city (the red areas). But while this led to re-segregation of neighborhoods and housing at the metropolitan scale, it did not sever the connections between the suburbs and the inner city. If we take the landlords on the map to be an approximation of where slumlords, or at least somewhat negligent landlords, lived, we see that most of them lived in the suburbs. Professional landlords who had offices based in the urban core virtually always resided in the suburbs.[94] Thus profits from rentals in the inner city generally flowed outward, to the suburbs. Moreover, part of those profits were built on the systematic neglect of housing in the inner city, including – and perhaps especially – the neglect of paint. So while this sort of management of housing yielded profits that flowed out of the inner city, it also yielded environmental hazards that accumulated in the inner city.

neighborhood in west Baltimore, on block 7121 (Figure 4). They do not appear to have bought any other properties in the city or the county. The couple bought properties on the same block as some well-known speculators and blockbusters, such as "Straw Man Incorporate," and Manuel Bernstein and Warren Shaw. The suburban couple bought from another couple, however, not a land speculator, and they got financing through the Municipal Building Association. Not much other information is available on them, but they seem to be an example of small time suburban realtors who were successful. Their tenants, however, were subject to deteriorating lead paint as a 1960 violation record from the BCHD indicates. From property data see, Maryland Land Records, Block 2171, Block Book MSA CE9 986, 1954-1959, mdlandrec.net. The owner was Irvin Norwitz. See 1940 Census, Baltimore City, Maryland, Ward 15, Block 33, Line 21, Sheet 6A, page 5676, image from ancestry.com. Date of marriage inferred from obituary, *Sun*, February 16, 2005. Later, was listed as a rental in the *Afro-American* as a rental (classifieds, April 20, 1968, 21). The block probably began flipping from Black to White around 1957. See "Baltimore's Changing Neighborhoods," *Sun*, November 23, 1958, A1; Baltimore City Health Department, "Census Tract Map of Baltimore City Showing Areas Where Negro Births Exceeded 50% of Total Births, 1957," Folder 25, Box 1, Series VI, BNI Records, LLSC.

[94] I was able to find information on most of the large, professional landlords. They all lived in the suburbs.

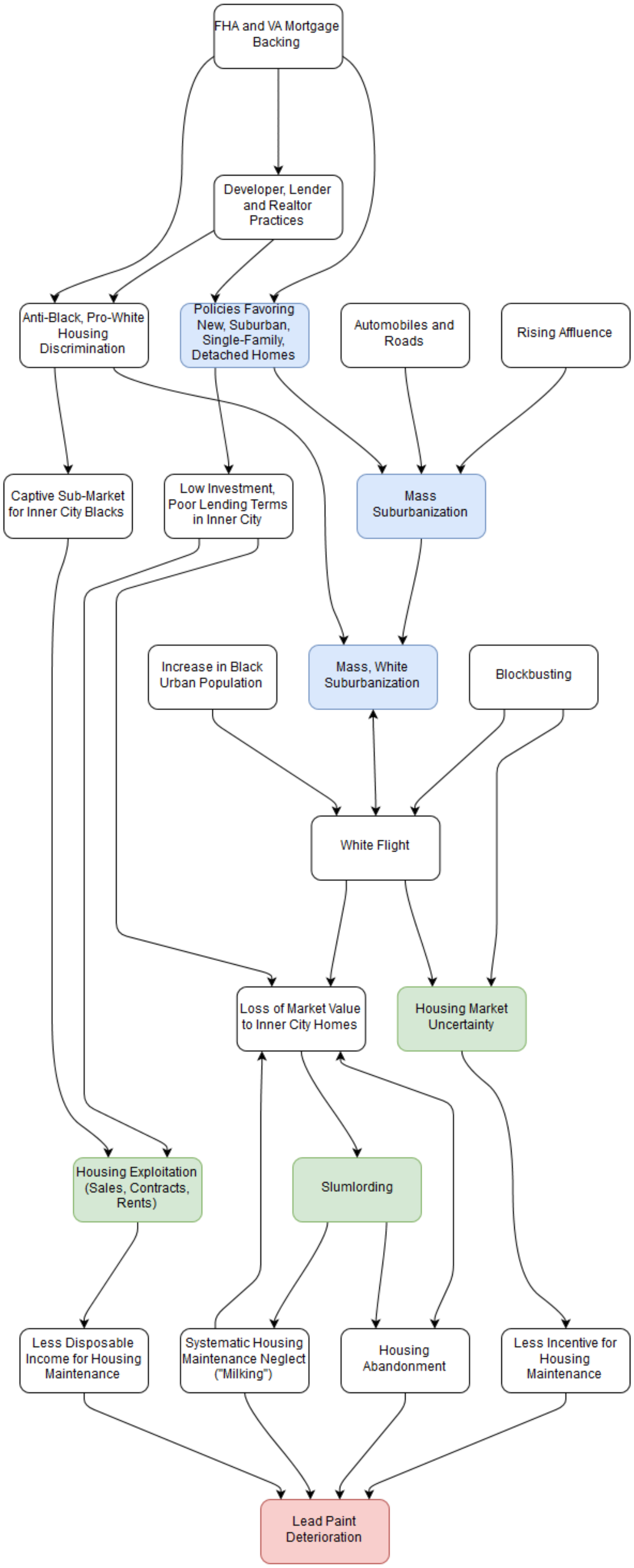


Figure 40: This diagram shows the causal chains discussed in this chapter that connect policy and metropolitan change -- namely, massive, race-based suburbanization -- to lead paint deterioration in the inner city. The blue boxes are key aspects of suburbanization, and the green boxes are the three housing dynamics outlined above that caused lead paint deterioration. **Figure:** Leif Fredrickson.

Conclusion

Post-war housing deterioration was a complicated process. Uncertainty, devaluation, exploitation and discrimination overlapped and fed on each other. It is worth recapping and diagramming how these processes unfolded and interacted (Figure 40).

As I have argued, three housing dynamics rooted in race-based mass suburbanization were critical to inner city housing deterioration from the 1940s to the 1960s. The first dynamic was *uncertainty* in the housing market. Before World War II, some Baltimore neighborhoods had changed from white to black as African Americans asserted their right to own and reside where they pleased. Catalyzed by World War II, this process of neighborhood racial change accelerated in and after the 1940s. More African Americans lived in the city, and they pressed into formerly white areas. White people, who did not want to live near black people or feared a loss of property value, moved out. Realtors, known as "blockbusters," amplified these fears in order to get white people to sell, and to sell cheaply.

All of this might have looked much like the pre-WWII shifts in neighborhoods were it not for a massive new housing market in the suburbs. Suburban developments blossomed in response to rising affluence and liberalized federal housing policies. They flooded the housing market and provided a place for inner city white people to flee. This easy, residential mobility produced great uncertainty in the inner city housing market. The movement of a black family onto a street could drain the value of a house overnight – at least that is what blockbusters warned and white residents believed. White homeowners did not know if they would recoup investments in their home and they were thus reluctant to maintain them. Speculators, meanwhile, sought to gain from the uncertainty in the market, buying cheap from fleeing White people and selling dear to black housing sub-market. These speculators had no interest in maintenance while they held houses, however. They invested in arbitrage, not paint.

The second characteristic, related to uncertainty, was the *devaluation* of inner city housing that opened the door for slumlording. Slumlords often made large profit margins on their rentals and some of them became very rich. In addition to having a captive market in black people as a result of housing discrimination (public and private), keeping operating costs low was critical to successful slumlording.

That meant paying as little as possible for maintenance, taxes and, above all, for the initial housing investment. Getting properties for cheap was crucial to highly profitable slumlording. As noted above, mass suburbanization combined with blockbusting kicked the legs out of home prices in neighborhoods with fleeing white people. As black people moved into these formerly white neighborhoods, older black neighborhoods, where constricted supply had propped prices, lost value. These devaluations, particularly the latter, provided fertile soil for slumlords. But it also made slumlord rentals different from other kinds of rentals, because their properties often had little or even zero value in the housing market. Whatever money was to be made would be made primarily on rent, not on any equity built up in the house, which was a significant, even dominant, way other landlords made money. Slumlords thus had little incentive to invest in their properties and they had a strong incentive to spend as little on maintenance as possible to increase their short term (rental) profit margins. At worst, they "milked" properties, allowing their properties to sink into decrepitude while collecting (often exorbitant) rents. They did this out of greed as well as mismanagement. When milking was not enough or when it went on so long that housing was no longer viable, slumlords often abandoned their properties. Housing deterioration and housing abandonment resulted in lead paint deterioration. And both, especially abandonment, further depressed home prices, creating a cycle of slumlording and abandonment.

The third dynamic was the combination of *discrimination* and *exploitation* in the housing market. Race-based housing laws and practices severely restricted the housing black people could rent or buy. Subject to basic laws of supply and demand, and facing limited supply due to legislation and social practices that artificially limited that supply, realtors and landlords could charge African Americans more than what a white person would pay for the same level of housing. In addition, lenders and federal policy makers considered black homebuyers and inner city homes to be high-risk investments. If they could get homes at all, black buyers or those buying in the inner city had to pay higher interest rates. If they could not get traditional financing, they had to turn to rent-to-own deals called land installment contracts that were extremely exploitative. Among other things, high prices for housing meant that black owners and renters had less money to spend on home maintenance. And many ended up taking in boarders to help cover costs, which put more wear and tear on housing. Lead paint deterioration was one result.

In general, neighborhoods followed a progression in which the threat of blockbusting and racial change (white to black change) produced uncertainty and devaluation, which invited housing speculation and then yielded exploitative rental, lending and installment contracts for housing. This progression happened at different times in different neighborhoods. Blockbusting and white flight peaked in the inner city between about 1955 and 1965. Neighborhood change and devaluation happened at different times in different neighborhoods, but in general the process occurred first in neighborhoods close to the center of the city and in older black neighborhoods. Eventually the systematic exploitation, capital scarcity, and maintenance neglect of neighborhoods led to further devaluation and abandonment, with housing abandonment reaching crisis levels for Baltimore and other cities in the 1970s.

While lead paint and other environmental hazards piled up in the inner city, those in the suburbs benefited from better– healthier and wealthier – housing. But the development of suburbs and the inner city in post-war America was more than a story of divergent development helped along by federal policies. Mass, race-based suburbanization accelerated the decay of urban housing at the same time it provided better housing for those in the suburbs, thanks in part to the federal government's mortgage insurance policies. They did so, largely, by getting houses at rock-bottom prices and draining the value from them. This could take decades, but the long-term effects of this slumlord capitalism was to slowly ransack the capital stock of inner city housing.

As historians of American capitalism have argued, we need to be attentive to the ways in which capital investment – perhaps the defining aspect of capitalism – changes across space and time.[95] Slumlord capitalism is clearly different than many forms of capitalism in which profits are re-invested into factories, technology and training to increase the stock of physical or human capital. But it is perhaps not unique. It is akin to what urban capitalists from Chicago did with their forested hinterlands in the

[95] Louis Hyman, "Interchange: The History of Capitalism," *Journal of American History* 101, no. 2 (September 1, 2014): 503–36.

nineteenth century. After getting these resources at rock-bottom prices, they clear cut them, and left the stump-filled wastelands to burn. They stopped paying taxes on them, letting them revert to state ownership. In short, they acquired natural capital (forests) for prices well below what they were worth. But rather than maintaining their capital so that its productivity could be used sustainably, they cashed in on it, raking in profits over decades until their capital was all used up.[96]

In the case of Chicago and the surrounding forests, profits flowed from the periphery to the urban core, while environmental problems accumulated in the periphery. In the case of lead paint hazards and post-war metropolitan Baltimore, these relations were reversed. Benefits and slumlord profits flowed to the periphery, while environmental hazards accumulated in the urban core. This was the Golden Age of the American Suburbs, as well as the Golden Age of the American economy. In the inner city, however, slumlords mined housing, and one of their by-products was a toxic heavy metal. The 1950s and 1960s might have been the Golden Age for some, but for people in the inner city, it was the Age of Lead.

[96] Cronon, *Nature's Metropolis*, 168–72.

Chapter 5 – Healthy Housing and the Health of the State: Clearance, Codes and the Struggle to Eliminate Lead Paint Poisoning

Mass race-based suburbanization spurred the spread of disinvestment and slumlording in Baltimore's post-war housing market, especially the sub-market for African Americans. As owners and managers abdicated housing maintenance, lead paint deteriorated and child lead poisoning cases vaulted to agonizing heights. Just as there was nothing natural about the decline of inner city housing in the post-war period, there was nothing that precluded governments, organizations and citizens from implementing policies to roll back housing deterioration, segregation, exploitation and lead poisoning itself. There were many people and organizations in Baltimore, including the municipal government, that had a stake in these post-war urban problems, particularly the problem of housing deterioration – "blight" and slums. Social welfare and civil rights organizations, not to mention residents themselves, worried about the effects of these changes on health, quality of life, housing opportunity, and property values. Many people who did business in the city, or who owned or looked to develop property in the city, became concerned about their investments. Baltimore City, meanwhile, faced a problem of rising service costs and an eroding tax base (Figure 41). The flagging tax base was the result of people and businesses leaving the city, as well as the consequent deterioration of housing in the city. Deteriorating housing, meanwhile, also contributed to rising service costs. Directly or indirectly, slums and "blight" cost the city, whether it was in care of the indigent and sick – including children with lead poisoning – or in attempts to intervene to make homes and neighborhoods safer and healthier.[1]

---

[1] The CPHA claimed that Baltimore's "blighted district" covered 9.5% of the city's area and received 40% of the city's budget. Property values in those areas decreased by $10 million from 1938 to 1945. Altogether, the net loss in government income from the tax revenues versus city spending on blighted areas equaled about $1.25 million per year. Citizens Planning and Housing Association, *The Battle of the Slums* (ca. 1948), 7, Folder 6, Box S2B-B6, Series II, Citizens Planning and Housing Association Records (hereafter, CPHA), LLSC. Similarly, two writers from the *Baltimore Sun* argued that, "Slum housing, which comprises about 20% of this country's residential areas and contains at least a third of its population, yields only 6% of the real-estate tax revenue that is the mainstay of municipal governments. In return for that 6%, slums require, on a national average, more than half of the available medical and institutional care, half the time of the police, more than a third of the time of the fire departments, and most of the welfare benefits." Edgar Jones and Burke Davis "Slum Clearance at a Profit" *Atlantic Monthly*, May, 1949, reproduced in Nathan Straus, *Two-Thirds of a Nation: A Housing Program* (Knopf, 1952), 43.

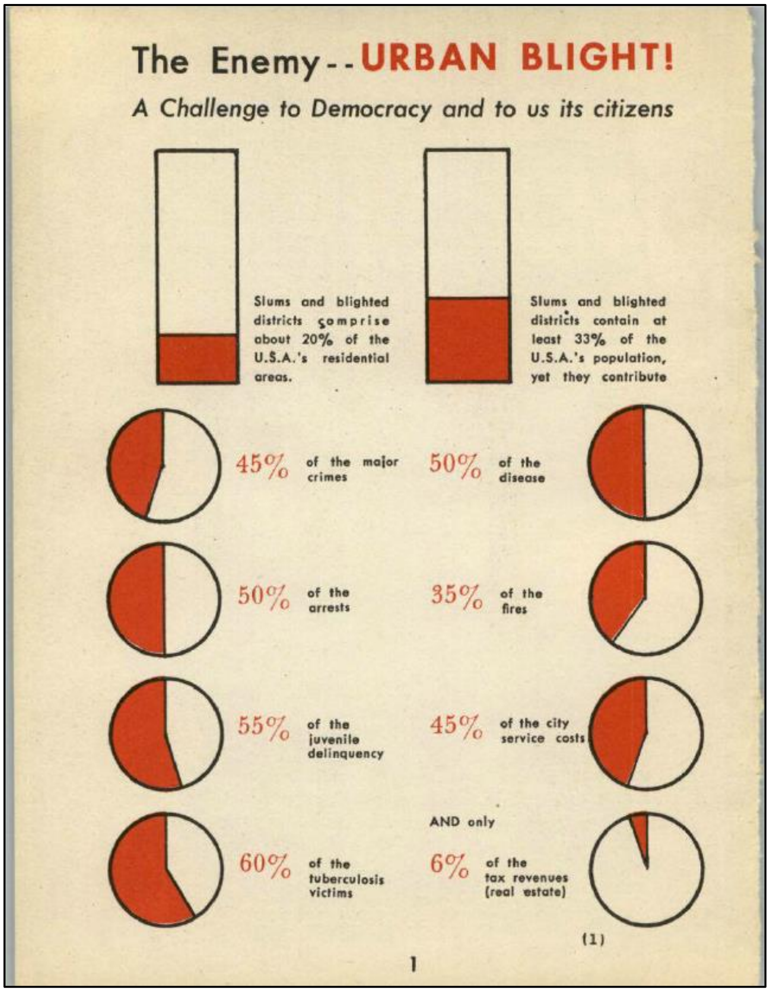


Figure 41: The Citizens Planning and Housing Association in Baltimore used graphics like this one to make their argument that slums and blight threatened governance and burdened tax payers. In the post-World War II period, central city governments faced problems of declining tax base and increasing costs for services. Slums and blighted areas became a focal point for municipalities and private organizations that sought to maintain fiscal solvency and reduce tax burdens. **Source:** Citizens Planning and Housing Association, *The Battle of the Slums* (ca. 1948), 1, Folder 6, Box 6, Series II, CPHA Records, LLSC.

People and organizations with a stake in these problems considered and pursued various responses in Baltimore during the 1940s to the 1960s. They sought to build, demolish, redevelop, rehabilitate, and conserve aspects of the urban built environment in an attempt to "renew" the city (in the parlance of the time). Heavily overlapping with urban renewal were more specific attempts to mitigate or eliminate slums and blight – a goal in Baltimore since the late nineteenth century. There were seven approaches to mitigating or eliminating slums and blight in this period:

1. Housing regulation: This mostly took the form of creating and enforcing building codes and health codes. But regulation could also include the rent control and consumer protections.

2. Voluntarist action: Education, moral suasion and the provision of resources provided by various public-private partnerships and self-help and charitable organizations.
3. Slum clearance: The destruction of poor quality housing.
4. Public housing: The building and socialization of housing, especially low-income housing.
5. Open housing: Desegregating housing in the urban core and the suburbs in order to eliminate the housing sub-market for African Americans, which slums thrived on.
6. Filtering: Government policies to support and subsidize middle-class housing development so that low-income people could "filter" up[2] into older middle-class housing, leaving slum housing behind.
7. Low-income housing support: Government policies to support and subsidize the low-income housing market.

Lead paint hazards were bound up in these strategies aimed at urban renewal and the elimination of slums and blight, even when the explicit goals of these strategies never mentioned lead paint. Some of these programs did include provisions aimed at reducing lead paint poisoning, however. And the city also enacted several policies and programs with the main goal of curbing child lead poisoning.

The strategies for dealing with urban renewal, blight and slums took place in the context of both local and national constraints on these strategies. Baltimore City's growing fiscal bind provided one heavy constraint. The rate of increase in assessed value per capita fell after 1950 while the rate of increase in spending per capita grew. In other words, the city was increasing per capita spending at a faster rate than the value of taxable property per capita was increasing. In response to the flagging tax base and rising service costs, the city raised tax rates after 1950.[3]

But tax raises angered home owners, especially those in the outer areas of the city, and drove more people out of the city to the county where tax rates were lower. This constrained the tax increase strategy. An amendment to the Maryland Constitution in 1948 foreclosed another strategy: annexation. It required a majority vote from any area that a municipality sought to annex. Because these surrounding areas did not want to pay high city tax rates, or pay the cost of enhanced services for an increasingly

[2] By the 1940s, the language of housing "filtration" was common among urban development experts. Harris, "'Ragged Urchins Play on Marquetry Floors.'"
[3] For appropriation and taxation data, see Department of Planning, "Community Facilities and Services," 1970, Folder 1, Box 1, Series VII, BCDP Records, LLSC.

darkening population, this effectively ended the possibility of annexation. Thus, despite the continuing economic and social interdependence of the municipality and its surrounding areas, the city would not be able to capture any of the tax base from surrounding areas to fund its operations.[4]

But the city was not entirely on its own. The share of city revenue from state and federal sources grew in the 1930s and 1940s, reaching about 1/3 of general revenue in the 1950s and over half by the end of the 1960s.[5] The rationale behind much of this government spending reflected a combination of Keynesian "growth liberalism" – an ideology that sought to make the pie bigger through government stimulus of consumption rather than redistribution of income and wealth – and state-led developmental policy. The FHA and GI Bill housing policies were intended in part to prop up consumer demand, for example. State-led development policy, meanwhile, soared to new heights in the building of the national interstate highway system.[6] At the city-level, the most ambitious attempt to induce development via the built environment was a program eventually known as "urban renewal."[7]

Historians and social scientists have analyzed post-war urban redevelopment and renewal from many angles. Much of this history has been critical. Early on, planners and policy analysts of various

---

[4] Suburban resistance to annexation: Henry Frank, "Maryland's Second City," *Sun*, January 23, 1949, A1. Although Baltimoreans voted against the Constitutional amendment requiring a majority vote for annexation (rather than a plurality, as had been the case), the mayor claimed at the time that he had no intention of annexing surround areas. "6 Amendments Are Approved," *Sun*, November 4, 1948, 15; "Annexation and Local Problems," *Sun*, September 12, 1947, 12.

[5] U.S. Department of Commerce, *Local Government Finances in City Areas 1953*, 6. By 1963, intergovernmental grew to about 42% of general revenue, with federal aid about 8% of intergovernmental. U.S. Department of Commerce, *Compendium of City Government Finances*, 1951, 26, 78. By 1968, intergovernmental accounted for 50% of general revenue, with federal aid contributing about 4.6%. U.S. Census, *Statistical Abstract for the United States*, 1970, 424.

[6] On "growthmanship" economic policy generally, see Robert M. Collins, *More: The Politics of Economic Growth in Postwar America* (Oxford University Press, USA, 2000). On the interstate systems policy context, see Jason Scott Smith, *Building New Deal Liberalism: The Political Economy of Public Works, 1933-1956* (Cambridge University Press, 2006), 252; Joyce Appleby, *The Relentless Revolution: A History of Capitalism* (W. W. Norton & Company, 2011), 301.

[7] Especially good on this is Brent Cebul, *The American Way of Growth: Business, Poverty and Development in the American Century* (forthcoming, University of Pennsylvania Press). See also Jon C. Teaford, *The Rough Road to Renaissance: Urban Revitalization in America, 1940-1985* (Johns Hopkins University Press, 1990); Alexander von Hoffman, "The Lost History of Urban Renewal," *Journal of Urbanism: International Research on Placemaking and Urban Sustainability* 1, no. 3 (November 1, 2008): 281–301.

ideological stripes criticized urban renewal as a top-down, modernist planning folly.[8] Many historical analyses have carried this critique forward, although they have also tempered the idea that urban renewal was planning imposed from above (rather than an often highly coalitional, local endeavor), and have been less harsh on the motives and effects of the program.[9] A second robust literature, perhaps the most generative, has been the role of politics and business in shaping the prerogatives of urban renewal. These analyses have included some of the most vigorous debates in political science, spanning pluralist, elite, and Marxist interpretations of urban renewal.[10] Historians have often found that developers benefited from urban renewal, while low-income and black neighborhoods were destroyed, families were unfairly relocated, and central cities got little, or negative, value out of the projects in the long-term.[11] A few recent analyses have taken a somewhat revisionist approach to urban renewal, arguing that it was beneficial in some ways to cities, even if it was not without serious consequences and was not the best way to try to revitalize cities.[12] But most of the recent historiographical attention to urban renewal has focused on the program's intellectual history, and in particular the way that urban renewal fit into the ideological struggles of the Cold War.[13]

---

[8] Jane Jacobs, *The Death and Life of Great American Cities* (Vintage Books, 1961); Herbert J. Gans, *The Urban Villagers: Group and Class in the Life of Italian-Americans* (Collier-Macmillan, 1962); Martin Anderson, *The Federal Bulldozer: A Critical Analysis of Urban Renewal, 1949-1962* (MIT Press, 1965).
[9] Teaford, *The Rough Road to Renaissance*; Warner, *The Urban Wilderness*.
[10] Robert Alan Dahl, *Who Governs?: Democracy and Power in an American City* (Yale University Press, 2005); G. William Domhoff, *Who Really Rules?: New Haven and Community Power Reexamined* (Transaction Publishers, 1978); John H. Mollenkopf, *The Contested City* (Princeton University Press, 1983).
[11] Sugrue, *The Origins of the Urban Crisis*; Self, *American Babylon*; Highsmith, "Demolition Means Progress Urban Renewal, Local Politics, and State-Sanctioned Ghetto Formation in Flint, Michigan"; Brent Cebul, "Developmental State: Business, Poverty, and Economic Empowerment from the New Deal to the New Democrats" (Dissertation, University of Virginia, 2014).
[12] Brent D. Ryan, *Design After Decline: How America Rebuilds Shrinking Cities* (University of Pennsylvania Press, 2012); William J. Collins and Katharine L. Shester, "Slum Clearance and Urban Renewal in the United States," *American Economic Journal: Applied Economics* 5, no. 1 (2013): 239–73.
[13] Nicholas Dagen Bloom, *Merchant of Illusion: James Rouse, America's Salesman of the Businessman's Utopia* (Ohio State University Press, 2004). See two issues of *Journal of Urban History* that begin with the following introductory articles: Samuel Zipp and Michael Carriere, "Introduction Thinking through Urban Renewal," *Journal of Urban History* 39, no. 3 (May 1, 2013): 359–65 and Alexander von Hoffman, "Coordinator's Introduction to the Forum," *Journal of Urban History* 40, no. 4 (July 1, 2014): 631–33. An excellent recent study of urban renewal that brings together some of these themes – political culture, race, and capitalism – is Connolly, *A World More Concrete*. For the cultural underpinning of renewal via destruction, see Francesca Russello Ammon, *Bulldozer: Demolition and Clearance of the Postwar Landscape* (Yale University Press, 2016).

This chapter takes the history of urban renewal in another direction: Away from the abstract intellectual history to the concrete, or rather to the paint and plaster, and ultimately to the heavy metals in those materials that made their way into people's bodies. Oddly, given the emphasis on public health in virtually every urban renewal legislative proposal or plan, historians have not substantially engaged this topic.[14] Doing so not only allows us to see how these housing and urban development policies affected lead poisoning, but they ultimately yield different interpretations of these programs. One of the leading historians of urban renewal, for example, has argued that the "physical legacy" of urban renewal was limited.[15] Yet if we extend the "physical legacy" of urban renewal to its physical effects on the body, we see that urban renewal, including its failure to actually renew and conserve low-income housing, had a profound legacy. Attuning ourselves to the leaded experience of urban renewal can also bring some less studied aspects of urban renewal to the fore. Code enforcement, for example, was a major issue for post-war cities and an important aspect of urban renewal yet it has received little attention from historians. We have many stories of bulldozers, but few about housing inspectors.

Examining the history of code enforcement and urban redevelopment, alongside related, and potentially alternative programs, such as public housing, shows us how institutions, interests and ideas came together to produce the failures, successes and legacies of attempts to re-make the post-war city. We can see the range of options contemplated by politicians, reformers and residents, and can see how decisions about what, and who, to invest in were made. And we can see who had the power to influence those decisions and who had the power to fight them when they were made.

---

[14] A few important urban environmental health histories mention urban renewal, but do not concentrate on it. See Dawn Day Biehler, *Pests in the City: Flies, Bedbugs, Cockroaches, and Rats* (University of Washington Press, 2013); Samuel Roberts, *Infectious Fear: Politics, Disease, and the Health Effects of Segregation* (University of North Carolina Press, 2009); Julie Sze, *Noxious New York: The Racial Politics of Urban Health and Environmental Justice* (MIT Press, 2006). One psychiatrist has delved into the mental health consequences of aspects of urban renewal: Mindy Fullilove, *Root Shock: How Tearing Up City Neighborhoods Hurts America, and What We Can Do About It* (Random House Publishing Group, 2009). And one public health expert has written about the role of public health professionals during urban renewal, see Russell Lopez, *Building American Public Health: Urban Planning, Architecture, and the Quest for Better Health in the United States* (Palgrave Macmillan, 2012); Russ P. Lopez, "Public Health, the APHA, and Urban Renewal," *American Journal of Public Health* 99, no. 9 (September 2009): 1603–11.

[15] Jon C. Teaford, "Urban Renewal and Its Aftermath," *Housing Policy Debate* 11, no. 2 (2000): 443–465.

By the measure of their effect on lead paint poisoning and other problems of slum housing, the outcomes of these struggles over the built environment were a failure, both because of what was done and what was not done – or not done effectively. In Baltimore and other cities, white homeowners and various housing business interests fought against the expansion of public housing, which provided an alternative to slum housing that, while far from perfect, was healthier and easier to regulate than private housing for the poor. Not only were far fewer public housing units built than were planned, let alone needed, public housing was built over old housing, eliminating almost as many units as it created. With public housing providing, at best, a weak solution to slum housing, city governments tried to modernize and expand housing code enforcement. Regulating the thousands of diverse housing units and their owners and managers in the city, however, proved to be a gargantuan task. Modernized code enforcement programs won several courtroom wars over their constitutionality, but they lost thousands of battles to landlords who ignored, delayed and obstructed code enforcement through court challenges, corruption and their social power over tenants. More broadly, code enforcement programs simply did not have the institutional capacity to match the scale of slum housing in the city. That lack of capacity was an outcome of the worsening revenue situation of cities, the product of suburbanization mentioned above, as well as how the city prioritized the revenue it had. The institutional character of code enforcement was also influenced by which city agency was in control of the program, something that shifted over time. The Health Department had different goals, and different political influences, than the Department of Public Works, for example. In general, however, it is not clear that even a much expanded code enforcement program was up to the task of regulating the enormous private market in housing, especially with regard to lead paint, which was difficult to test for and expensive to abate. Code enforcement undoubtedly improved the lives of some slum tenants and helped reduce lead paint problems in the city. But, even by the standards of housing officials at the time, code enforcement programs were not a success. Moreover, other programs, especially urban redevelopment, often exacerbated housing problems by displacing people and eliminating housing units.

The Rise of Housing Codes and Condemnation

Housing codes were derived from the police power of the state to provide for the health and safety of its citizens. Police power was part of English Common Law (and had roots in Roman law). Baltimore City used its police powers to pass a housing code in 1750, for example, that forbid owners to leave trash and dead animals in their yards. After the American Revolution, the Tenth Amendment implicitly left police powers to the states, who could then codify them or delegate them to municipalities and other local governments. Baltimore City gradually expanded its codified power to regulate housing. A potentially powerful 1801 ordinance, for example, allowed the Commissioner of Health to enter buildings and lots without a search warrant to inspect for nuisances. But it was not until after the Civil War, as industrialization and immigration changed the city, that Baltimore again expanded its powers substantially. In the late nineteenth century, the city passed a series of laws controlling the construction of new buildings, as well as ordinances regulating the size, ventilation, roofing and number of occupants in a house. In 1908, the city replaced its accumulated ordinances with a comprehensive building code.[16]

Despite this slew of ordinances, action to control the health and safety of housing was weak.[17] Before 1908, for example, the Department of Health had never condemned a house because it was unfit for human habitation.[18] In light of increasing attention to slums, which included the study of them in Baltimore carried out in 1908 (discussed in Chapter 3), city agencies tried to explain their inaction. The health commissioner stated that he did not have the funding for a "force of inspectors constantly alert in the slums" that would be necessary to improve the sanitary conditions in these rundown neighborhoods. The head building inspector, meanwhile, said that the current building code did not allow him to prohibit

[16] Virginia B. Ermer, "Street-Level Bureaucrats in Baltimore: The Case of Housing Code Enforcement" (Dissertation, Johns Hopkins University, 1972).
[17] William Novak has argued that not only were local regulations pervasive in the nineteenth-century, but they were pervasively enforced. He offers evidence from fire and gunpowder nuisance cases, for example. The housing and health codes discussed in this paragraph do not seem consonant with Novak's interpretation, however. As the discussion of housing code enforcement suggests, we need to focus as much on the capacity of the state to carry out enforcement, not just the willingness or opportunity to do so given political culture and legal institutions (Novak's focus). Novak, *The People's Welfare*, 273.
[18] Ermer, "Street-Level Bureaucrats in Baltimore."

the construction of buildings where “wholesome living” was not possible.[19] In 1908, the city replaced its accumulated ordinances with a comprehensive building code with the hope that the new code would prevent some of the abuses in building construction that helped create slums. But the code did little to fix the main source of slum housing, which was the conversion of houses from their original uses (single-family homes) to multi-family homes or “tenements.”[20]

In the 1910s, 1920s, and 1930s, the city incorporated zoning regulations as a tool for dealing with slums and “nuisances.” Baltimore’s first zoning law was its infamous racial occupancy law (repealed in 1917). Then, in response to problems of industrial pollution and housing deterioration (the latter especially connected to World War I), the city adopted its first comprehensive zoning ordinances (1923) and began residential home inspections for zoning compliance. In 1931, permanent zoning ordinances replaced those interim measures.[21] Like its comprehensive building code, however, zoning did little to affect problems that were already in place. More importantly, enforcement of regulations about new construction was erratic.

In parallel with zoning, the city continued to add to its building and health codes. The 1927 version of these codes became the standard until the reorganization of building and health codes during and after World War II. The 1927 code laid out a broad palette of potential public nuisances that included the “accumulation of dirt, filth, rubbish, garbage or similar matter.” Yards and courts had to be clean. Many of these stipulations were derived from older versions of the city code. The ordinance also required dwellings to be “maintained in good repair by the owner or agent, and fit for human habitation.” Particularly relevant for lead paint deterioration, although not in any way driven by concerns about lead hazards, the ordinance proscribed leaky roofs that caused “dampness in the walls or ceilings.” And it required that in the enclosed courts of multiple-dwellings, all walls had to be whitewashed or painted “a light color,” and that this paint and whitewash had to be renewed as necessary in the “opinion of the

---

[19] “The Tenement House Problem,” *Sun*, July 31, 1907, 4.
[20] “The Tenement House Problem,” *Sun*, July 31, 1907, 4.
[21] Greater Baltimore Committee, “…But What About Our Housing?” no date (circa 1962), Folder 3, Box 12, Series VI, GBC Records, LLSC

Commissioner of Health." If a dwelling was in violation of these or other regulations listed in the code, and the health commissioner determined that they were "dangerous or detrimental to life or health," the Commissioner could declare them a public nuisance and order them "removed, abated, suspended, altered or otherwise improved or purified, as his order shall specify." If there was not compliance in five days, the city could make the repairs itself and put a lien on the house until it was paid back (plus 10%). Finally, the health commissioner (or Bureau of Buildings) could order a dwelling vacated if it was deemed unlawful given the building regulations.[22]

In addition to housing regulation, the city occasionally engaged in projects that entailed slum clearance. Until the 1930s, however, the legal basis of clearance was rooted not in police power but in eminent domain. Eminent domain gave the state the power to expropriate ("condemn") private property for public use. As with police power, eminent domain had its roots in common law. Eminent domain was considered an inherent (implied) power at the inception of the United States, and a more limited form of eminent domain was reserved for the national government under the Fifth Amendment, which required private property only be taken for public use with "just compensation." State constitutions also usually limited eminent domain by requiring compensation and public use. As with police power, states could delegate eminent domain to local governments and even private organizations, such as railroads.[23] Most of Baltimore City's uses of eminent domain entailed expropriating property to build roads, bridges, parks and so on. But these objectives sometimes carried subordinate or perhaps ulterior motives, which aimed at the removal of slum dwellers who were seen as a threat to property values, morality, health and white

---

[22] City of Baltimore, *Ordinances and Resolutions of the Mayor and City Council of Baltimore* (Baltimore: King Bros., Inc. City Printers., 1927), 915–17, archive.org/details/ordinances27balt. The 1904 code for example allowed for the health commissioner to require abatement for various unsanitary conditions and to remove or abate the nuisance at the owner's expense and charge fines for failure to comply. The 1904 code was not much different than the one from 1803. Baltimore City, *Ordinances and Resolutions of the Mayor and City Council of Baltimore.* (Baltimore: Wm. J.C. Dulany Company, City Printers., 1904), 102–4, archive.org/details/ordinances04balt; Baltimore City, *Ordinances and Resolutions of the Mayor and City Council of Baltimore.* (Baltimore: Re-printed by John Cox, City Printer., 1877), archive.org/details/ordinancesres12balt. The main difference with the 1927 code was a much greater focus on the building itself as a potential public nuisance to be regulated by the Health Department, rather than the environment surrounding the building.

[23] T. Havran, "Eminent Domain and the Police Power," *Notre Dame Law Review* 5, no. 7 (April 1, 1930): 380. For example, Black residents were displaced when a railroad condemned their homes. Hawkins, "A Year of Segregation in Baltimore."

control of city space.[24] In 1911, during the push for racial zoning, some neighborhood associations advocated slum clearance as way to rid neighborhoods of black residents. Later, in 1917 Mayor Jackson sought, with the help of the health commissioner, to create small parks razing buildings in the dense inner city in order to create "breathing places" and eliminate "plague spots."[25] Jackson, who had supported Baltimore's segregation ordinance, was particularly interested in eliminating "certain congested sections, populated by Negroes," in which there had been many deaths from communicable diseases.[26]

In the 1930s, the BCHD saw slums and "so-called blighted areas" (as it put it) as being the result of a complex interplay of health, housing and economics. "The causal relationship of slums to a low state of civic health, while in part true, is often exaggerated and unthinking," it wrote in 1936. Slums put people at risk for tuberculosis, but people often lived in slums "as a result of having been pushed forcibly down the economic ladder on account of their tuberculosis, unemployment and inability to conquer the disease." Notably absent from this description was housing segregation. Nevertheless, the BCHD did recognize that "the problem of improving housing conditions is one which is intricately involved with the general economic structure of the community, with its real estate and mortgage inheritances and many other determining factors that lie beyond the scope of the Health Department activity."[27] In other words, the health department recognized its own limit to solve problems of healthy housing through nuisance regulation alone with more penetrating changes in labor and housing markets.

Despite this apparently complex view, the BCHD became instrumental in slum clearance programs that provided little in the way of restructuring housing and urban development in a way that would benefit slum residents or fend off the creation of slums in the first place. In the mid-1930s, the

---

[24] The engineer for the city, Major C.H. Latrobe, for example called for a widening of streets in part to "break up the miserable slums which disgrace [the nearby] neighborhood." "Opening of North Street," *Sun*, September 18, 1888, 2. In another case, the *Sun* pushed for the creation of a city park to replace "some of the lowest and most dangerous dens of vice and infamy" – "slums" that threatened the property values and moral sanctity of nearby residents. "Give Old Town the Little Park," *Sun*, April 24, 1896, 4. In addition, similar to the situation with energy utilities, the *Sun* looked to the Glasgow's use of eminent domain to raze slums and provide better housing for the poor. "The Government of Cities," *Sun*, August 9, 1892, 4.
[25] "Aimed At Plague Spots," *Sun*, August 9, 1917, 12.
[26] Power, "Apartheid Baltimore Style," 315–26.
[27] "The Baltimore City Health Department and the So-Called Blighted Areas," *Baltimore Health News*, June 1936, 31-32, MR, Pratt.

social worker Frances Morton carried out a detailed study of slums and their relation to disease in parts of Baltimore City.[28] In 1939, catalyzed by Morton's study, the city health commissioner recommended the demolition of several dwellings that were "unfit for human habitation from a sanitary and health standpoint." This was the first time the Health Department had condemned a dwelling. This recommendation allowed the building engineer to order the demolition of an east Baltimore slum known as St. John's Court eliminating, according to the BCHD, "what was probably the worst slum area in the city." The housing conditions were indeed awful. They included nine dwellings, in serious disrepair, with only two communal frost-proof toilets and one shared hydrant – surrounded by piles of trash – for drinking water.[29]

Although the BCHD and social workers like Morton, who subsequently helped form the influential Citizens Planning and Housing Association, expressed concern about the slum residents, their actions and the legal basis of their action was rooted in a concern for the community or public rather than specific individuals or families. In short, police powers allowed for the regulation and even removal (through condemnation) of a nuisance, but they did not provide any particular power (let alone funding) to help those displaced.

Public Housing in Depression and War (1930s-1940s)

By the end of the 1930s, however, there was another route the state could take to clear slums in the name of better housing: the use of eminent domain to erect public dwellings to provide affordable, low-income housing. In 1937, Congress passed the Federal Housing Act. An earlier attempt to imbue the national government with the powers to condemn property for the erection of public housing was invalidated in court. As with so many other New Deal programs, the 1937 act thus provided national funding for state and local governments who created their own laws and agencies to condemn in the name

[28] Frances Morton, "A Social Study of Wards 5 and 10 in Baltimore, Maryland," (Baltimore Council of Social Agencies, April 1, 1937), Folder 2, Box 2, Series I, HWC Records, LLSC.
[29] BCHD, *Annual 1939*, 9-10, 48, 250, Baltimore City Health Department Archives.

of public housing. Maryland passed an enabling act in 1937 and Baltimore City subsequently created a Housing Authority.[30]

Many interests opposed public housing, especially for African Americans, or sought to direct it toward interests other than those of low-income residents. From the beginning, the real estate industry ferociously opposed slum clearance for public housing. Slum owners did not want their profitable properties destroyed and private landlords did not want to compete with government landlords. Housing developers opposed public housing on vacant land, especially vacant land in the suburbs. Public housing was not only a potential competitive threat to builders and developers, these groups also saw it as a threat to property values – particularly if the residents of the public housing were black. White homeowners also opposed black public housing, out of both antipathy to blacks and because they saw it as a threat to their home values. Just as with the movement of black Baltimoreans into private housing in formerly "white" neighborhoods, these white residents used protest, intimidation and violence to oppose black public housing. In the 1940s, these opponents of black public housing had the support of the Baltimore Housing Authority, whose board chair, Cleveland Bealmear, was a segregationist and who had, as a member of the real estate board, opposed public housing.[31] Other opposition came from residents who would be displaced by public housing projects. Residents of all races often objected to forced removal for public housing, but African Americans correctly saw condemnation disproportionately targeting them.[32]

The St. John's Court slum clearance was part of a larger slum clearance project that scraped away many other surrounding dwellings to make way for a public housing project. It was at the request of the Housing Authority that the BCHD condemned St. John's Court. Eventually, the homes around St. John's Court were also demolished to build Latrobe Homes. Latrobe was Baltimore's second public housing

---

[30] There is a large literature on the way cities and states implemented New Deal federal policies, often on the ways these policies reinforced local power relations and racial discrimination. For Baltimore see, Argersinger, *Toward a New Deal in Baltimore*. For an examination of the way New Deal programs were instituted in more progressive ways, see Mason B. Williams, *City of Ambition: FDR, LaGuardia, and the Making of Modern New York* (W. W. Norton & Company, 2013).

[31] Rhonda Y. Williams, *The Politics of Public Housing: Black Women's Struggles against Urban Inequality* (Oxford University Press, 2004), 59.

[32] "Slum Clearance Displeases Many," *Afro-American*, June 18, 1938, 24.

project. The first was Edgar Allan Poe Homes. Poe Homes was built in west central Baltimore after clearing the dwellings of 385 households, about 90% of them black. The public housing developments that replaced these cleared residences – many of which were not rock bottom "slums" (Figure 42) – in Baltimore and other cities were both segregated and failed to keep pace with the dwellings destroyed (especially for black public housing), let alone in mitigating low-income housing problems more generally. Poe Homes, for example, yielded a net loss of about 100 dwelling units. Latrobe Homes yielded a net gain of about 110 dwelling units over the 589 demolished. But Latrobe was for whites only, and 66% of the households displaced from the Latrobe site were black.[33]

Figure 42: Homes scheduled for demolition in 1939 for the Edgar Allan Poe housing project. Many of the homes cleared for housing projects were not the rock bottom slums journalists loved to describe. These residences have notes on the door regarding condemnation and some already have windows removed. **Source:** Francis Old, *North Side of 800 Block of West Lexington Street, Baltimore*, 1939, mdaa071, Views of African American Life in Maryland Collection, Enoch Pratt Library, available at collections.digitalmaryland.org/cdm/singleitem/collection/mdaa/id/106/rec/3.

Baltimore's Housing Authority built two more low-rent public housing projects for black families – both entailing a net loss of dwelling units – through 1941. With the U.S. entry into World War II, public housing construction shifted toward the goal of providing housing for people flocking to the cities for the

[33] Housing Authority of Baltimore, *Public Housing in Baltimore 1941-1942*, 2-56, Folder 56, Box 20, Series X, GBC Records, LLSC; BURHA, "Data Sheets: Urban Renewal and Public Housing Projects," May 1961, Folder 21, Box 4, Series X, BURHA Records; Urban Renewal and Public Housing Fact Sheets, various years, Folder 43, Box 1, Series VI, CPHA Records; all in LLSC.

war industry (as well as some army enlisted accommodations). These were also segregated. Most were built on unoccupied land, although Gilmore Homes (black) displaced 325 households (probably mostly black) and Perkins Homes (white) displaced 811 households, about 42% of whom were black. After the war, the city returned to building low-income housing, with federal assistance. Most of the war industry housing projects were converted to low-income housing. The city built eight more public housing projects, the last in 1963, followed by a gap of five years without new construction. Of the eight new projects built through 1963, one was built for black residents and one for white residents. The rest were built after 1953 and were officially integrated, while the extant projects were officially desegregated. The city built some of these new projects on vacant land, while other entailed more clearance of residences. Again, most of these were black. The projects built in the post-war period (to 1963) created a net of 2,355 dwelling units after demolishing the homes of 2,194 households (about 1,890 of which were black).[34]

Public housing's impact on the creation of affordable low-income housing was at best modest, especially for African Americans. Low-income public housing was usually an improvement over congested, slum housing, but public housing at best resulted in a small net gain in low-income housing in the city.[35] Public housing projects, in short, yielded a net supply of a few thousand dwelling units, primarily targeted black neighborhoods for clearance, cleared low-income housing that was not "rock bottom," and was segregated until 1953. Even after older segregated units were "integrated," white families only numbered in the single digits.[36]

War Profiteering on the Home Front: Rent Control

The relatively small increase in housing capacity created by public housing programs, whether low-income or war industry, from the late 1930s through the 1940s meant that housing problems remained severe. As noted in the previous chapter, housing congestion, deterioration and rent increases

---

[34] Ibid.

[35] The quality of public housing varied, however, and could be quite bad. Armistead Gardens, a White public housing unit, began as a low-income project for "slum dwellers," but when WWII started, the national government bought it for defense industry housing. There were many complaints about the shoddy construction, and critiques of Uncle Sam as a "slumlord." "Armisteader's Homes Already Crumbling," *Sun*, October 31, 1941, 30.

[36] Williams, *The Politics of Public Housing*, 113.

became especially severe during World War II. One effort to rein in these problems was the imposition of rent control. Another was the modernization and more aggressive enforcement of housing codes.

As a result of skyrocketing rents in cities with war industries, the national government established rent control, drawing its authority from the powers granted to the Office of Price Administration (OPA) by the Emergency Price Control Act of 1942. The OPA initially designated limited "defense rental areas" (including Baltimore) before expanding the purview of rent control to most of the nation. Federal rent control lasted from 1942 to 1946 and was applicable to about 80% of the 1940 housing stock. It pegged the ceiling on rent for different cities to somewhere around the spring of 1942.[37]

In Baltimore, rent control was initiated locally in 1941 through the advocacy of the Citizens Planning and Housing Association (CPHA). Initially, it was voluntary. When the voluntary program proved ineffective, the CPHA pushed for a local rent control ordinance and then for federal designation as a "defense rental area." On July 1, 1942, federal rent control went into effect in the city.[38] After the war, Congress continued federal rent controls in recognition of the continuing impact of the housing issues created during the war, as well as inflationary pressures from the Korean War. But the federal strictures were gradually loosened and more control given over to states and cities. In 1953, the federal rent control was automatically terminated unless local governments continued it. Most did not, and New York City was the only major city to do so for a long period of time.[39] Baltimore continued rent control after 1953, with Mayor D'Alesandro arguing it was still necessary and would be continued under the same conditions as the federal program.[40]

---

[37] Daniel K. Fetter, "The Home Front: Rent Control and the Rapid Wartime Increase in Home Ownership," Working Paper (National Bureau of Economic Research, October 2013), www.nber.org/papers/w19604.
[38] CPHA, "Annual Report of the Citizens Planning and Housing Association of Baltimore," 1941-1942, Folder 1, Box 5, Series I, CPHA Records, LLSC.
[39] Lawrence M. Friedman, *American Law in the Twentieth Century* (Yale University Press, 2008); Robert Bloom and Marshall Newman, "Rent Control," *Annual Survey of Massachusetts Law* 1974, no. 1 (January 1, 1974), lawdigitalcommons.bc.edu/asml/vol1974/iss1/22.
[40] Maryland passed an enabling act in 1947 – against the protests of the real estate industry – that allowed cities and counties to establish local rent control laws. CPHA, *Housing*, March 1947, 3 and May 1947, 2, both in Folder 5, Box 4, Series I, CPHA Records, LLSC. "Rental Curb Approved By City Council," *Sun*, May 22, 1953, 36.

In Baltimore, rent control did lower average rental prices, and it did curb some of the ruthless evictions.[41] As such, it probably militated against even worse housing conditions, and thus lead paint deterioration, rather than exacerbated lead paint problems as one historian has claimed.[42] But landlords bucked the rent control law in at least three ways. First, landlords provided false statements, unlawfully evicted tenants or charged more than the rent ceiling allowed. In Baltimore, at least sixty landlords were accused of these violations within the first year of the program. Violations continued through the war and included several landlords who were later violators of lead paint ordinances.[43] Compliance issues continued after the war. One study suggested that about 20% of renters in cities were being over-charged. Truman's head of housing, Tighe Woods, urged Congress to allow government authorities – not just tenants, who were usually too fearful of eviction – to bring triple damage suits against violators as the only way to end the black market in over-ceiling rent.[44] In Baltimore, the court ordered landlords to pay dozens of tenants back for overcharging, which was somewhere around $1,500 per tenant in today's dollars.[45] Many over-charges clearly went unprosecuted however (if 20% of renters were being over-

---

[41] According to Fetter, the effect of rent control was different in different cities depending on where the rent ceiling was pegged for that city and how much rent prices had increased since that time. In Baltimore, rents had gone up precipitously from 1940 to 1942 (in contrast to some cities like Boston, where they did not rise as much), and Baltimore's choice of a date to peg the rent ceiling made for a relatively low ceiling (compared to Buffalo, for example). Fetter, "The Home Front." The CPHA carried out a Rent Study during the war and concluded that rent control had "held down rents and curtailed evictions." CPHA, "The Year's Progress: Annual Report of the Citizens Planning and Housing Association of Baltimore," 1943-1944, 4-5, Folder 2, Box 5, Series I, CPHA Records, LLSC.

[42] English suggests that rent control worsened housing conditions because it "prevented landlords from making needed repairs." English, *Old Paint*, 105. But federal rent control laws (and Baltimore's continuation of these laws) provided for adjustments in maximum rent contingent on investments in housing and "unavoidable" increases in maintenance expenses. Normal maintenance was not a justification for increasing rents, but failure to perform maintenance, repair and replacement was a reason to *lower* the rent ceiling. Bloom and Newman, "Rent Control," 505–506, note 34; "Rent Control: Hang-Over from the War," *Sun*, October 7, 1955, 16. In short, to the extent that landlords incorporated incentives from the rent control laws, they would have reason to make small investments to repaint houses, so as not to lower the rent ceiling, and no incentive not to invest in large painting investments. Of course, many landlords ignored rent control laws, but that just meant that the houses were no worse off than they would have been without rent control. That said, the *Sun* argued in one article that rent control interfered with the "normal functioning of supply and demand in housing," though the editorial was vague on what that meant exactly. The editorial also argued that rent control "had the effect of creating slum conditions," but again there were no details. "Ending Fifteen Years of Rent Control," *Sun*, March 22, 1956, 16.

[43] Morris Garbis, later an infamous slumlord and violator of lead paint ordinances, was charged with violations of a price ceiling on refrigerators during WWII. "Rent-Ceiling Enforcement Drive Starts," *Sun*, December 12, 1942, 24. The OPA also filed a suit against Herbert Kaufman. "3 OPA Suits Filed," *Sun*, January 24, 1945, 12.

[44] Rodney Crowther, "Rental-Unit Shortage Held to be Critical," *Sun*, February 8, 1949, 2.

[45] No author, "4 Landlords Sued in Rental Cases," *Sun*, February 25, 1949, 22. The over-charges ranged from $50 to $161 per tenant in 1949 dollars, with an average around $120. $120 in 2017 dollars is around $1,200 (real price) to

charged). That was because landlords used the threat of eviction to keep tenants from bringing suit. Although such a threat was illegal, landlords could invent other reasons to evict tenants and challenging evictions was too expensive for many tenants.[46] Finally, landlords got around the rental control law in yet another way: Since there were no controls on the sale of homes, some rental owners sold homes instead of renting them.[47] In the inner city, however, where racial confinement ruled, landlords shifted to using contract sales to get around rent ceilings.[48] This hyper-exploitative, hybrid form was neither well-controlled by laws on renting nor laws on selling homes.

Still, landlords hated rent control and they had political allies who pushed back against the law. The program was controversial especially as Baltimore was one of the few cities that still had rent control. Landlords argued that rent control was unnecessary – where it was removed landlords were not "hoggish" in their rents – and, somewhat in contradiction, that landlords could not meet their expenses under rent control. Some city council members tried to gut the enforcement provisions of the program. It also faced legal challenges. The mayor argued the city had the authority to control rents under its police powers. But in 1956, a judge ruled that there was no longer any emergency requiring rent control. The ordinance was due to expire ten days later anyway. The city council killed a renewable bill, and that year 50-60,000

$1,800 (real value), as per Samuel H. Williamson, "Seven Ways to Compute the Relative Value of a U.S. Dollar Amount, 1774 to present," MeasuringWorth, 2017.

[46] Thus Truman's head of housing, Tighe Woods, urged Congress in 1949 to allow government authorities, not just tenants, to bring triple damage suits against violators as the only way to end the black market in over-ceiling rent. Rodney Crowther, "Rental-Unit Shortage Held to be Critical," *Sun*, February 8, 1949, 2.

[47] It is unlikely that rent control led to more low-income housing shortages and thus congestion. The textbook economic argument for this is that rent ceilings decrease the supply of rental housing, either because builders stop building them or because owners switch from renting to selling homes. Like many rent control laws, however, Baltimore's law did not apply to buildings built after the law was enacted, so it did not affect new construction. (The Baltimore law also did not apply to expensive apartments and to homes where the homeowner rented out part of his or her home as a separate dwelling.) E.V.B., "Rent Control: Hang-Over from the War," *Sun*, October 7, 1955, 16. In addition, many of the assumptions about supply and demand for rental markets would not have applied, or would have applied only weakly, to the inner city sub-market for African Americans. Outside of contract sales, it was often not possible to sell houses rather than rent them.

[48] "Real Estate Curb Sought," *Sun*, February 15, 1951, 23.

rental units were released from control (during the war, there had been about 200,000 units under control).[49]

Modernizing Housing Code Regulations: The Hygiene of Housing Ordinance

One problem with an under-supply of housing was that landlords could gouge their tenants with high prices. Another was that it allowed landlords to cut maintenance costs, let houses deteriorate, and chop up houses in small, congested multi-family units. The latter led to housing deterioration, blight, the spread of disease and the perpetuation or creation of slums. As these problems festered during the war, the city sought to re-formulate its housing code and to take a more aggressive approach to using its police powers to fend off and roll back slums.

In 1941 the Baltimore city council passed the Ordinance on the Hygiene of Housing (Ordinance No. 384), often regarded as the first "modern" housing code.[50] As with rent control, the ordinance was a response to the particularly bad conditions of Baltimore's housing during the war, with an undergirding of concern from housing problems during the Great Depression.[51] The code was an extension of the 1927

---

[49] "Rental Law Penalty Eyed," *Sun*, March 2, 1954, 19; Norton Schwartz, Letter "Rent Control," *Sun*, July 24, 1954, 10; Frank Cromwell, Letter "Rent Control," *Sun*, February 25, 1955, 16; "Ending Fifteen Years of Rent Control," *Sun*, March 22, 1956, 16; Jesse Glasgow, "Rent Control Bill Killed," *Sun*, March 28, 1956, 42.

[50] National Commission on Urban Problems, *Building the American City*, 274. There were really two meanings to code modernization at this time. One was the expansion of power for code enforcement. The other was the modernization of the building code to include new materials and to eliminate what were seen as needless, expensive and outdated provisions about building construction. Baltimore did both of these in 1941. City of Baltimore, *Ordinances and Resolutions of the Mayor and City Council of Baltimore* (Baltimore: King Bros. Inc., City Printers., 1942), archive.org/details/ordinances42balt.

[51] The hygiene of housing ordinance was also related to a broader attempt to modernize and consolidate building codes. Many building codes in cities had not been updated to include new materials and engineering studies. Thus cities often had to pass special variances for new buildings so that they did not have to adhere to outdated building methods. During the war, these outdated methods and materials became particularly important because they could increase building costs at a time when cities were desperate for new construction. Codes related to building were also often scattered across agencies. Baltimore's Mayor Jackson created a committee, which included the health commissioner, to study the building code. But disagreements delayed a new building code for years. In order to keep the health provisions of the extant building code in play while the rest of the code was reformed, the city passed the separate ordinance on the hygiene of housing. "A Modern Building Code May Be Around the Corner," *Sun*, January 29, 1941; "Council Study New Health Code," *Sun*, January 28, 9; "Council Passes Bill to Regulate Dwellings," February 11, 1941, 11. Two other factors prompted and facilitated the new hygiene ordinance. One was a challenge in court, which the BCHD lost. The BCHD determined that the existing ordinance provisions were not sufficient. (The BCHD won another case. The condemnation of the St. John's Court slum had not been challenged in court. BCHD, *Annual 1941*, 37-38). The second was that the BCHD, with the help of the CPHA, had teamed up with the *Evening News* to publish a series on slums in the city. The series, especially the ample photographs, shocked many Baltimoreans. H. Williams, "Housing as a Health Officer's Opportunity," *American Journal of Public Health and the Nation's Health* 32, no. 9 (September 1942): 1001–4.

code and its provisions for the abatement of public nuisances. Much of Ordinance 384 was similar to the 1927, but had some differences.[52] From a legal standpoint, the key difference was that the ordinance gave the BCHD the authority to make rules. The BCHD and the Bureau of Buildings already had rule-making authority in some domains (sewage, gas, fire and rats, for example), but the new ordinance gave the BCHD broad authority to make regulations for "the enforcement of this ordinance for the better protection of the health of the city."[53] The following year, the BCHD promulgated a series of regulations aimed at healthy housing. These included a number of matters relevant to lead paint, such as prohibitions against damp floors and walls, weather-proof dwellings and occupancy limits.[54] The ordinance and initial regulations thus contained the potential for dealing with lead paint problems, among other housing-related health issues, but it did not originate in a concern about lead paint poisoning (as some historians have suggested) and contained nothing specific about any disease for that matter.[55]

Like rent control, the housing ordinance was a product of both the material consequences of war (housing congestion and the spread of disease) and the rise in state authority during the war. Politicians and administrators justified new housing and health regulations during the war both because they argued the war was an acute, temporary emergency and because of the importance of a healthy workforce and

---

[52] In addition to the provision that buildings needed to be in good repair, the ordinance added buildings had to be "fit for human habitation."

[53] In 1939, the city council passed a law requiring new buildings to be made rat proof and giving the BCHD the authority to make regulation to make the rat proof requirement effective in order to "prevent the introduction or spread of rat-borne diseases." City of Baltimore, *Ordinances and Resolutions of the Mayor and City Council of Baltimore* (Baltimore: King Bros. Inc., City Printers., 1939), 173, archive.org/details/ordinances39balt. For other rule-maker powers, see the 1927 code: City of Baltimore, *Ordinances*. "Ordinance on the Hygiene of Housing," reprinted in BCHD, *Annual 1941*, 301-302. In addition to this legal change, the ordinance consolidated aspects of the code, such as the provisions about rodents.

[54] BCHD, "New City Housing Regulations," *Baltimore Health News*, April 1942, 25-31. The regulations also included specific provisions for rooming houses, lodges and hotels, which derived from a separate ordinance that granted rule-making authority.

[55] Elizabeth Fee's article on lead poisoning in Baltimore can be read to suggest that Baltimore's 1941 Hygiene of Housing Ordinance was driven by a concern about lead poisoning (although she does not say that explicitly). But there is no evidence that lead paint was discussed in relation to this ordinance (the BCHD promulgated a regulation banning lead paint in homes in 1951). Fee also suggests that what was new about the ordinance was the power of the BCHD to abate public nuisances that threatened life or health. But that power was just the police power of the state. The health commissioner's power to abate public health nuisances had been part of the city code at least as early as 1803, and the specific wording of that power in the ordinance from 1941 was virtually the same as the 1927 ordinance. What was new was the rule-making authority. David Rosner and Gerald Markowitz repeat these misconceptions about the 1941 ordinance, citing Fee. Fee, "Public Health in Practice," 585; Gerald Markowitz and David Rosner, *Deceit and Denial: The Deadly Politics of Industrial Pollution* (University of California Press, 2002), 56.

army to fighting a war.[56] Nevertheless, Baltimore's hygiene of housing ordinance was a product of a variety of influences. Advocates for better low-income housing, such as Frances Morton and the Judge Thomas Waxter pushed the health commissioner, Huntington Williams, to promote the ordinance.[57] And the real estate industry successfully lobbied Williams to shift some of the liability for cleanliness and plumbing problems to occupants, rather than owners (as it had been in the 1927 code).[58] Nor was the legal basis of the law unquestioned. In 1942, at least three different owners challenged the law in court. The city won, but one case was appealed to the state courts.[59] Jacob Petrushansky, a notorious slumlord, brought this appeal on many grounds, several of which were related to the arbitrary or discretionary nature of the power given to the health commissioner under the law. Petrushansky lost, and the decision was hailed by the BCHD (and the Baltimore *Sun*) as a victory for housing code enforcement and slum eradication.[60]

---

[56] The general relationship between Baltimore's defense industry, housing congestion and health problems is threaded throughout U.S. Congress, *National Defense Migration: Part 15, Baltimore Hearings*. and is discussed in William Oswald Weyforth and United States Employment Service Maryland Division, *Manpower Problems and Policies in the Baltimore Labor Market Area during World War II* (U.S. Dept. of Labor, U.S. Employment Service for Maryland, 1946), 23. For the specific discussion of the health/housing codes as they relate to wartime conditions, see "Health Chief Asks 3 New Inspectors," *Sun*, July 10, 1941, 11; "City to Canvas Crowded Houses," *Sun*, October 6, 1942, 26; "Warns of Slums in Housing Rush," *Sun*, March 14, 1941, 8; "Dr. Williams Pushes War on Bad Housing," October 5, 1942, 24; BCHD, *Annual*, 1943, 45-46; For a general discussion of health, with some reference to housing, during World War II, see K.R. Lee, "Disease in Wartime," *Editorial Research Reports*, Congressional Quarterly, I (1942). For the nexus of the state, war, the military and disease, see Allan M. Brandt, *No Magic Bullet: A Social History of Venereal Disease in the United States Since 1880* (Oxford University Press, 1987). For the broader history of the relationship between disease, war and state-building, see Mark Harrison, *Disease and the Modern World: 1500 to the Present Day* (John Wiley & Sons, 2013).

[57] Interview with Frances Morton Froehlicher, November 22, 1977, Folder 17, Box 2, Series I, CPHA Records, LLSC. According to Froehlicher (nee Morton), the mayoral change from Jackson to McKeldin was also critical, given how close Jackson's ties were to the real estate industry.

[58] Section 156A, Ordinance 284. "Council Studying New Housing Code," *Sun*, January 28, 1941, 9; Franklyn Baumgart, "Under the Dome of the City Hall," *Sun*, February 9, 1941, 16. In the next few years, the real estate industry continued to press for even more changes to the ordinance in an effort to shift liability to occupants. But they were not successful. "Health Code Shift Asked," *Sun*, May 25, 1943, 11; "Would Transfer Sanitary Burden," *Sun*, May 26, 1943, 32; "Housing Hygiene Bill is Tabled," *Sun*, June 15, 1943, 13.

[59] BCHD, "Court Upholds New Housing Ordinance, and Regulations," *Baltimore Health News*, December 1942.

[60] *Petrushansky* v. *State*, 182 *Md*. 164, 32 A.2d 696 (1943). BCHD, "Decision of the Maryland Court of Appeals," and "Welcome Decision," Evening *Sun*, July 17, 1943, (reprint) both in *Baltimore Health News*, August 1943, 161-162. Perhaps in response to one of Petrushansky's charges, that he did not have adequate time to respond, the city council updated the ordinance to make it clear that the health commissioner had the ability to begin acting immediately to abate health nuisances. "Amendment to the Ordinance on the Hygiene of Housing," BCHD *Annual*, 1943, 321-322.

But defending the law in court against specific cases was only part of the struggle to develop an effective method of promoting healthy housing. The struggle also required proactive surveys for code violations in tens of thousands of homes. And it required the notification, charging, prosecuting, and enforcement of penalties against tens of thousands of owners (and, to the extent the law held them liable, tenants). Finally, if the state was not able to force owners to abate housing issues, it had to have the capacity to abate problems itself, including razing unsalvageable housing. These necessary features provoked attempts to "modernize" not only of the housing the code, but an expanded capacity and re-organization of the state. At the same time, the state looked to strengthen its organizational entwinement with business and housing organizations, several of which had, if not the same goals as the state (such as fiscal solvency, the maintenance of social order, and the management of risk), overlapping goals (such as social welfare, the spread of middle-class mores, tax reduction, and securing a good business environment).

In the first four years after the passage of Ordinance 384, the BCHD not only developed regulations and tested its legal clout against violators, it also built up its organizational capacity. It hired more housing inspectors and promoted an ambitious inspector, G. Yates Cook, to lead the charge against unhealthy housing. In 1943, the BCHD created a separate Housing Division in the Bureau of Sanitation. The BCHD forced some owners to abate nuisances and in some cases required dwellings to be vacated and demolished. Between 1941 and 1944, the BCHD inspected about 1,915 dwellings and sent out about 4,368 notices for violations. The BCHD's actions resulted in the improvement (abatement) of 4,247 dwelling units. These abatements probably had little effect on lead paint deterioration, however, since the deterioration of paint and plaster was not a specified violation and was not listed as one of the housing problems that resulted in notifications. The BCHD focused primarily on trash accumulation, rat infestations and facilities related to sewage, water supply and drainage.[61]

---

[61] BCHD, *Annual*, 1941, 38.

Modernizing Housing Code Enforcement: The Baltimore Plan

Despite some headway in housing issues, the situation was still dire in 1944. The BCHD had only a handful of inspectors for the more than 200,000 buildings in the city.[62] Compliance with notifications was low (about 27% between 1941 and 1944). Penalties for non-compliance were weak. About 458 cases of non-compliance resulted in summonses to court, but only about 48 cases were tried. It is likely that many cases were dismissed with warnings or small penalties. The BCHD's actions also resulted in families being forced to vacate dwellings (there were 272 orders to vacate) and the destruction of dwellings (28). Even the abatements that resulted from BCHD action would have included reductions in overcrowded housing, meaning that some people would have been pushed out of housing.[63]

As a result of these problems, the mayor convened a committee in 1944 to study housing problems. The Committee on Housing Coordination, as it became known, determined that the city would never improve the 50,000 or so dwellings that were in violation of the healthy housing regulations if the BCHD continued to work on a complaint basis – i.e., discovering housing violations only after tenants complained. The committee also suggested that city departments that enforced health and housing codes needed to work more closely together.[64]

Taking a more proactive, cross-departmental approach to code enforcement was daunting, but it was here that a voluntary organization, the Citizens Planning and Housing Association (CPHA), played a critical role in both conceptualizing and implementing a modernized approach to housing codes. The CPHA had been formed in 1941 from two organizations: the Citizens Housing Council, a group of social workers concerned about low-income housing led by Frances Morton, and the Citizens Planning and Redevelopment Association, a group of professional architects and real estate investors concerned about

[62] Neverdon-Morton, "Black Housing Patterns in Baltimore City, 1885-1953." Similarly, the Bureau of Buildings claimed in 1942 that it would need 1,000 inspectors to adequately cover the city, instead of the twenty that it had. "Dr. Williams Pushes War on Bad Housing," *Sun*, October 5, 1942, 24.
[63] BCHD, *Annuals*, various years.
[64] "Round-Table Discussion on Housing Scheduled," *Sun*, April 6, 1945, 9; Ermer, "Street-Level Bureaucrats in Baltimore."

blight and declining property values.[65] The resulting CPHA thus combined goals about providing decent living conditions for the poor and African Americans (via public housing, code enforcement, slum clearance, rent control and education) with goals about preserving property values (via zoning, land use planning, code enforcement, slum clearance, and redevelopment). The goals of the two parent organizations thus overlapped, especially with regard to code enforcement and slum clearance. The CHC stood to gain from the merger by tapping into the political capacity of the CPRA, while the CPRA stood to gain from the CHC's research and education capacity.[66] The resulting organization, the CPHA, described its purpose as to "foster good city planning, to promote better land use, to improve housing and living conditions and to correct urban decay, in the Baltimore metropolitan area, by means of research, education, public discussion, legislation, law enforcement and other methods."[67]

In 1945, the CPHA suggested that Baltimore agencies work together on code enforcement in one area in the city to see if a coordinated, concentrated, proactive approach could reverse housing deterioration. In suggesting this approach, the CPHA drew inspiration from Toronto, which instituted

---

[65] The CHC was formed in 1940 by "approximately a dozen social workers," with the purpose of promoting "better low-rent housing in Baltimore, by research and community education, through public and private enterprise." "Let's Look At Housing in Baltimore: President's Report of the First Year's Activities of the Citizens' Housing Council of Baltimore," 1 (May 1941), Folder 2, Box 1, Series I, Citizens Housing Council of Baltimore Records (hereafter, CHCB), LLSC. The CPRA was formed in 1941. The *Sun* described the CPRA as an organization with the "purpose of encouraging private property owners to save their neighborhoods from economic blight by private initiative and private funds," ("Need for Stiffer Zoning Stressed," *Sun*, July 1, 1941, 5) and "to study the problem of what owners of private property can do to stabilize or increase values of their holdings for their own financial benefit as well as for the benefit of the city" ("Plans to Survey Blighted Areas," *Sun*, June 21, 1941, 5). See also "Prospectus of Proposed Citizens Planning and Redevelopment Association of Baltimore," Folder 1, Box 1, Series I, CPHA Records, LLSC, which states the purpose is to "develop a program, through research and community education, for more efficient and healthful urban land use, to the benefit of the residents of the community, the owners of property and the city government." Members of the CPRA included: the well-known architect John H. Scarff ("Johns H. Scarff, Architect and Writer, Dies at 77," *Sun*, November 1, 1964, 26); Walter Kidd, an investor with T. Rowe Price and long-time member of the Chamber of Commerce ("Walter H. Kidd Dies at 82; Was Investment Executive," *Sun*, October 19, 1990, 3D); and the architect Lucien E.D. Gaudreau ("Gaudreau, Retired Architect, Dies," *Sun*, May 2, 1977, A12.

[66] Gaudreau to Morton, August 1, 1941 and Morton to CHC Members, August 11, 1941, both in Folder 7, Box 1, Series I, CHCB Records, LLSC. Gaudreau claimed the main difference between the two organizations was that the CPRA was just "broader in scope." But the CPRA seems to have had little interest in public action, especially public housing, unlike the CHC. Gaudreau did, however, become a key advocate and administrator of rent control in the city during WWII.

[67] "Constitution of the Citizens' Planning and Housing Association of Baltimore," Folder 2, Box 1, Series I, CPHA Records, LLSC. This wording comes directly from Gaudrea to Morton, August 1, 1941.

code enforcement on a block-by-block basis and presented on that program to the CPHA in 1941.[68] The CPHA was also influenced by housing advocates from Washington, D.C. who had presented on the need for a coordinated code enforcement program.[69] Finally, the CPHA pushed for not only coordination with code enforcement agencies, but also with individuals and other organizations that could assist in revitalizing places targeted for housing conservation and rehabilitation. For the latter efforts, the CPHA drew on Baltimore's extensive history of voluntary "clean-up, paint-up, fix-up" campaigns. These campaigns included various local beautification efforts as well as Federal Home Loan Bank's experimental program to help residents "conserve" housing values in the middle-class, but declining, neighborhood of Waverly.[70]

The ideas of the city's Committee on Housing Coordination and the CPHA were put into action by a new city institution, the Housing Code Enforcement Committee, in 1945. This Committee, led by the BCHD, focused on one block – what became known as Block One – in south Baltimore. The Committee included representatives from the Health, Fire, Police and Public Welfare Departments, as well as representatives from the Baltimore Housing Authority, the City Solicitor, the Commission on the City Plan, and the Bureau of Buildings and Bureau of Street Cleaning. For the next year and a half, the Committee coordinated code enforcement in every structure on the block. It fined tenants for littering.

---

[68] "Information Requested of Citizens Planning and Housing Association by the Baltimore Council of Social Agencies," July 1947, Folder 3, Box 2, Series I, CPHA Records, LLSC.

[69] John Ihlder (Washington Housing Association), "A Housing Code for the District of Columbia," April 15, 1940, CHCB Records, LLSC.

[70] For local programs: "Beautify-Baltimore Campaign Opens Today," *Sun*, May 2, 1932, 5; see also notes in Chapter Three. For the Waverly Project, see United States Federal Home Loan Bank Board, *Waverly: A Study in Neighborhood Conservation* (Federal home loan bank board, 1940) and Light's discussion in Light, *The Nature of Cities*, 60–63. The CHC was "keenly interested" in the Waverly plan. "Let's Look At Housing in Baltimore: President's Report of the First Year's Activities of the Citizens' Housing Council of Baltimore," 5 (May 1941), Folder 2, Box 1, Series 1, CHCB Records, LLSC.

And it enlisted the residents, especially children, in the task of cleaning up the block. [71] By the end of that time, the block had been reclaimed from its "rock bottom slum."[72]

The experiment in Block One was heartening enough that the BCHD began code enforcement in several other small blocks over the next two years. In one of these, the BCHD carefully catalogued the changes that took place under the program. The program razed 63 residential structures that were beyond rehabilitation. It eliminated all dilapidated wooden fences, which had provided homes for rats. Where 4% of families had to rely on neighbors for water, 100% had running water. Where before 80% of families used outdoor toilets, 83% attained private toilets. Unacceptable heating facilities were reduced from 49% to 3%. Children who had once had no place to play but in the streets were given a playground in the interior of the block, "free from vehicular traffic." In addition to an appearance characterized by litter and a maze of lumber, the *Sun* described the initial conditions as a place where "fresh paint was a rarity."[73] Thus these programs may have reduced lead paint hazards by painting over deteriorating paint, although it is also possible that the renovations created lead paint hazards or even that the "paint-up" efforts used lead paint.

But while this block-by-block approach of code-enforcement – or what was, by 1948, being called the "Baltimore Plan" of slum rehabilitation[74] – was an apparent success in some regards, it was dishearteningly slow. For Block One, it had taken four municipal departments and two bureaus coordinating for a year and half to bring to raise *one* block to the *minimum* housing standard. Moreover, by 1947, Block One was already deteriorating again.[75]

By the end of the 1940s, four perceived problems emerged from these early block-by-block experiments. First, while agencies could order abatements to code violations, landlords often did not take

---

[71] Sherry H Olson, *Baltimore : The Building of an American City* (Baltimore: Johns Hopkins University Press, 1981). For at least one member of the Committee, the problem was mainly one of the tenants and residents, not the landlords. J. George Eirman of the Bureau of Street Cleaning said the problem was "mainly one of convincing the people of the slum sections of the city that they 'must cooperate." "Housing Code Group Forms," *Sun*, September 12, 1945, 10.
[72] Ermer, "Street-Level Bureaucrats in Baltimore."
[73] Carroll Williams, "Slum Work Bears Fruit," *Sun*, August 4, 1948, 7.
[74] Carroll Williams, "Slum Work Bears Fruit," *Sun*, August 4, 1948, 7.
[75] "Court Action as a Warning to Slum Profiteers," *Sun*, April 30, 1947, 10.

enforcement seriously. When landlords were sent to court for non-compliance, they received warnings, extensions or small penalties. And the courts were backed up, so they often did not go to court for some time. To mitigate these problems, the Housing Enforcement Committee and the CPHA pushed for the creation of a separate court to handled housing code violations. In 1947, the state of Maryland gave Baltimore the first Housing Court in the nation. In the same year, the police commissioner appointed twenty police sanitarians to help increase the state's face-to-face authority with violators. Finally, pressure on the courts resulted in judges handing down more penalties. As an example, the *Sun* reported that Judge Joseph Sherbow gave owners of buildings with defective paint and plaster (among other building problems) only about two weeks to correct these problems or they would be sentenced based on how much they had accomplished.[76]

The second problem was that poor homeowners could often not afford to make investments necessary for compliance. In one of the blocks the BCHD studied, landlords had spent $80 to $800 (about $800 to $7,800 in 2017 dollars) to bring their buildings up to standards. (In turn, they raised rents on tenants by 11% – perhaps making some rents unaffordable, and also showing that rent control did not preclude raises in rents to improve buildings).[77] But for low-income homeowners, these costs were daunting if not impossible, especially homeowners who were discriminated against in lending because they were black or they lived in redlined areas. As the *Sun* put it, it was one thing to tell an absentee landlord to repair his property, but another to tell an "elderly couple or large, struggling family that has nothing to its name but the leaky roof overhead" to repair it or get out.[78] Here, again, Baltimore produced a unique response: The Fight Blight Fund. A group of bankers, real estate professionals, and corporate and insurance executives started Fight Blight in 1951 to provide a revolving fund of private money for loans for needy homeowners as well as financial counseling. Fight Blight argued that homeowners were

[76] "Court Action as a Warning to Slum Profiteers," *Sun*, April 30, 1947, 10.
[77] Carroll Williams, "Slum Work Bears Fruit," *Sun*, August 4, 1948, 7. The real price in 2017 dollars was calculated using Measuring Worth, www.measuringworth.com.
[78] "Fight Blight," *Sun*, December 17, 1957, 18.

not necessarily negligent; some – including those "too broken in health to earn decent wages" – could simply not meet the obligations to housing codes without help.[79]

The Fight Blight group was proud that it was the first program of its kind "anywhere in the world." But it was also quick to point out that the goal of the program was not to improve the lives of low-income homeowners. "Is the Fight Blight Fund a charitable organization?" the organization asked itself. The answer: "Definitely not!" For one thing, the organization did not hand out money; it loaned it with interest. The Fund only helped owners as a last resort, and it screened against "freeloaders." But the goal of the program was not to make money on loans, either. The goal was to fight "blight," because blight was "an insidious cancer," which, if unchecked, would result in slums which "eat into municipal tax revenue" (Figure 43). The Fight Blight Fund was "a sure way to keep salvageable properties on the municipal tax rolls, where they help stabilize the city's tax base" without spending "one penny" from city taxes.[80]

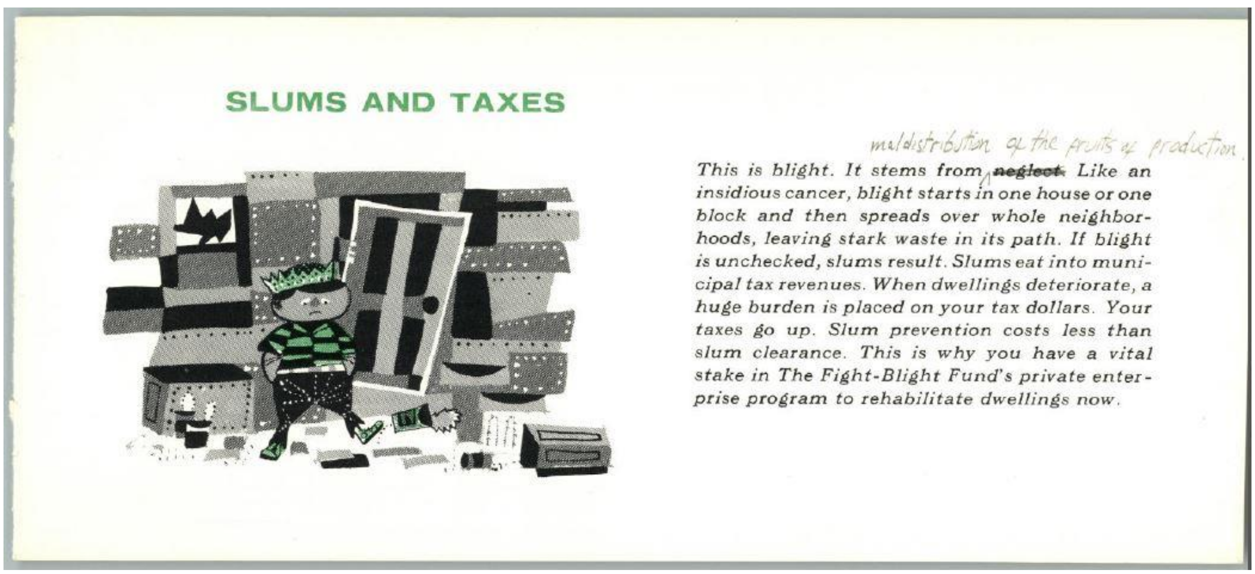


Figure 43: Fight Blight was a private effort to supply loans to Baltimoreans to rehabilitate housing. As this pamphlet shows, the concern was with preserving the tax base of the city, not charity. This particular pamphlet, from the Greater Baltimore Committee, and organization tightly connected to Fight Blight, contains and edit – crossing out "neglect" and replacing it with "maldistribution of the fruits of production" – that suggests that someone in that organization saw housing inequality as resulting from broader structural problems. **Source**: Fight Blight Council, "Private Enterprise Fights Blight," ca. 1956, Box 5, Series XIII, Greater Baltimore Committee Records (hereafter, GBC), LLSC.

---

[79] Fight Blight Council, "Private Enterprise Fights Blight," ca. 1956, Box 5, Series XIII, GBC Records, LLSC.
[80] Fight Blight Council, "Private Enterprise Fights Blight," ca. 1956, Box 5, Series XIII, GBC Records, LLSC.

The third problem that emerged from the experiments with block-by-block code enforcement was that blocks were too small. Proponents of slum rehabilitation came to believe that because individual blocks were surrounded by other slums, they easily slipped back into slum status. Thus the next code-enforcement experiment, called the "Pilot Program," selected a bigger area in east Baltimore. This "Pilot Area" included 27 blocks, three of which were "rock bottom slums" and the remainder of which were "blighted." There were 1,050 dwelling units in the area, which housed 3,300 people, 20% of whom were black.[81] It was this larger, concentrated code-enforcement project that gained national notoriety as the "Baltimore Plan," a notoriety that was helped along when the Fight Blight Fund kicked in money to have Encyclopedia Britannica produce a short film, *The Baltimore Plan*, about the program.[82] The CPHA, the BCHD, the mayor and other organizations involved with the program also promoted it, often to national audiences. Although the "Baltimore Plan" was never explicitly about lead paint problems, the Fight Blight film showed a number of properties with peeling paint on woodwork, and probably much or all of this paint was lead paint (Figure 44). As with other attempts at neighborhood clean-up, re-painting was often emphasized, for aesthetic and property value reasons. In addition, as I describe below, a stronger regulatory basis for dealing with the health hazards of lead paint also emerged during the Pilot Program, in no small part because many of the child lead poisoning victims were located within its boundaries.

---

[81] Ermer, "Street-Level Bureaucrats in Baltimore."
[82] Encyclopedia Britannica Films, *Baltimore Plan*, 1953, archive.org/details/baltimore_plan.

Figure 44: Stills from *The Baltimore Plan*, a film funded by Fight Blight and produced by Encyclopedia Britannica. Neither the film nor the plan discussed the problem of lead paint poisoning, but the film showed that deteriorating paint (probably lead paint) was a problem in housing in the Pilot Area (left), and that re-painting was a major component of this attempt at slum rehabilitation (right). At least three children within several blocks the house pictured at right (1819 West Biddle Street) died of lead paint poisoning between 1942 and 1951. **Source**: Encyclopedia Britannica Films, *Baltimore Plan*, 1953, archive.org/details/baltimore_plan; for lead poisoning data, see spreadsheet in Folder Lead Poisoning in Baltimore Children 1931-1955, Box R125R2 Lead, Anna Baetjer Papers, AMCM Archives.

Urban Redevelopment

Before turning to lead paint regulations and the continuing story of code enforcement, however, it is necessary to discuss another ambitious program that emerged in the late 1940s and early 1950s as well: urban redevelopment. In 1949, the national government passed the Housing Act, which, under Title I, provided federal funds for the clearance of slums and blighted areas and the redevelopment of those areas. The Act also extended authorization and money for creation of low-rent public housing, along with other provisions, all with the goal of a "decent home and a suitable living environment for every American family, thus contributing to the development and redevelopment of communities and to the advancement of the growth, wealth, and security of the Nation."[83]

The Housing Act of 1949 drew in part on the 1937 Housing Act, regarding slum clearance and public housing, while also pushing into new territory regarding the redevelopment of cities for economic

[83] Senate, Committee on Banking and Currency, *Housing Act of 1949*, (GPO, 1949).

growth. Redevelopment was, in some ways, an updating of the basic power of eminent domain, and that is certainly what it derived legal standing from. But unlike earlier eminent domain projects, redevelopment had a far more comprehensive and future-oriented vision of what the city should be. This vision had its roots in a response to what politicians, civic leaders and business people saw as the various threats to the post-war city, from slums and blight, to mass suburbanization, to property values, to the inefficient use of land. Along with this broader vision came a broader understanding of how eminent domain could be used for the public good, including in the condemnation of private property for redevelopment by other private interests. The use of eminent domain for private redevelopment was not new, but the earlier uses had primarily been for creation of transportation infrastructure that was clearly used by a huge swath of the public. But in the post-war years, the redevelopment of the city via eminent domain for use by private business was more loosely connected to the public interest by the argument that these businesses would increase property values or economic growth. Because the 1949 Housing Act contained many provisions and had such sweeping goals, it garnered support from diverse constituencies, including housing reformers, public health experts and, ultimately, the real estate industry.[84]

As with the 1937 Housing Act, the 1949 Act required that local governments pass enabling legislation related to slum clearance and redevelopment. Many states had already passed the necessary legislation because they had already identified the use of eminent domain to clear slums and blighted areas for private redevelopment as a strategy necessary to tackle the emerging problems of the post-war city. In 1943, legislators introduced a bill that authorized the creation of a Baltimore Land Development Commission with the power of eminent domain. But Baltimore's Mayor McKeldin did not create the Commission, in part because he and the city solicitor, Simon Sobeloff, believed the Baltimore Housing Authority should be in charge of dealing with blight and slums. Sobeloff argued that even though public redevelopment would reduce the tax base, it would guarantee the city would get what it wanted: low-income housing development and the replacement of housing destroyed in slum clearance. Private developers, he argued, were not likely to build housing for the very poor because it would not be

[84] Teaford, "Urban Renewal and Its Aftermath."

profitable. McKeldin also argued that the initial legislation was vulnerable to charges of unconstitutionality. To fix the latter problem, the legislators proposed an amendment to the state constitution allowing for such a commission in 1944. The mayor, under great pressure from the real estate industry, created the Baltimore Redevelopment Commission in 1945.[85]

The purpose of the BRC was to identify, obtain and clear land that was currently covered with slums or blighted housing and dispose of that to private industry for redevelopment. In addition to the use of the state's eminent domain power, the program subsidized private investment in urban land by using state funds to carry out research, physical clearance, and legal procedures necessary to procure and sell land. Although some of the initial proposed legislation to create the redevelopment commissions emphasized the private redevelopment to create "low rent housing and collateral facilities" via private investment,[86] the final amendment said nothing about low rent housing. The stated goal of the Commission was to eliminate slums and blight and facilitate "redevelopment." Beyond that, the amendment was concerned with the details of the process.[87]

In the same year the Redevelopment Commission was created, Baltimore's 1945 Commission on the City Plan released its report on blight and housing problems in the city. In regard to what to do about private development and public housing, the City Plan Commission argued that, "with the exception of housing for persons of very low income, especially when this housing must be on expensive land," housing should be subject to the market and to taxation (i.e., not government-owned). People living in blighted areas could not afford to pay rents that provided "decent living conditions," according to the Commission. This produced an inherent tension in the Redevelopment Commission strategy of using private enterprise in the project of eliminating slums and blighted areas. Low-income housing was not as profitable for developers. As a consequence, the state would have to provide a much larger subsidy to

---

[85] "Sobeloff Makes Report on Slums," *Sun*, October 22, 1940, 24; "Mr. McKeldin and the Belated Land-Development Commission," *Sun*, December 11, 1944, 10.
[86] Chapter 664 (House Bill 761) "Land Development Commission," May 4, 1943, *Laws of the State of Maryland* (Baltimore: King Bros., 1943), 871, aomol.msa.maryland.gov/000001/000584/pdf/am584--871.pdf.
[87] Chapter 649 (House Bill 731), Article XI-B "Baltimore Redevelopment Commission," May 5, 1943, *Laws of the State of Maryland* (Baltimore: King Bros., 1943), 849, aomol.msa.maryland.gov/000001/000584/pdf/am584--849.pdf.

entice private developers to create low-income housing. But even if, as the report argued, the Redevelopment Commission had as its "sole interest… doing away with the slums, not the provision of low-rent housing," the BRC still had to face the issue that clearing slums would simply displace low-income people to other places and with them slum conditions. Ultimately, while the Commission on the City Plan found the BRC to be a "radical" idea, it believed that used alongside publicly subsidized low-income housing, it was a worthwhile experiment.[88]

If slum clearance for low-rent public housing produced, at best, moderate results in terms of increasing the housing supply for low-income and African American people, urban redevelopment was a disaster. After its creation in 1945, the BRC worked slowly toward identifying and designating "blighted" areas of the city and getting the city to pass bonds to fund its redevelopment plans.[89] The passage of the Housing Act of 1949 pushed redevelopment planning into high gear. The BRC completed its first plan – "Redevelopment Project No. 1-A" – in May of 1950, and Mayor D'Alessandro passed it on to the city council urging them to approve it so that "Baltimore may maintain its position in the forefront of the cities waging aggressive war on slums and blight."[90] The city council quickly passed legislation approving the project.[91] In less than a year, the federal government had approved the plan, kicking down two-thirds of the money (as the 1949 Housing Act stipulated) of the $1.5 million dollar budget for the project.[92]

Project 1-A was located in South Waverly, adjacent to North Waverly, which was the neighborhood that had been targeted by the Federal Home Loan Bank for a revitalization campaign. The BRC described South Waverly as a "bad slum." Yet pictures of the area, which were probably chosen to be as shocking as possible, did not reveal the sort of squalor that was evident in some of the worst slums in Baltimore (Figure 45). As the report of the Commission on the City Plan had made clear, Waverly was

---

[88] Commission on City Plan, *Redevelopment of Blighted Residential Areas*, 1, 57–59.
[89] "Two Project Plans Submitted As Patterns to Combat Blight," *Sun*, January 18, 1946, 24; "Present Status of the Redevelopment Program," *Sun*, February 9, 1947, 16.
[90] Baltimore Redevelopment Commission, "Redevelopment Project No. 1-A" (Baltimore, May 1950).
[91] "2 Blighted Area Plans Approved," *Sun*, July 12, 1950, 34.
[92] BURHA, "Data Sheets: Urban Renewal and Public Housing Projects," December 1962, Folder 28, Box 13, Series XII, BCDP Records, LLSC.

not in fact a very bad slum, if it was a "slum" at all. Of the five blighted areas studied by the CCP, Waverly had the newest houses, the lowest need for repairs and the highest ownership rate. And it had a *lower* rate of tuberculosis and meningitis than the city average.[93] Instead of focusing on the worst housing or health conditions – as the purpose of the 1949 Housing Act might dictate – the BRC chose Waverly because the "better residential sections of Waverly north of this area were constantly in danger from the close proximity of this isolated slum section."[94] And Waverly was probably also chosen because while the area had a significant mix of both whites and blacks, it had become increasingly black over the 1940s.[95]

Figure 45: South Waverly, the site of the Baltimore Redevelopment Commission's first urban redevelopment project, and one of the first redevelopment projects completed under Title I of the Housing Act of 1949. The picture shows a neighborhood of old houses with dirt streets, but not a "rock bottom slum." The site was chosen not because it had the worst housing conditions or public health issues, but because it was threatened nearby property values. **Source:** Baltimore Redevelopment Commission, *Redevelopment Project No. 1-A*, May 1950.

[93] Commission on City Plan, *Redevelopment of Blighted Residential Areas*, 16, 22; Baltimore Redevelopment Commission, "Redevelopment Project No. 1-A," 6.
[94] Baltimore Redevelopment Commission, "Redevelopment Project No. 1-A," 4.
[95] Commission on City Plan, *Redevelopment of Blighted Residential Areas*, 20.

It is likely that the deteriorating homes in South Waverly contained lead paint.[96] As such, they posed a hazard to the children that lived there. But the slum clearance and displacement that went with it probably did not yield healthier housing situations for the former residents, especially for African Americans. Between 1951 and 1953, the city demolished every one of the 162 residential dwellings in South Waverly, along with 31 commercial buildings. Then it sold most of the land to an ambitious developer, James Rouse, who built 321 "garden apartments" and a shopping center on the 23 acres of land. Backed by the federal mortgage insurance, Rouse's apartment complex was the first FHA-insured rental housing project connected to slum clearance in the nation. While 62.5% of the 192 households from South Waverly were black, Rouse's apartments were whites only. Those displaced from Waverly were paid for their homes (if they owned them).[97] Displaced people were given priority for public housing, but public housing was already overwhelmed by demand. It is not known how many applied for public housing, but only 16 households ended up there. Other than public housing priority, the city set up a relocation office to counsel displaced people, but it was not until 1970 that governments were required to provide reimbursements for moving expenses. According to one study, about 45% of the households were able to move out of blighted areas. However, relocation surveys were made shortly after relocation and it is not clear that those areas remained un-blighted or also deteriorated (as the Commission on City Planning argued would happen). Homeowners who moved ended up paying more to purchase a new house than what the government had paid them for their old house – a result, according to those displaced, of the government's hardball negotiating practices. African-American homeowners, for example, were paid about $3,700 for their homes, but paid on average $7,800 for their new homes. The higher costs may have indicated a move to a better neighborhood, but it is more likely that realtors and lenders could charge them exorbitant prices due to exclusion from much of the Baltimore metropolitan area's housing market). Since the income of the displaced residents probably did not change, they paid more than what

[96] Waverly had originally been a suburb of the city. "Houses Begin to Come Down for Waverly Redevelopment," *Sun*, July 6, 1951, 28.

[97] BURHA, "Data Sheets: Urban Renewal and Public Housing Projects," December 1962, Folder 28, Box 13, Series XII, BCDP Records, LLSC; "Waverly Cleanup," *Sun*, February 7, 1953, 24; "Baltimore's Pioneer Project in Private Slum Redevelopment," *Sun*, November 30, 1952, 16.

was commensurate with their earnings. As discussed in the previous chapter, this often resulted in doubling up or deferring maintenance on homes, leading to housing and paint deterioration.[98]

The Waverly projected was completed in 1957. It was the second redevelopment project begun under Title I to be completed in the nation. By that point, the city was in the process of clearing another 70 acres of urban land for two more urban redevelopment projects (Broadway and Mount-Royal Fremont), and more were in the planning stages. These projects continued to displace many families, and when the city finally did a detailed study of displacement in 1960, it found that most displaced families stayed in the same section of the city, essentially moving into surrounding neighborhoods. (The exception was Waverly, where many moved away because they were black and "only a limited amount of housing was available to Negroes in the vicinity of the site" i.e., they were discriminated against). Since those surrounding neighborhoods were similar to the ones the families had just been displaced from, most families remained in the "rundown sections of the city," according to the report.[99]

The city also made detailed studies of displacement from some projects, such as Area 3C, which illustrate the way that people displaced from Title I projects did not get anything like a "decent home and a suitable living environment." Area 3C was located in east Baltimore. It was home to 199 families, 84% of them black. In 1957, this area was slated for complete clearance in order to provide space for parking lots, a Johns Hopkins medical facility and a laundry to serve hospitals. Redevelopment would also be an opportunity for the city to re-route some streets in the area.[100] According to the city, most of the families (70%) who were displaced from the "crumbling, rat-infested hovels" (as the *Sun* described it) moved into better living conditions.[101] The *Sun*'s investigation of displaced people from 3C uncovered less beneficial changes than the city did. The *Sun* selected 25 families at random. It found that four families (16%) were

---

[98] "Displaced Persons, Baltimore Style," *Sun*, July 2, 1950, 10; "The Waverly DP's," *Sun*, July 12, 1952, 8; Baltimore Urban Renewal and Housing Authority, *Ten Years of Relocation Experience in Baltimore, Maryland*, 1961.

[99] Ibid.

[100] "Urban Renewal Plans Being Pressed," *Sun*, January 12, 1958, B8; BURHA, "Data Sheets: Urban Renewal and Public Housing Projects," December 1962, Folder 28, Box 13, Series XII, BCDP Records, LLSC.

[101] BURHA, "The New Locations and Housing Characteristics of Families Displaced from Area 3C," March 1961, Folder 9, Box 4, Series X, BURHA Records, LSSP; "Baltimore's Displaced Persons: Some Improved Housing in Move from Area 3C," *Sun*, January 2, 1961, 22.

living in worse conditions (in contrast, the city reported that only *one* family out of 186 interviewed was living in worse conditions). Another three families stated their conditions were "about the same." Still, the *Sun*'s research came up with a similar number of families living in improved housing as the city had found (72% and 70% respectively).

Moving to a better home, however, was a low-bar since, as one official put it, "Any place they moved was bound to be an improvement. Slums don't come much worse than 3C." Less than half of the families the *Sun* surveyed were living in "standard" housing (12), as opposed to "borderline" (5) and slum-level housing (8). Conditions may have improved, but families were still often living in awful conditions. Some households literally moved across the street into slum housing where they watched the demolition of their old homes and saw the Area 3C site sit vacant for years. One household consisting of ten people, four of whom were children, lived in a five-room house equipped with an illegal space heater and riddled with gaping holes in the wall where the plaster was falling away in patches. In another house taken up by a displaced couple, plaster "shower[ed] from the ceilings and water leak[ed] through the walls on which the paper [was] peeling in sodden strips."[102] As the *Sun*'s study suggests, many of the displaced people were probably moving into places that had serious lead hazards. Mapping where these families moved to in the city along with the concentration of lead paint violations in 1959 and 1960 also suggests that, in terms of lead paint hazards, urban redevelopment mostly redistributed low-income families to other hazardous housing conditions in the city (Figure 46).

---

[102] Many families also reported problems with rats – "they torture you," as one woman put it – and congestion. In one case, four children slept in one bed in a six-square foot cubicle with no ventilation. "Baltimore's Displaced Persons: Some Improved Housing in Move from Area 3C," *Sun*, January 2, 1961, 22.

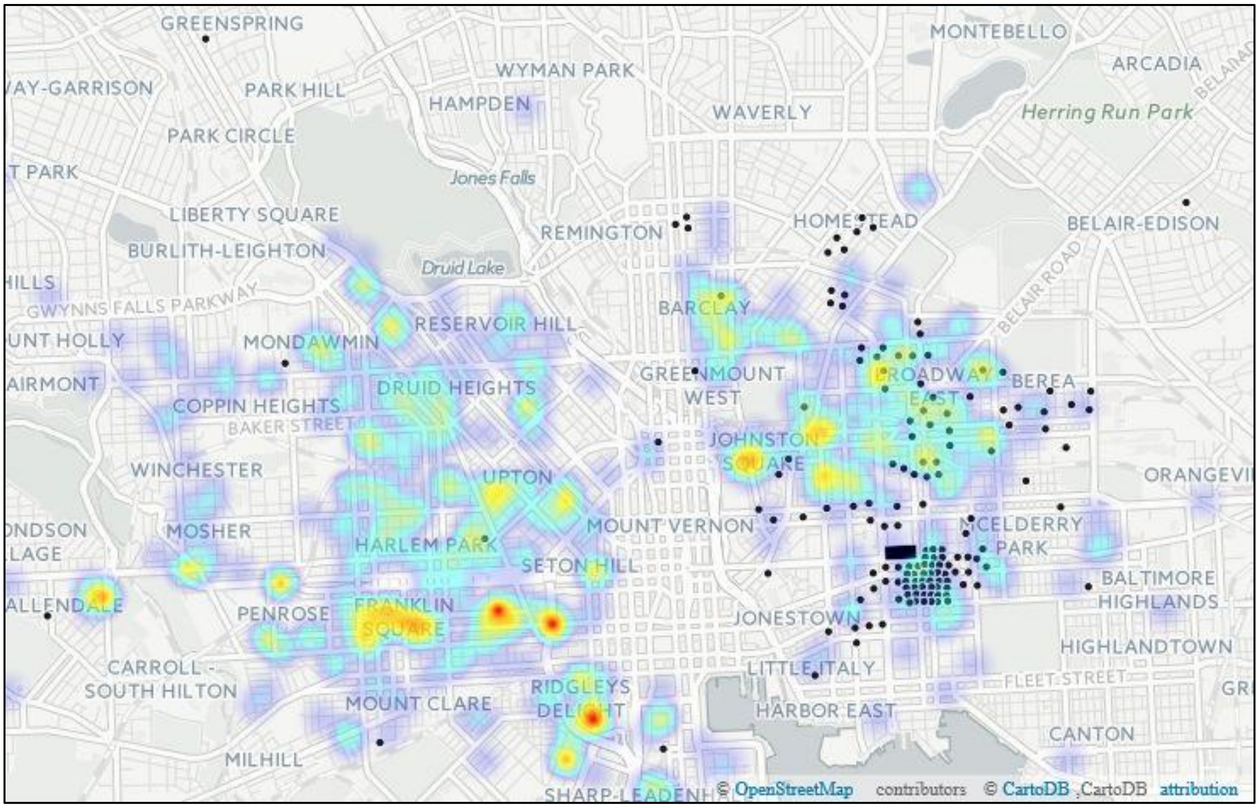


Figure 46: Relocation of families (black dots) from Area 3C (black rectangle) compared with hot spots (all areas shaded, with purple the least "hot" and red the most "hot") for lead paint violations. Area 3C was a slum area cleared with the help of federal funds, between 1959 and 1960, and later redeveloped as buildings for Johns Hopkins Hospital. The map shows that most families relocated in the immediate vicinity of the slum, an area that was not much better in terms of housing. This area and others that people relocated to were generally neighborhoods that had many problems with lead paint violations in the late 1950s and early 1960s. A few, however, did move to neighborhoods that had better housing and better track records with lead paint violations. Some also moved into public housing (not pictured). **Sources:** Baltimore Urban Renewal and Housing Authority (BURHA), "The New Locations and Housing Characteristics of Families Displaced from Area 3C," March 1961, Folder 9, Box 4, Series X, Baltimore Urban Renewal and Housing Authority Records (hereafter, BURHA), LSSP; "Lead Paint Poisoning Tabulation of Lead Paint Notices, 1956-62," in Box Restricted Material Pulled from Series III, GHW Papers, AMCM Archives. **Map:** Leif Fredrickson.

Moreover, even if displaced households achieved relatively good housing, it was not clearly economically sustainable. Displaced renters paid an average of $10 more per month in rent (about $80-100 in 2017 dollars). This was probably one reason that the city found no improvement in crowding before and after displacement. Paying more for rent required doubling up. Similarly, some homeowners could barely afford their new homes. One homeowner was paid $4,166 for his home but the least expensive house he could find cost $6,800. A factory worker who planned to retire, the man had to convince his employer to let him stay on at his job. Even then he did not know if he could make his payments.[103]

In addition to displacement, urban redevelopment projects injected even more uncertainty into housing markets. People were uncertain if their houses would be demolished or what they would be worth, and so many of them probably pulled back on maintenance, if not right out abandoned it. From the beginning, redevelopment projects like Waverly attracted speculators who tried to get homeowners in condemned areas to part with their homes for a relatively small amount of money. Although the city warned against such "unscrupulous agent[s]," the city's own practices of starting with a low negotiating price (rather than the fair value of home), not compensating rental owners for losses that resulted from tenants abandoning them, and in general drawing out the process of acquisition and demolition for years, contributed to uncertainty and speculation.[104] Condemnation of houses for expressway and interstate development in the 1960s and after had a similar effect.[105]

The limbo of properties in areas targeted for urban redevelopment also affected government actions. Condemnation yielded "virgin slums" (as the *Sun* put it), which were untouched by any regulation because health inspectors believed the slums would eventually be destroyed for redevelopment.[106] In recognition of this problem the city created a new program in 1959 called the "interim program" designed to prevent the deterioration of areas in between the time they were designed as urban renewal areas and the time when a "definite plan is evolved and approved." This was essentially

---

[103] "Baltimore's Displaced Persons: Some Improved Housing in Move from Area 3C," *Sun*, January 2, 1961, 22. Even the Greater Baltimore Committee, which included members who were traditionally opposed to public housing, admitted in its review of Baltimore's urban redevelopment and renewal program, "it is generally economically unfeasible unless subsidies are made available to substitute low-cost housing that is being demolished with new housing at rental levels within reach of the people being displaced." Memo, "Review of the Urban Renewal Program in Baltimore," GBC Committee Staff to GBC Urban Renewal Subcommittee, circa 1964, Box 25, Series XIII, GBC Records, LLSC.

[104] Fair Housing Price Pledged," *Sun*, July 21, 1950, 20; "Baltimore's Displaced Persons: Some Improved Housing in Move from Area 3C," *Sun*, January 2, 1961, 22.

[105] Terry Wikberg, "Building Baltimore: The Baltimore City Interstate Highway System," *Maryland Legal History Publications* (2000), 6, digitalcommons.law.umaryland.edu/mlh_pubs/13.

[106] "Two Slum Houses," *Sun*, December 21, 1951, 14.

a code enforcement program.[107] Similarly, when the city government acquired properties that still had tenants in them, the city became the landlord. "Quite logically, as the property will soon be razed, no unnecessary work is done," the city emphasized, only the "minimum necessary [maintenance] for continued occupancy." While that included emergency plumbing and electrical repairs, it almost certainly did not include paint maintenance.[108]

In 1954, Congress created a new housing act that merged urban redevelopment aspects of the 1949 Housing Act with elements of the Baltimore Plan. In the late 1940s and early 1950s, real estate and building interests latched on to the Baltimore Plan as an alternative to public housing, which they were virulently opposed to. Although the original proponents of the Baltimore Plan, including Frances Morton (Executive Director of the CPHA), Huntington Williams (health commissioner) and Mayor Thomas D'Alessandro, consistently argued that concentrated code enforcement had to go along with a major investment in public housing – that the Baltimore Plan was really just "first aid" – the real estate and construction industries distorted the Baltimore Plan into a program that would cure the disease of blight in and of itself (and did so when evidence for the efficacy of the Baltimore Plan was equivocal).[109]

James Rouse was the most potent evangelist for the Baltimore Plan as a cure for blight without building public housing. Rouse was the private developer had carried out Baltimore first two redevelopment projects (Waverly and Broadway) under Title I of the 1949 Housing Act. Rouse was also the founder of Fight Blight, which had seeded money for the film about the Baltimore Plan. (Not coincidentally, the film made little mention of public housing). Later, in the 1950s, Rouse would help start the Greater Baltimore Commission (a group of bankers and developers concerned with the economic

[107] BURHA, "A Summary of the Highlights of the Third Year's Operations of the Baltimore Urban Renewal and Housing Authority," circa 1960, Box 30, Series XIII, GBC Records, LLSC.
[108] HABC, "Relocation Activities in Baltimore," January 7, 1969, Folder 107, Box 7, Series 7A, Movement Against Destruction Records (hereafter, MAD), LLSC. The "rent collector" for the city was the Relocation Specialist for the tenant, which the city acknowledged made for a "complicated" relationship. BURHA, "Relocation Project Agreement," October 24, 1967, Folder 107, Box 7, Series 7A, MAD Records, LLSC.
[109] Thomas Winship, "Remedy of Home Builders is Mere Palliative, Says Senator Sparkman," *Washington Post*, April 31, 1949, B1; Frank Buchanan, "Housing Act of 1949," HR 4009, 81st Cong., *Congressional Record* (June 23, 1949), Appendix A4128; "Frances Morton Froelicher, "The History of Neighborhoods in Baltimore From 1936-1969, " (typewritten draft), no date, Folder 11, Box 2, Series I, CPHA Records, LLSC; Huntington Williams, "Law Enforcement and the 'Baltimore Plan,'" in *Housing and Health* (Annual Conference of the Milbank Memorial Fund, New York: Milbank Memorial Fund, 1951).

vitality of the downtown) and would become a member of the CPHA (which, despite members such as Frances Morton, also included many developers and bankers). President Eisenhower asked Rouse to be part of an advisory commission on housing, and in that capacity, Rouse and others helped conceptualize a reorientation to urban housing that included “renewal” – conservation and rehabilitation – in addition to redevelopment. Although public housing remained part of the 1954 Housing Act, it was relegated to the role of providing a place for displaced families or as a holding pen for the very poor, rather than a broader project to providing decent, suitable housing for people who were not getting it in the market. On the other hand, the act provided funding for conservation and rehabilitation projects, and required cities to modernize their housing codes, as Baltimore had done over a decade before. Thus in many cities, and especially Baltimore, federal urban renewal programs increasingly merged with housing code enforcement programs in the 1950s and 1960s.[110]

Lead Paint as a Public Health Nuisance and a Public Health Program

Under Huntington Williams, the Baltimore City Health Department clinched more power over lead paint problems along with its other expanded powers in housing regulation. In 1951, the BCHD promulgated its first new housing code regulation since 1942. On June 29, it created Regulation 17, requiring that “no paint shall be used for interior painting of any dwelling or dwelling unit or any part thereof unless the paint is free from any lead pigment.” The BCHD had considered a similar rule three years before, when child lead poisoning cases had jumped from 11 in 1947 to 42 confirmed and probable cases in 1948. When the BCHD investigated the homes of these children, they found that in two-thirds of the homes the paint was scaling or flaking. The BCHD issued notices to the property owners (all the homes were rentals) to correct the “unsafe condition.” Thus, the BCHD used could and did use its general powers of nuisance abatement even before it promulgated a rule on lead paint. In 1951, child lead poisoning cases again climbed dramatically, this time to 77 cases with 9 deaths. In addition to sporadically ordering lead paint abatement as it did in 1948, the BCHD had been active in warning

[110] Bloom, *Merchant of Illusion*, 56–75; Charles Rhyne, “The Workable Program—A Challenge for Community Improvement,” *Law and Contemporary Problems* 25, no. 4 (October 1, 1960): 685–704.

parents about lead paint hazards since the 1930s. But child lead poisoning cases had increased since 1945, and the spike in 1951 was a nail in the coffin for the idea that education alone would solve the problem. In addition, a drawn-out court battle with a landlord over the abatement of lead paint under the general nuisance abatement power of the BCHD helped convince the Department that an explicit regulation was needed.[111] As a result, Baltimore became the first American city to ban lead paint in housing.[112]

The new rule on lead paint gave the BCHD much more secure legal standing to charge and convict landlords of public nuisance violations when those landlords had hazardous lead paint in their homes. And the Housing Court had expanded the capacity, and to some degree the willingness, of the judiciary to convict housing code violators. But the BCHD soon found out that even when they could convict landlords of lead paint violations, the penalty levied at the time, $50, was not enough to dissuade the landlords from violating the law. But on revisiting the 1941 Hygiene of Housing Ordinance, the BCHD found that it was allowed to charge $50 a day for violations. Thus, G. Yates Cook, the director of the Housing Bureau, began instituting this more stringent penalty to get landlords to comply with orders to abate lead paint. Still, there were several problems. While the new penalty system seemed to give landlords an incentive to fix problems sooner, if they did fix the problem in the 30 to 60 day timespan, they would not be fined at all. More generally, landlords had no incentive to act until there was a complaint lodged, and perhaps not even until a court had found them guilty. At that point, they had their two months to make the repair – more than enough time for a child to progress from warning signs of lead poisoning to a life threatening condition.[113]

Even the increased penalties barely fazed many of the professional landlords. Stanley Lapidus racked up his thirtieth conviction on housing code violations in 1953. Number thirty included a host of

[111] BCHD, *Annual*, 1948, 39; BCHD, *Annual*, 1951, 280-281; "Lead Paint Regulation" (Regulation 17), reprinted in BCHD, *Annual*, 1951, 369; "Lead Poisoning in Children," Baltimore Health News, April 1937, 109; "Lead Poisoning Killed 83 Children: Occurrence by Months of 293 Cases, 1931-1951," *Baltimore Health News*, August-September 1951, 113-114.

[112] This was not, however, because there was no conception that lead paint was hazardous, as I discuss in Chapter Two and other historians have discussed, especially Warren, *Brush with Death*; Markowitz and Rosner, *Deceit and Denial*. In 1952, just one year after the BCHD promulgated its lead paint rule, the National Association of Home Builders recommended using paint with lower lead content as way of reducing deaths and accidents in the home. "Builders Open Campaign for Safer Dwellings," *Washington Post*, November 30, 1952.

[113] "City Official Says Heavy Fines May End Fatal Lead Poisoning," *Sun*, October 17, 1951, 34.

housing problems, including scaling paint and falling plaster. The court warned him that he would be penalized every day after the deadline for remedy. Stanley said he appreciated the violation notices because they let him know when there was a problem, but eight months later he had only completed ten percent of the work to fix the place. Neither fines nor public shame did much. "Isn't it true that you are a chronic violator of the housing code?" the assistant city solicitor asked. "Yes," Stanley replied.[114]

Other slumlords easily absorbed fines and court costs as a matter of business, with tragic effects on the bodies and brains of children who lived in their buildings. From 1943 to 1953, Jacob Petrushansky – the landlord who had brought the most serious legal challenge to the 1941 Hygiene of Housing Ordinance – was convicted of dozens of housing code violations. These included several for loose plaster and other structural violations that probably included lead paint. In at least two instances, children in his rentals were hospitalized from ingesting lead paint. In August of 1951, a 22-month-old girl died after ingesting lead paint in one of his rentals. In September, a girl at another rental was hospitalized for lead paint ingestion. Her blood lead level was 320 micrograms (about 65 times as high as the CDC's current level of concern). Follow up with Petrushansky by the Health Department was not speedy. It sent a notice for corrections a month after the first child died. Over the ten-year period of violations, the court fined Petrushansky a total of $1,340.[115] Considering he made millions on his properties before the 1960s, these fines amounted to well below 1% of his profits. It is little wonder that he kept violating the law and paying the fines.[116]

After years of battling landlords over lead paint after children had been poisoned, the BCHD eventually searched for a more proactive approach. This new approach happened in the context of a shifting institutional landscape for code enforcement. The Pilot Project in east Baltimore carried on for four years, ending in 1954 and gaining national attention as the "Baltimore Plan." The program

---

[114] "Top Fine Given to Landlord," *Sun*, May 8, 1953, 32.
[115] "Landlord – Jacob Petrushansky"' Memo Housing Bureau to Huntington Williams, May 5, 1954; "Record of Court Cases…" in Folder Case History – Proceedings Against Jacob Petrushansky, Box Restricted Materials Pulled from Series III, GHW Papers, AMCM Archives.
[116] "Services Today for Jacob Petrushansky," *Sun*, June 20, 1969, A13. Petrushansky apparently lost about half of his wealth in the 1960s when his real estate depreciated.

catalogued many successes, when the program ended in 1954, the BCHD discovered that it could not maintain compliance without enforcement. One year after the program ended, BCHD was again sending out many violation notices. Within a few years, the program's effect on the area was not discernible.[117] After the Pilot Program, Baltimore City went on to try several more large-scale rehabilitation and conservation programs, using funding from the 1954 Housing Act. Having failed in "rock bottom slums" and blight, but not rock bottom areas, the city shifted to trying to "save" middle-class neighborhoods and some of the "slums" that were in or near them from impending blight. (Mount Royal-Fremont and the Harlem Park Demonstration Project were the main projects begun in the 1950s). The city also created the Baltimore Urban Renewal and Housing Authority (BURHA) in 1957 to administer these programs.[118] By this point, lead paint had become a permanent fixture of the inspector's arsenal, often showing up as one of a small set of explicitly required aspects of compliance for conservation or rehabilitation.[119] But in general, under BURHA, the goals of code enforcement and rehabilitation shifted even more toward the maintenance of property values and the preservation of middle-class residents, and further from the provision of public health and quality low-income housing.

This institutional change, however, freed the BCHD to pursue specific health issues more vigorously.[120] This freedom, along with an unflagging, and, in fact, increasing problem of child lead poisoning, resulted in an ambitious new lead paint abatement program. In the 1940s and 1950s, the BCHD expressed a great deal of optimism about expunging child lead poisoning. By the end of the 1950s,

---

[117] Ermer, "Street-Level Bureaucrats in Baltimore."
[118] Urban Renewal Study Board, *Report of the Urban Renewal Study Board to Mayor Thomas D'Alesandro, Jr.*, 1956, in Folder 35A, Box 2, Series III, ACLU Collection, LLSC.
[119] BURHA, *A Demonstration of Rehabilitation, Harlem Park, Baltimore, Maryland*.; BURHA, "Urban Renewal Plan, Project I, Mount Royal-Fremont Renewal Area (Project No. MD, R-7)," Baltimore, MD, March 1, 1960, 18, 34, Folder 24, Box 7, Series X, BURHA Records, LLSC.
[120] This seems to have been the outcome that health commissioner Huntington Williams wanted. In the early 1950s, Williams got into a power struggle with his Housing Bureau head, G. Yates Cook. Cook wanted to create a separate agency to handle all housing code enforcement. Although one historian has presented this as a classic battle over bureaucratic power, with Williams looking to hang on to the BCHD's leading role in housing code enforcement and the Baltimore Plan, it seems to have been more the case that Williams was disinterested in general housing code enforcement, which he saw as a distraction from the more traditional focus on specific diseases related to housing (e.g. lead paint poisoning). ELJ (letter), "Strong Letter to the Mayor," *Sun*, May 6, 1952, E16; Edward Burks, "Cook Resigns as Housing Bureau Head," *Sun*, February 5, 1953, 32. Cf. Alexander Von Hoffman, "Enter the Housing Industry, Stage Right: A Working Paper on the History of Housing Policy," *Joint Center for Housing Studies* 1 (2008).

the BCHD realized more than ever that it was up against a huge problem. At the same time, child lead poisoning cases had been increasing since 1954, growing from 34 in that year to 56 in 1957 before soaring to a record-smashing 133 cases, with 10 deaths, in 1958. In 1956, the BCHD had already created a committee to study lead paint poisoning prevention, and in the wake of increasing cases it launched a new approach to its 30-year war on lead poisoning: "to discover and get the lead paint out of these homes of susceptible children before they get sick, rather than afterward." To do so, it concentrated in the Druid Hill area, where there had been many child lead poisoning cases – "lead alley," as the BCHD called it. Rather than waiting for children to get lead poisoning and then checking the house for lead paint, the BCHD proposed to test houses for lead paint and, if the test was positive, require abatement *before* children living in those homes were poisoned. Based on studies from 1957, it was clear what most samples from these houses would show: the BCHD's lab studies suggested that 98% of homes had lead paint in them (defined as paint with lead in excess of 1%). There were 25,000 homes or more in "lead alley" with young children in them. Thus, even though the BCHD got assistance from BURHA in this concentrated lead paint code enforcement project, they were faced with a massive task.[121]

The program was not effective. In addition to the large number of houses to be inspected and abated, families moved often, which effectively increased the number of houses that had to be abated when a family with children moved into a house that had not previously housed children. Part of the reason they moved was that the Property Owners Association had, according to head sanitarian George Schucker, "developed a policy of evicting tenants if they received a notice from the Health Department." In addition, the BCHD had lost some inspectors and the inspectors that did work were often handicapped by other duties.[122] Lead paint inspection was also more time consuming than other forms of housing inspection, requiring carefully scraping from several surfaces and lab tests. Schucker later did a back-of-the-envelope calculation to see how long it would take the BCHD to "prevent" lead paint poisoning based

[121] BCHD, "True Prevention Lead Paint Poisoning," *Baltimore Health News*, February 1960, 11, MR, Pratt; George W. Schucker et al., "Prevention of Lead Paint Poisoning among Baltimore Children. A Hard-Sell Program," *Public Health Reports* 80, no. 11 (1965): 969.
[122] BCHD, "Lead Paint Poisoning Prevention Committee," Minutes of the First Meeting, January 11, 1962, Folder Lead Paint Poisoning Prevention Committee Minutes 1962, Box 3.3-4, GHW Papers, AMCM Archives.

on the rate of work and the total number of dwellings needing abatement in the city (about 73,726). Schucker concluded the city would need 155 sanitarian-years. Thus, if there were six inspectors devoted to lead paint poisoning, it would take 25 years. Since the BCHD only had 64 sanitarians for all sanitary inspection (industries, milk, meat, food, rats, water and so on), Schucker concluded that this approach to the prevention of lead paint poisoning was economically unfeasible.[123]

Power/Failure: Landlords, the State and the Failure of Code Enforcement

The problems with lead paint code enforcement were really just part of a broader lack of effectiveness in housing code enforcement in the 1950s and 1960s. One of the major problems facing code enforcement was that there was not enough state capacity to carry it out effectively. The effective provision of healthy, low-income housing via the regulation of tens of thousands of distinct landlords, owners, tenants and dwelling units was a perpetual, massive project. The city did fund more inspectors over time in the post-World War II period, but not anywhere near enough to bring housing into compliance on a time scale short of decades, if not centuries. This was a constant grievance of health and building code agencies in Baltimore and in other cities in the post-WWII period.[124] And more than inspectors were needed. In order to draft new codes and litigate cases, cities and departments needed more judges, lawyers and legal staff, but as with inspectors, they did not usually get these resources.[125] Thus the very proliferation of the targets of housing regulation – slumlords – in post-war Baltimore shielded them from regulation, given the inadequate capacity of the state. Although large, powerful corporations

---

[123] Schucker et al., "Prevention of Lead Paint Poisoning among Baltimore Children. A Hard-Sell Program."

[124] Williams, for example, complained to the Board of Estimates about an "emergency situation" due to lack of plumbing inspectors in the Sanitary Section of the Department. Baltimore City Board of Estimates, Minutes, June 9, 1948, 737-739, mdhistory.net/bca_brg36_1/bca_brg36_1_24_bca270/pdf/bca_brg36_1_24_bca270-0447.pdf On petitions for inspectors and clerks for slum rehabilitation, see Baltimore City Board of Estimates, Minutes, November 2, 1951, 2022-2023, mdhistory.net/bca_brg36_1/bca_brg36_1_28_bca274/pdf/bca_brg36_1_28_bca274-0148.pdf. For complaints from the Baltimore Department of Public Works about lack of staff and lack of quality personnel, see Confidential interview with Bernard Werner (DOPW), Box 28, Series XIII, GBC Records, LLSC. For other cities, see NYC Department of Buildings, "Problems of the Housing Division of the Department of Buildings and Suggested Solutions," circa 1960, Box 5, Series XIII, GBC Records, LLSC; Confidential interview with Martin Millspaugh (*Sun* reporter) and Leonard Czarnieki (urban renewal professional), February 3, 1960, Box 28, Series XIII, GBC Records, LLSC; and Rhyne, "The Workable Program—A Challenge for Community Improvement."

[125] Ibid.

presented many problems for regulators, the regulation of many small, diverse businesses was also formidable.

Legal ambiguity also tripped up the code enforcement. As the previous chapter described, one outcome of this was the drawn out legal battle over the responsibility for maintenance in land installment contracts. Another was confusion over responsibility between owner and agent (i.e. the landlord or manager). The Health and Hygiene Ordinance, for example, stated that dwellings "shall be maintained in good repair by the owner or agent." One landlord for the American Realty Company, Samuel Kalis, challenged his conviction and fine in the housing court for lead paint violation connected to the poisoning and hospitalization of a four-year-old boy. Samuel Kalis was the vice president of American Realty, but argued that the president of the company, Benjamin Kalis, was the responsible officer. Moreover, he argued that it was the owner, not the landlord, who was responsible for the lead paint. Ultimately, in the Court of Appeals, both Samuel and Benjamin Kalis were convicted of the lead paint violation.[126] In another case, however, Samuel Kalis and the owner of the property Kalis managed were acquitted of charges that they violated health codes by failing to remove trash and debris from a vacant rental. The Health and Hygiene Ordinance specified that only "occupants," not owners or agents were responsible for this kind of nuisance.[127] Thus to the extent that occupants could be held liable for "debris" of lack of "cleanliness" that was related to lead paint deterioration, landlords and owners could try to escape blame for those problems.

These legal issues were part of a broader issue of landlord and real estate power in the city. Real estate developers and property owners had always had the ear of city government. In the 1930s, Mayor Jackson had largely opposed public housing because of his close ties to these interests. While subsequent mayors, like McKeldin and D'Alessandro, were more responsive to housing reformers and African Americans, they still relied heavily on real estate interests for advice. Politicians faced tremendous

---

[126] "Kalis Asks Review of Housing Case Fine," *Sun*, August 15, 1951, 9; "Other Decisions," *Sun*, March 9, 1952, 27.

[127] "2 Men Win Acquittals," *Sun*, July 1, 1959, 17.

pressure from landlords, for example, to put more liability on tenants for code enforcement and to end rent control, and they received tremendous pressure from developers to oppose public housing.

Landlords also used political influence to obstruct the implementation of housing codes. Politicians distribute benefits to supporters – as part of extant machines or more individualized connections – through their influence on bureaucracies and courts that enforced housing codes. In a confidential interview in 1960, Martin Millspaugh, a former journalist with the *Sun* and an official for the national Urban Renewal Administration, stated that judges were politically appointed in Baltimore and thus vulnerable to political pressure, including the pressure to get cases against landlords transferred to the Supreme Bench, where they would get suspended sentences or at least delays in sentencing.[128] Similarly, the director of Baltimore's Department of Public Works, Bernard Werner, said in confidence that code enforcement was a "political hot potato" and complained that his head inspector was too "conscientious" and "idealistic" and not flexible enough to understand the pressure placed on Department head by 'letter perfect code enforcement.'" The Department, according to Werner, constantly received calls to "go easy" on various landlords with political connections.[129]

In addition to working through political channels, landlords bribed government officials. Jacob Petrushansky's agents were convicted of trying to bribe Health Department inspectors three times (and that was only the count up to 1953). Petrushansky denied any knowledge of bribery attempts by his agents, but the circumstances were fishy to say the least. The same day he was to face Judge Kruger in the housing court, Petrushansky's agent dropped $25 dollars on the floor of a health inspector's car and said, "We don't want any trouble with Judge Kruger."[130] Petrushansky may have been a particularly egregious violator and obstructor of housing codes, but bribery was not uncommon. In the early 1960s, the *Sun* found evidence of widespread bribing of inspectors and neglect of housing codes. Professional plumbers

[128] Confidential interview with Martin Millspaugh, February 3, 1960, Box 28, Series XIII, GBC Records, LLSC.
[129] Confidential interview with Bernard Werner, 1960, Box 28, Series XIII, GBC Records, LLSC.
[130] "Record of Court Cases…" in Folder Case History – Proceedings Against Jacob Petrushansky, Box Restricted Materials Pulled from Series III, GHW Papers, AMCM Archives. "Realty Man Held on Bribe Charge," *Sun*, December 15, 1950, 32. Petrushansky's agent was an elderly black man who did live in the inner city. The judge went light on him given his age, but sent him to jail for six months with a $250 fine. "Landlord's Aide Jailed in Attempt to Bribe," *Sun*, January 12, 1951, 9.

said that “some” of the inspectors were “susceptible to bribery,” and some plumbers admitted to it. The *Sun* also talked to a professional landlord of inner city properties who “readily” admitted he bribed housing inspectors. “We all do,” he said.[131]

In addition to their economic and political power, landlords and developers wielded considerable cultural power. In fact, they converted economic power into cultural power, and they converted cultural power into political and social power. Landlords, including many violators of lead paint codes and some notorious slumlords such as Jacob Petrushansky, mustered soft power from their donations to charities, sports teams and religious institutions.[132] Robert Seff, discussed in the previous chapter, was perhaps the ultimate example of this form of soft power, a repeat violator of lead paint violations who also developed his own private social work division to manage his tenants.[133]

Landlords also tapped into the opposition to taxes and code enforcement among home-owners who lived outside the inner city – both those in the municipality (in older suburbs such as Roland Park) and those in the county suburbs. Homeowners living outside the inner city (where home-ownership was dominant) complained fiercely about property tax increases. They sometimes argued against increases property taxes on account of the fact that big slumlords did not pay their fair share. While they might suggest that slumlords pay their fair share, the main effect was to join in a chorus against property taxes in general. These protests limited city revenue and thus limited the capacity for city services, including housing inspection. Similarly, some residents argued that the housing codes were unfair when they were applied equally to owner-occupants and large landlords, and they argued against codes that they saw as “aesthetic” as opposed to codes that were truly about health (evidently unaware of lead paint poisoning problems).[134]

---

[131] “Leaky Plumbing,” *Sun*, April 26, 1963, 20.
[132] “Services Today for Jacob Petrushansky,” *Sun*, June 20, 1969, A13.
[133] An excellent examination of the soft power of landlords is Connolly, *A World More Concrete*.
[134] Taxes on Property,” *Sun*, November 18, 1963, 18. Landlords argued against increases in property taxes, which they said would “discourage inner city living” and make the city less attractive for industry. The Property Owners Association of Baltimore suggested just about every kind of tax other than a property tax “Realtors Urge Tax on Earnings,” *Sun*, November, 1961, 34; “New Housing Code,” *Sun*, July 4, 1963, 20.

No issue represented this better than the enforcement of ordinances about deteriorating paint and plaster, which many homeowners clearly did not see as health nuisances.[135] All of these issues came together early on, when residents of the wealthy Ward 26 in the far northern part of the city argued against both increased taxes and housing regulation. "We're caught between the Health Department and the tax man. If we let the property deteriorate – if the shutters start falling off, if the paint peels… around comes a man from the health office to tell us we got to fix it up." But once fixed, the property owner said, the next thing you know "the assessor has come around to raise the taxes because we've made a lot of improvements."[136] Landlords did not orchestrate this opposition from owner-occupiers, but they benefited from it. Real estate developers who sought to eradicate blight did, however, cultivate a culture of concern about slums that was oriented toward relatively small investments in housing code enforcement, a cold shoulder to public housing, and a framing of the problem as one of property values and taxes rather than one of public health or social justice. Fight Blight, the Greater Baltimore Commission, and even the Citizens Planning and Housing Association (which had considerable membership overlap with Fight Blight and the GBC) produced pamphlets, filmstrips, films and other media that promoted this conceptualization of slum problems.

Another wrench in the machine of code enforcement was the social power landlords held over their tenants, which landlords used to drive a wedge between tenants and inspectors and other people associated with code enforcement. Until 1968, landlords in Baltimore had to give tenants 60 days of notice for eviction, but they did not need to provide any reason for eviction, and there was nothing illegal about evicting a tenant in retaliation for siccing the inspector on a landlord. Landlords could also evict tenants more quickly if tenants did not pay rent, even if tenants withheld rent because landlords failed to maintain or repair the tenant's home.[137] Thus when, in 1965, one landlord sought to evict a family of nine,

[135] "Ear to Bolton Hill," *Sun*, January 18, 1963, 10.
[136] "Reprisal Threat Made on Taxes," *Sun*, August 24, 1949, 26; "Review of the Urban Renewal Program in Baltimore," GBC Committee Staff to GBC Urban Renewal Subcommittee, circa 1964; Eugene Petty to GBC Urban Renewal Subcommittee, June 25, 1964, Box 25, Series XIII, GBC Records, LLSC.
[137] James McElhaney, "Retaliatory Evictions: Landlords, Tenants and Law Reform," *Maryland Law Review* 29, no. 3 (1969): 193–226.

because two of the children had been poisoned by lead paint and the mother had alerted the building inspector, there was nothing illegal about the retaliatory eviction. The most the city could do was to help the mother pay rent on time so the landlord could not quickly evict her, and help her drive her poisoned children back and forth to the clinic for several weeks.[138]

Landlord power over tenants seriously obstructed tenant reporting of housing problems, but so, too, did the relationship between poor tenants and the government. Virginia Ermer, a political scientist who studied housing code enforcement in the city, argued that urban bureaucracies did not deliver for lower-class clients because the great burden of work that had to be done did not allow for sensitivity to the rights of clients (whereas in upper-class neighborhoods, policing or other bureaucratic workload is easier, and so bureaucrats could take time to respect civil rights). Moreover, the lower-class, unlike middle class, was in constant contact with government agencies through welfare, health clinics, state hospitals, employment offices, police, and housing inspection. These contacts were often "abrasive" or "non-supportive," as the journalist Paul Jacobs put it, because the poor were treated either punitively or grudgingly as dependents. They were seen as irresponsible, and thus not having the same rights as others. In response, "ghetto residents" saw city bureaucrats as symbols of repression and negligence. And so they were often hostile and unwilling to cooperate with them.[139] There were also economic reasons tenants did not cooperate with inspectors. For one thing, they were also the object of fines from inspectors. But landlord compliance could also hurt tenants economically. If code violations resulted in orders to vacate houses – and further orders to raze those houses – tenants were forced to move. And the enforcement of laws about housing congestion also resulted in problems for tenants who doubled up in cramped apartments because they could not afford anything else.[140]

---

[138] Housing Welfare Council, "Background Material for Use by the Relocation Project Evaluation Committee," June 1965, Folder 18, Box 24, Series 1, HWC Records, LLSC.
[139] Ermer, "Street-Level Bureaucrats in Baltimore." Paul Jacobs and Center for the Study of Democratic Institutions, *Prelude to Riot: A View of Urban America from the Bottom* (Random House, 1968), quoted in Ibid.
[140] Emily Lieb, "Row House City: Unbuilding Residential Baltimore, 1940–1980" (Ph.D., Columbia University, 2010).

The costs of compliance were also a problem for low-income homeowners. The Fight Blight Fund's assistance to low-income homeowners was successful insofar as it helped hundreds of families with repairs. The Fund was primarily for major, structural repairs, but that could include "extensive re-plastering," and thus assistance with reducing lead paint hazards.[141] But, like the capacity of housing inspection, the Fund never came close to the scale of the problem, as Fight Blight admitted in 1962.[142]

Code compliance could also be expensive for larger, more professional landlords, but it is not clear that, as many landlords claimed, strict code enforcement made slumlording unprofitable. As discussed above, landlords with a lot of money and those with political connections were often able to skirt, or at least absorb, many of the costs of code enforcement. But to the extent that landlords were forced to comply with codes, compliance costs could be expensive. Newspapers carried personal stories about how some landlord was forced to abandon his or her properties because the costs of compliance had made the properties worthless.[143] Even more often, articles about slumlords and landlords contained complaints that code enforcement was not economically feasible, and these complaints were sometimes accompanied by ominous predictions of widespread abandonment.[144] These sorts of complaints by regulated industries were so predictable that it is difficult to evaluate them on their own. But even some government officials, speaking confidentially, such as Bernard Werner, director of Baltimore's Department of Public Works, also worried about the "feasibility of enforcing" codes that might "force buildings to be vacated, demolished or hurt the owners financially."[145]

---

[141] Fight Blight Council, "Private Enterprise Fights Blight," ca. 1956, Box 5, Series XIII, GBC Records, LLSC; "Fight Blight," *Sun*, December 17, 1957, 18. Since one percent defaulted, the fund also indicated that the lack of lending in the inner city and African Americans was not based on an actual risk, but on institutional discrimination.
[142] Sigmund Schaffer (NYC Housing and Redevelopment Board) to William Boucher (GBC), January 14, 1963; Harry Cooper (GBC) to Schaffer, January 17, 1963; Series XIII, GBC Records, LLSC.
[143] For example, George Frank, "East Harlem Owner Says: I Was a Slumlord…" *New York Times*, June 1, 1972, R1.
[144] Mark Reutter, "The Abandoners – Who, What and Why," *Sun*, October 6, 1974, 258. For that matter, journalists sometimes made the same claims about code enforcement causing abandonment while providing no specific evidence that it was true. For example, Paul Good, "Vacant Buildings: Urban Tombstones," *The Courier-News* (Bridgestone, NJ), March 29, 1972, 52. It was a theory that was reasonable enough, and it played to the trope of unintended consequences, which seems to have been enough for some writers.
[145] Confidential interview with Bernard Werner, Box 28, Series XIII, GBC Records, LLSC. Perhaps not coincidentally, the Bureau of Building Inspection within the DPW was, however, the city bureaucracy that was most closely aligned with landlords

But did compliance force landlords out of business, accelerating the process of inner city housing abandonment? This question became increasingly common in the 1960s and 1970s as more and more owners abandoned houses in the inner city.[146] A common conclusion was that code enforcement might be useful in preserving good housing, but once housing and neighborhoods had significantly deteriorated, code enforcement could accelerate abandonment. In some cities, slumlords drove housing quality to the brink of worthlessness and then sold the almost-worthless property to desperate or ill-informed owners. When those owners were hit with housing code violations, they found that they could not afford to comply and were forced to abandon their properties. But this link between code enforcement and abandonment was more relevant to the small homeowners discussed previously than the professional, larger-scale landlords who fought against code enforcement. An Urban League report noted that, by the time the city started enforcing codes in slums, the “neglectful landlord had typically sold his building to someone without the resources to make extensive repairs.” But abandonment also happened in some cases when an owner or manager had “milked” a property for so long that bringing it back up to code was considered a “poor investment.” The Urban League thus suggested code enforcement could work if implemented in cities before racial change in a neighborhood – before the “speculators [had] made their killing – but afterward it could be counter-productive.[147] Other major studies of abandonment also argued that code enforcement could be “self-defeating” when housing conditions had already significantly deteriorated.[148]

In Baltimore, a study of landlords in the inner city found that only in a “very few” cases did abandonment follow from strict enforcement of the city’s housing code. As discussed in Chapter Four, the main reason for abandonment was “vandalism” (more accurately, theft). Also important were the

[146] Based on a study in Chicago, researchers found that stringent code enforcement could be the “straw that broke the camel’s back” for landlords owning properties that had many code violations. Lieb et al., “Abandonment of Residential Property in an Urban Context,” 1196–97.

[147] In Cleveland landlords sold on contract to relatively poor homeowners who then illegally converted houses into multiple dwellings in order to pay their contract agreement. When the city forced these owners to convert homes back to single-family dwellings, the owners had to both pay the cost of conversion and they lost the income from their renters. National Urban League, *National Survey of Housing Abandonment* (National Urban League, 1972), 8–9, 16, 41, 96–97, archive.org/details/nationalsurveyof00cent.

[148] George Sternlieb, Robert W. Burchell, and Virginia Paulus, *Residential Abandonment: The Environment of Decay* (Monticello, Ill., Council of Planning Librarians, 1972), 5.

"adverse effects" of nearby urban redevelopment projects. It is possible that code enforcement contributed in a more indirect way in Baltimore, with professional landlords dumping their properties ahead of planned, concentrated code enforcement programs. But as the BCHD noted in their first concentrated code enforcement program, what many landlords did was simply raise the rent after investing in code compliance. Moreover, the study of Baltimore landlords concluded that if Baltimore's housing codes were enforced to the letter of the law, bringing a dwelling into objective compliance with the housing code (as opposed to compliance with whatever an inspector required to be fixed), "widespread boarding-up would no doubt result." Researchers in Baltimore and other cities thus suggested focusing on code enforcement in non-slum areas (as Baltimore had already started shifting to doing in the mid-1950s) and recalibrating the objectives and rules about code enforcement for slums.[149]

Ultimately, code enforcement never lived up to the promise of saving housing in the post-war urban core for three broad reasons. First, there was never enough capacity to carry it out effectively. There were not enough judges, prosecutors and inspectors (and, indeed, not enough well-trained, permanent inspectors). The public-private partnerships that helped extend the influence and power of the state, through community organization and social influence, were helpful but also inadequate. Second, even if the state had the capacity to carry out and enforce inspections, tenants, homeowners and landlords would have trouble complying. Tenants and homeowners did have trouble complying. Landlords had less trouble, but if they were forced to comply with the letter of the law, it seems likely that many of them would have abandoned the rental market in the urban core.

Code enforcement might have been an effective program if it had been paired with a robust investment in public housing. Under such a system, vigorous code enforcement could have been applied to non-slum housing while slum housing was razed and public housing was simultaneously erected to provide homes for those displaced. That was the system that many housing reformers and politicians (such as mayors McKeldin and D'Alessandro) strongly advocated. Even some anti-public housing

---

[149] Stegman, *Housing Investment in the Inner City*, 65, 261–63. For a similar recommendation for Baltimore, see Harvey et al., "The Housing Market and Code Enforcement in Baltimore," 11–10.

evangelicals, such as James Rouse and others associated with the Greater Baltimore Committee, came around to the idea that slums and blight could not be tackled without a public subsidy for low-income housing.

But that was not the system that was created. Instead, as a result of the power of landlords and real estate developers, public housing was weakened. But slum clearance – and clearance of neighborhoods that were not even slums – continued. When added to other urban redevelopment and infrastructure projects (such as highways), government-sponsored eminent domain projects resulted in a net loss of housing. Between 1937 and 1964, the city and federal government created about 10,280 dwelling units for low-rent public housing. In the same period of time, about 14,455 were displaced (6,740 from urban redevelopment and 2,188 from public housing).[150] This is probably an underestimate of those displaced (Figure 47 and Figure 48).[151] These net losses were losses for low-income tenants and those displaced were overwhelmingly African American (Figure 49).

[150] Housing Authority of Baltimore, Public Housing in Baltimore, 1941-1942, Series XIII, GBC Records, LLSC; BURHA, "Data Sheets: Urban Renewal and Public Housing Projects," May 1961, Folder 21, Box 4, Series X, BURHA Records; Urban Renewal and Public Housing Fact Sheets, Folder 43, Box 1, Series VI, CPHA Records; all in LLSC.

[151] For one thing, the code enforcement data only goes to 1956 and only includes the Health Department.

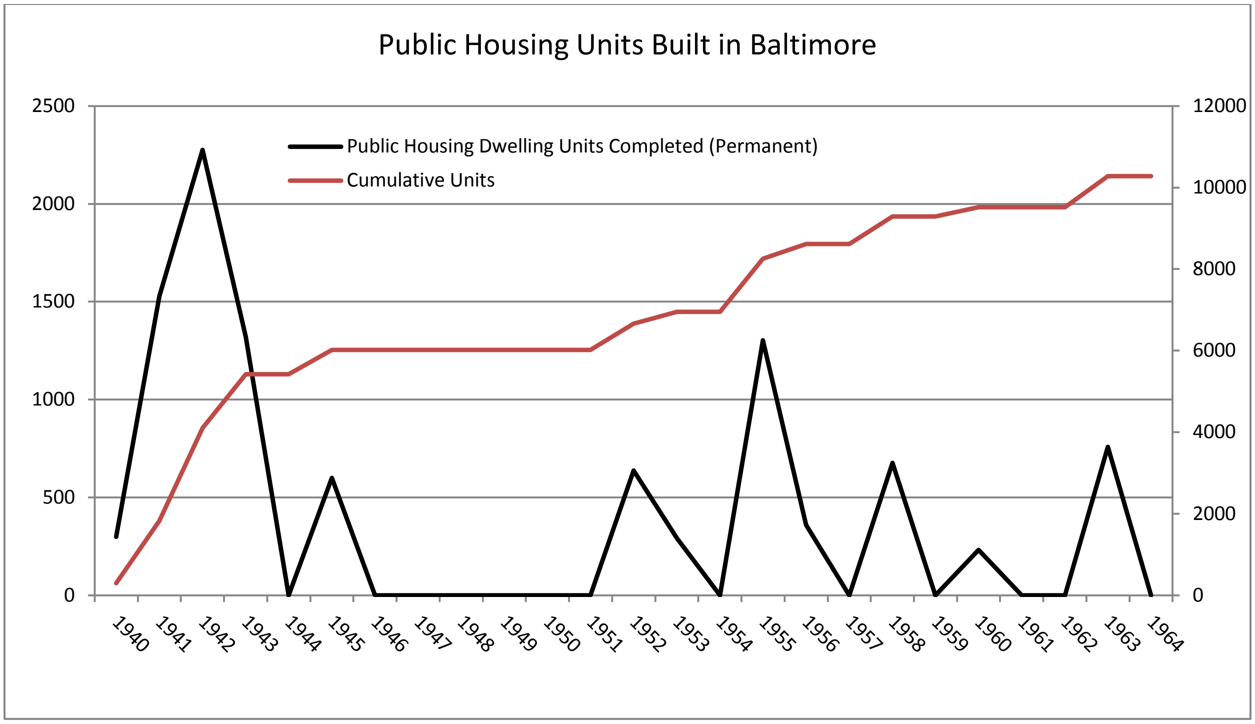


Figure 47: Permanent public housing units built in Baltimore. The units are recorded according to when the public housing units were opened. Typically the projects were begun a year or two beforehand. As the graph shows, public housing building slowed over time after a surge during the late Great Depression and World War II. **Sources:** Various in GBC, CPHA, BURHA, Baltimore City Department of Planning Records (hereafter, BCDP), LLSC. **Graph**: Leif Fredrickson.

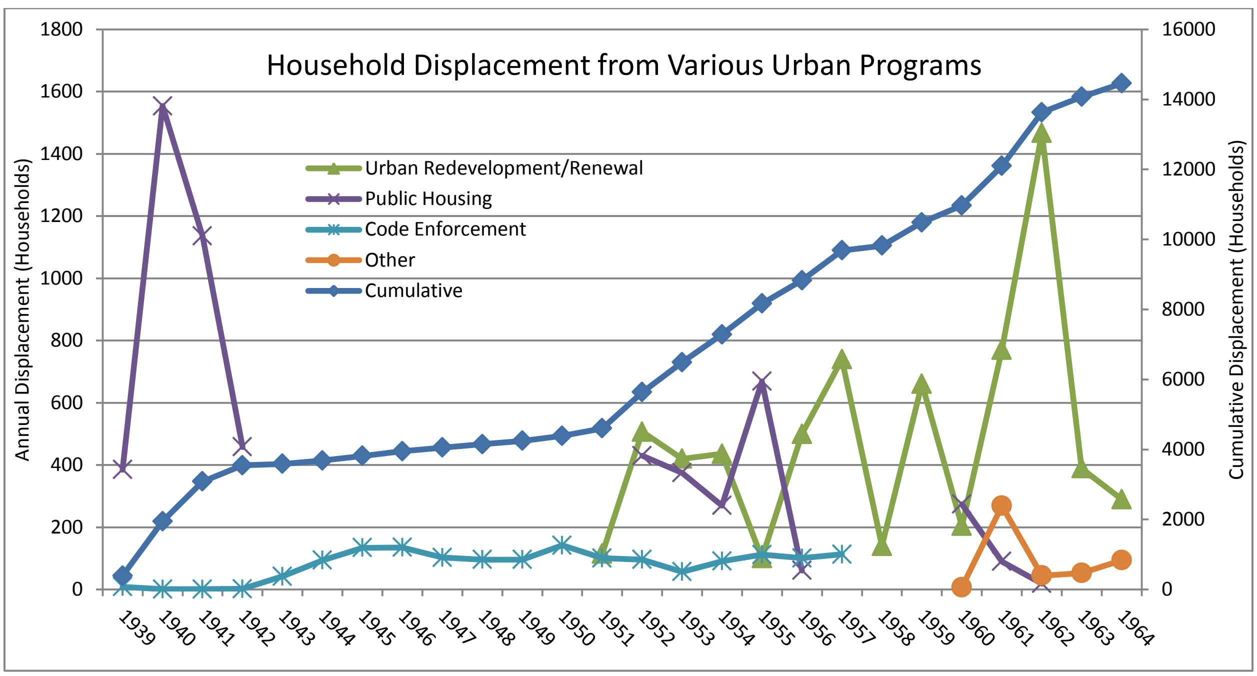


Figure 48: Annual and cumulative displacement of households in Baltimore by various urban programs. The scale of displacement was quite large over the 25 years from 1939 to 1964, expanding rapidly after urban redevelopment/renewal programs were put in action. **Sources:** Various in GBC, CPHA, BURHA, BCDP Records, LLSC. **Graph**: Leif Fredrickson.

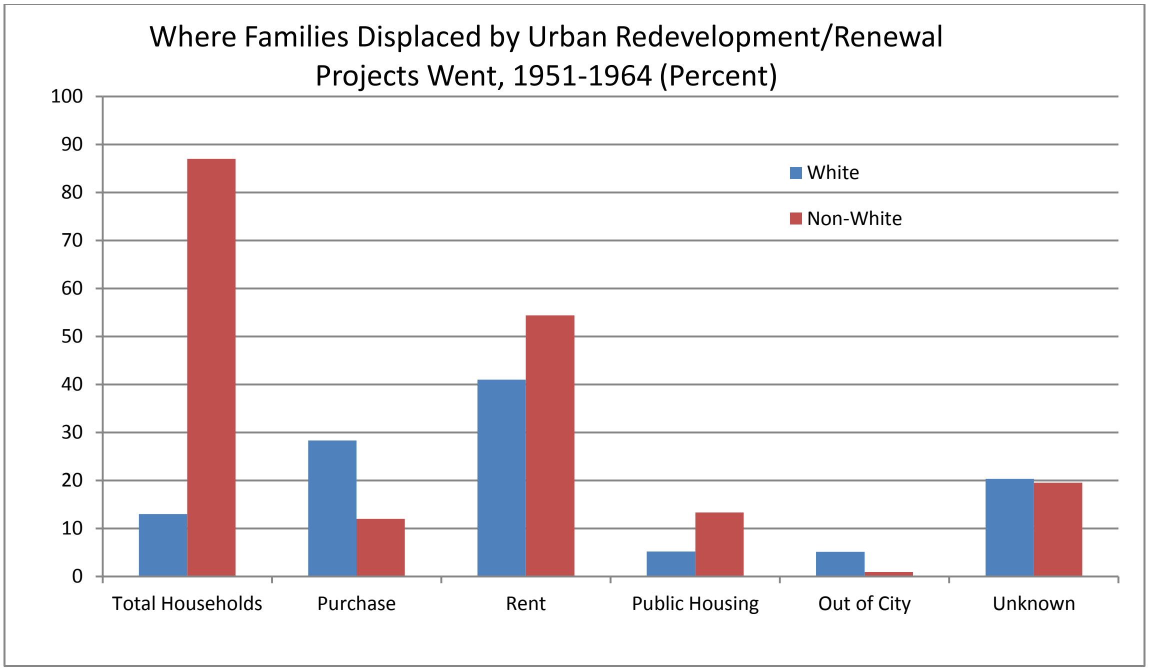


Figure 49: Urban redevelopment and renewal projects caused large scale displacement of people in Baltimore and other cities. Those displaced were overwhelmingly black. Displaced families ended up in various types of housing. Some former homeowners were forced to rent because they could not afford to buy another house. Although displaced families were given priority in public housing, public housing was already full, so many were not able to get in. About 20% of families could not be traced after displacement, perhaps suggesting they ended up in very poor, unregulated living conditions. **Source:** Baltimore Urban Renewal and Housing Authority, "Displacement and Relocation, Past and Future," Staff Monograph 5.4, March 1965, BCDP Records, LLSC. **Graph**: Leif Fredrickson.

Conclusion

In both rhetoric and funding, growth liberalism bolstered attempts to deal with problems of slums and blight in Baltimore. Along with numerous active local individuals and institutions, the city produced an exceptionally vigorous set of programs aimed at code-enforcement, urban redevelopment and renewal, and child lead poisoning. For all these assets, however, Baltimore's attempt to curb blight and end slums and lead poisoning was a failure. Progress was certainly made on these fronts. But measured by the goals set out initially, and in the frank retrospection of the groups and individuals involved, these programs produced, at best, frustratingly slow progress. Often they produced ephemeral improvements, and often enough, too, they produced no effect or even unintended and unwanted consequences.

Part of the reason for this was that slums, segregation and creation of slums, through housing disinvestment, was profitable. Landlords were powerful political agents, as were the subset of them who were slumlords. And slumlord power increased as slums increased. In addition, the problems of the city and inner city were emphatically connected to mass, race-based suburbanization, as I have argued in the previous chapter, and those with an interest in this form of suburbanization were usually not interested in changing it to accommodate the city or make its most disadvantaged residents better off.

But the failure also stemmed from within the broad set of actors who wanted to stop blight and eliminate slums. Most importantly, there were various and conflicting ideas about what the problem actually was. For some, the problem was with the people who lived in slums and blighted areas – with the poor and with African Americans. Often this problem with the residents was justified in terms of concern about disease, crime and vice emanating from slums or a belief that slums depressed property values or wasted urban space. Finally, some people saw slums and poor quality low-income housing as a problem of social justice; they were concerned with the welfare of people who lived in the slums. Because people had different conceptions of the slum problem, they had different goals in their approaches to "solving" slums. Some of these approaches were aimed at creating better housing for low-income people, but others were aimed at removing or controlling those people. Official justifications could cover over ulterior motives. Often, multiple approaches and multiple goals were packaged together in legislation or programs. As such, these laws and programs could draw support from coalitions that had different priorities and often conflicting goals. In practice, these approaches were sometimes effective at achieving their goals, but they often failed, worked at cross-purposes or had unintended consequences.

Institutional factors were also important. The problems of slums, blight and the need for renewal that cities faced in the post-war period required state reorganization and the expansion of state capacity. But these changes did not come easily, if at all, not only because institutional change and learning took time, but for the reasons mentioned above: There was disagreement and political opposition to institutional change.

In the 1960s and 1970s, Baltimore City's housing, health and lead paint programs retreated from the bold visions that were augured in the public housing vision of the 1937 and 1949 Housing Acts, Baltimore's 1941 Hygiene and Housing Ordinance, the Baltimore Plan, the lofty goals of the 1954 Housing Act, and the effort to create a lead poisoning program that provided primary prevention, not mitigation after children had already been lead poisoned.

Public housing disappeared almost completely in the 1960s. No additional units were built between 1963 and 1969, when 35 units were built. Housing code enforcement remained, but in a much softer form. Partly this was the result of concerns about strict enforcement accelerating housing abandonment. Partly it was a result of yet another reorganization of housing code enforcement, which became lodged in the Bureau of Building Inspection in the Department of Public Works. This was the agency most closely tied to landlords, who had vigorously opposed BURHA gaining control of city-wide enforcement. There was also a shift toward trying to get tenants and landlords to comply with housing codes through education rather than penalties. Shifts in legal doctrine made it easier for tenants to sue landlords or withhold rent in the 1960s and 1970s. Much of the "regulation" of housing code thus shifted to individuals using the courts for torts or breach of contract.

Many of these shifts were reflected in the approach to lead paint poisoning as well. After the failure of primary prevention, the BCHD embarked on a new program that tried to use intensive education to get to parents to understand the problems of lead poisoning. George Schucker and others on the Lead Paint Poisoning Prevention Committee saw irresponsible parents rather than exploitive landlords as the main cause of child lead poisoning. Several members of the committee even developed "indices of irresponsibility" to predict what families would have problems with child lead poisoning. Among the indices were: "lack of prenatal care"; "unregistered delivery of obstetrical patients"; "aid to dependent children"; "mothers who missed appointments"; and "families with truant children."[152] It is not clear if they used these indices in the "hard sell" education program. But what was clear was that the education program was a complete failure. Set up as an experiment to test changes in lead poisoning rates between families receiving intensive education materials and those that did not, the study found after several years that there was no difference at all between the two groups.[153] Nevertheless, the BCHD continued focus more than ever on education, tenant responsibility, and family responsibility as causes of child lead

[152] BCHD, "Lead Paint Poisoning Prevention Committee," Minutes of the First Meeting, January 11, 1962; and Minutes of the Second Meeting, February 8, 1962; both in Folder Lead Paint Poisoning Prevention Committee Minutes 1962, Box 3.3-4, GHW Papers, AMCM Archives.
[153] Schucker et al., "Prevention of Lead Paint Poisoning among Baltimore Children. A Hard-Sell Program."

poisoning. It increasingly emphasized the role of pica, liberally diagnosed children with pica, and framed pica as pathological conditions stemming from family dysfunction.

Chapter 6 – The Gas That Makes the Hills in High Gear: Tetraethyl Lead, Automobile Pollution, and the Co-Production of Urban and Suburban Environments

In John Bannon's Monumental Iron and Metal scrap yard, workers tore apart every kind of product of human labor, reducing them to jagged piles of metal pieces whose only commonality was their elemental composition. Finally, a furnace reduced the pieces to liquid metal, totally erasing their existence. It was the fate of kitchen pots and passenger ships. But one object escaped that fate: On display in Bannon's shop in 1908 was something that looked like an overbuilt toboggan atop four bicycle tires. It had seats. Behind the back seat was a boiler, and next to the boiler was a gasoline tank. It was an automobile – Baltimore's first "horseless carriage."[1]

Bannon bought the car from a Mr. Blaney, who had towed the car to Bannon's shop with a mule. ("Proud old vehicle – it was horseless to the bitter end," the *Sun* quipped.) Mr. Blaney had bought the car from its original owner, a man named W. Lee Crouch.[2] Crouch did not buy it; he built it. It was a prototype, and to test it and market it, Crouch took it on a spin in suburban Roland Park in 1899. At the time, the *Sun* described the vehicle as the first "horseless carriage" in Baltimore.[3] The car purportedly reached speeds of 40 miles per hour, enough to leave trolleys and horses in the dust. And it "climbed the steepest hills without difficulty."[4] A few months later, Crouch orbited his "strange machine" on the road around Druid Hill Lake and eased it up the "steepest hills" and "longest grades." Evidently, the sight of a vehicle climbing the hills of these wealthy neighborhoods was impressive to the media. By the time

[1] "Baltimore Saw First Auto in 1898," *Sun*, May 2, 1909, 15.
[2] "Baltimore Saw First Auto in 1898," *Sun*, May 2, 1909, 15.
[3] But there were several competing claims to the mantle of first automobile owner in Baltimore. See "Baltimore Saw First Auto in 1898," *Sun*, May 2, 1909, 15 and "The First Automobile," *Sun*, August 1, 1908, 9. One article claimed the first American-made automobile in the United States was built and used in Baltimore in 1891. "First American-Made Automobile Was Built By Two Ingenious Baltimoreans in 1891," *Sun*, May 9, 1909, 14. Another story states that the first manufacturer of "horseless carriages" in Maryland was incorporated in Baltimore in 1896. "Horseless Carriages," *Sun*, March 13, 1896, 1.
[4] "A Speedy Automobile," *Sun*, April 15, 1899, 12.

Crouch made his second exhibition, he and several partners had already made plans to start the Crouch Automobile Manufacturing and Transportation Company and locate it in Baltimore.[5]

Technological change also made automobiles more appealing. Starter batteries – the kind Monumental Iron tore apart for secondary lead smelting – eliminated the need for hand cranking. And in the 1920s, oil companies began adding tetraethyl lead (TEL) to gasoline as an "anti-knocking" agent. One of the most important aspects of TEL, particularly for Baltimore's suburban drivers, was that it allowed automobiles to climb hills without stalling or loss of power. Technological change in automobiles was accompanied by radical infrastructural change in the metropolitan landscape to accommodate and facilitate automobile use. Increasingly, these strange machines became normal, inevitable – even natural – parts of metropolitan life.

While automobiles brought benefits to some people, they also produced concerns about public health. Initially, these concerns were mainly about accidents, especially children being run over. The noisiness of automobiles also raised health concerns.[6] And as automobile numbers grew, people began to see them as sources of serious air pollution alongside industry. One of the earliest concerns about air pollution from automobiles regarded tetraethyl lead after its introduction in 1924. These concerns – which corporations and many public health researchers initially quashed –were not only correct, but underestimated the hazards from TEL.

Yet the story of leaded gasoline pollution, like that of lead paint, is not only one of technological change in automobiles and the failures and successes of automobile regulation. It is also the story of how people used automobiles and how the externalities of automobile pollution were distributed. In turn, it is the story of the way that policies, politics, ideas, technologies and markets shaped automobile use and social geography in metropolitan areas, among other places. Chronicling these factors shows us how the benefits and costs of leaded gasoline accrued across spatial, racial and class lines in the twentieth century.

---

[5] "A Spin in an Automobile," *Sun*, May 18, 1899, 10; "To Build Automobiles," *Sun*, July 4, 1899, 8.

[6] Many people, lay and expert alike, believed that noise caused mental health problems and interfered with healing. "How Baltimore Suffers From Unnecessary Noises," *Sun*, November 28, 1909, 14; "Unnecessary Noises and How They Wear Out the Nerves of the Sick And Well," *Sun*, September 6, 1908, 15.

Historians and analysts of environmental justice have rarely focused on commuter pollution. Environmental historians have frequently held up leaded gasoline as one of the great environmental disasters of the twentieth century, yet histories of lead gasoline have almost exclusively focused on its national regulation, rather than its use and the distribution of its pollutants in the population.[7] More broadly, historians have generally neglected the air pollution created by automobiles and commuters in the city.[8] Similarly, the multi-disciplinary analysis of environmental justice in cities has, in general, focused on industrial pollution and waste siting. This focus reflects in part the path dependency of debates in the environmental justice literature. A key debate has revolved around the question of whether industrial sources of pollutants and/or waste sites are disproportionately placed in minority/low-income neighborhoods, or whether minority/low-income residents end up near these polluting sources because the housing is cheaper there. This focus on industries and waste sites also reflects, in part, the "streetlight effect," in which researchers examine questions that are easier to answer. In this case, discrete point sources of pollution from factories and waste sites are typically easier to analyze (especially quantitatively) than dispersed sources of pollution (e.g., automobile emissions).[9] But industrial pollution

[7] For the importance of leaded gasoline, see, for example, J. R. McNeill, *Something New Under the Sun: An Environmental History of the Twentieth-Century World* (W. W. Norton & Company, 2001), 111. For excellent histories of leaded gasoline, largely from the perspective of national regulation, see W. J. Kovarik, "The Ethyl Controversy-How the News Media Interpreted the 1920s Controversy over Leaded Gasoline and the Alternatives" (Dissertation, University of Maryland, 1993); William Kovarik, "Ethyl-Leaded Gasoline: How a Classic Occupational Disease Became an International Public Health Disaster," *International Journal of Occupational and Environmental Health* 11, no. 4 (2005): 384–397; David Rosner and Gerald Markowitz, "A 'Gift of God'?: The Public Health Controversy over Leaded Gasoline during the 1920s.," *American Journal of Public Health* 75, no. 4 (1985): 344–352; Gerald Markowitz and David Rosner, *Lead Wars: The Politics of Science and the Fate of America's Children* (Berkeley : New York: University of California Press, 2013); Warren, *Brush with Death*; Jerome O. Nriagu, "The Rise and Fall of Leaded Gasoline," *Science of the Total Environment* 92 (1990): 13–28; H L Needleman, "The Removal of Lead from Gasoline: Historical and Personal Reflections," *Environmental Research* 84, no. 1 (January 1, 2000): 20–35.

[8] As far as I know, there is no article or book chapter, let alone a book, devoted to the subject, while there are many that focus on industrial pollution. Traffic pollution gets a couple sentences in Hurley, *Environmental Inequalities*, 33, 73. Likewise, more recent monographs and synthetic histories of environmental justice, focus on industrial pollution, with minor attention, if any, to the disproportionate effects of automobile pollution. For example, Sze, *Noxious New York*; Dorceta Taylor, *Toxic Communities: Environmental Racism, Industrial Pollution, and Residential Mobility* (NYU Press, 2014). One recent environmental history that does discuss congestion and commuters extensively, but not from the standpoint of its effects on inner city health or environmental justice, is Christopher W. Wells, *Car Country: An Environmental History* (University of Washington Press, 2013).

[9] For influential studies of environmental justice, see United Church of Christ, *Toxic Wastes and Race in the United States: A National Report on the Racial and Socio-Economic Characteristics of Communities with Hazardous Waste Sites* (Public Data Access, 1987); Bunyan I. Bryant and Paul Mohai, *Race and the Incidence of Environmental*

is not and has not always been the most important pollution source. Since the 1960s, pollution from automobiles has usually dominated urban air pollution, not industries. This was especially true of lead pollution. While smelters and other industrial sources could spew immense amounts of lead, the use of lead in gasoline for automobiles has dwarfed industrial sources. As such, analyses that use, for example, the Toxic Release Inventory (TRI) to represent the "environmental equity pattern" in Baltimore are not only incomplete, they are seriously misleading.[10]

Explicitly tracing the links between traffic, suburbanization and environmental health over time, as I do in this and the following chapter, helps re-conceptualize metropolitan development and the production and reproduction of inequality. Historians who have analyzed the links between transportation technology and environmental inequality have tended to focus on the way these technologies brought better environments and health to certain people, namely wealthy, middle class and white people. For example, the way streetcars and automobiles allowed wealthier (and whiter) people to escape to the suburbs.[11] Historians have focused much less on the negative externalities – the "bads" – created by these

---

Hazards: A Time for Discourse (Westview Press, 1992); Robert D. Bullard, *Dumping in Dixie: Race, Class, and Environmental Quality* (Westview Press, 2008); Luke W. Cole and Sheila R. Foster, *From the Ground Up: Environmental Racism and the Rise of the Environmental Justice Movement* (NYU Press, 2001); Andrew Szasz, *EcoPopulism: Toxic Waste and the Movement for Environmental Justice* (University of Minnesota Press, 1992); Robert Bullard, *Toxic Wastes and Race at Twenty, 1987-2007: A Report Prepared for the United Church of Christ Justice & Witness Ministries* (United Church of Christ, 2007); Robert Bullard et al., "Environmental Justice Milestones and Accomplishments: 1964-2014" (Texas Southern University: Barbara Jordan-Mickey Leland School of Public Affairs, February 2014). The environmental justice literature does include many studies that look at aspects of the environment other than industry and waste siting. Environmental justice analysis of Native American issues, rural places and places outside of the United States often consider access to natural resources. And there has been an important shift toward analyzing disparities in access to environmental amenities, especially urban parks, not just disamenities. But urban environmental justice analysis still tends to be dominated by a focus on industry and waste and there are very few environmental justice studies that examine traffic pollution. One notable exception is Robert Bullard, Glenn S. Johnson, and Angel O. Torres, *Sprawl City: Race, Politics, and Planning in Atlanta* (Island Press, 2000).

[10] For example, in a fascinating analysis, Christopher Boone has shown that TRI sites are concentrated in white working class neighborhoods in Baltimore, not in black or Latino neighborhoods as is generally found in other places. Boone's analysis is critical, yet the article gives the impression, as do many studies of industrial pollution, that it is representative of inequality in pollution hazards. Christopher G. Boone, "An Assessment and Explanation of Environmental Inequity in Baltimore," *Urban Geography* 23, no. 6 (2002): 581–595.

[11] See Thomas Zeller, "Histories of Transport, Mobility and Environment," *Journal of Transport History* 35, No. 2 (December 2014), iii-v and the accompanying articles in this issue for some examples of how the relationship between the environment and transportation have been conceptualized. Other environmental histories that foreground transportation technology include Tom McCarthy, *Auto Mania: Cars, Consumers, and the Environment* (Yale University Press, 2007); Wells, *Car Country*; White, *Railroaded*. Histories of environmental justice have also

systems: The ways that transportation technologies can disproportionately burden some groups with pollution. And even less common are histories that examine the dynamic interactions between environmental (dis)amenities, transportation and social geography. As this chapter shows, environmental problems in the urban core were a key reason that people moved to the suburbs. While suburbanites benefitted from transportation technology, the negative externalities from this transportation spewed environmental hazards in the urban core, where driving was heavier and more congested, which, in turn, spurred more suburbanization. This dynamic was especially evident in automobile-based suburbanization, which brought increasing traffic hazards, noise pollution and air pollution – including lead pollution – to the city center. The feedback loop of automobile pollution and automobile-based suburban escape thus co-produced the very different environments of the suburbs and the inner city.[12]

Automobile use arose out of problems of human congestion in the city in the early 1900s. Automobiles initially provided recreation for the wealthy and a means of hauling for producers and merchants. But as technology improved, automobiles became more attractive. Lead-related technology, such as rubber and batteries, played important roles in making automobiles easier to use and more desirable. Among these technologies was tetraethyl lead, a gasoline additive that increased the power and consistency of driving. These enhancements were particularly important for drivers looking for automobiles that could take them over hilly terrain, such as the kind that existed in Baltimore's suburbs. Baltimore thus became an early target for the new gasoline additive and it was widely adopted in the city, despite considerable controversy over its health effects.

A controversy with far more staying power was what to do about the massive traffic congestion that resulted from the increasing use of automobiles. In Baltimore, as in other cities, politicians,

---

discussed the way transportation technology, among other things, enabled people to move to healthier environments in the suburbs. For example, Hurley, *Environmental Inequalities*.

[12] Thanks to Robert Gioielli for suggesting the term "co-production." For Gioielli's suggestion of a metropolitan approach to environmental history, see Gioielli, "The City and American Environmentalism." Surprisingly few environmental justice histories even discuss the suburbs, but those that do tend to focus on the way that racial privilege and affluence allow certain people to escape the environmental problems of the urban core. They do not look at how suburbanization in turn affects the environmental health of the inner city. For excellent studies that probe the first half of this relationship, see Hurley, *Environmental Inequalities*; Pulido, "Rethinking Environmental Racism."

engineers, business leaders and the public wrestled with how to control traffic. But the solutions offered were not up to the task of taming the automobile. As a result, heavy traffic and traffic congestion, as well as the lead pollution that came with them, remained serious problems in the city in the 1920s and 1930s. While the burden of pollution was distributed over many social groups, it probably fell most heavily on poorer and African American neighborhoods. When it did affect wealthier people, it contributed to their exodus from the city – almost certainly via the automobile.

Rise of Mass Transit

As Baltimore industrialized and grew in numbers in the late nineteenth century, the city faced a problem of congestion. People crowded together at the neighborhood scale to be within walking distance of their employment, and poor families crowded together in order to afford housing, raising concerns of slums. By 1889, the *Sun* was calling this this situation unsustainable, noting that people would not put up with long (walking) commutes or the congestion and high rents that went with increasing density around places of employment. The *Sun* called for "rapid transit" as a way of overcoming these obstacles.[13]

Along with New York and a few other cities, Baltimore already had decades of experience with two kinds of transit. In the early 1830s, omnibuses (horse-drawn stagecoaches operating on a regular time and route) and horse-drawn streetcars (horse-drawn cars operating on track) began operation in these cities. They were not fast by later standards, running about 5-6 and 6-8 miles per hour respectively, but by mid-century they had helped expand the radius of cities using them to about three or four miles.[14] After the 1870, Baltimore expanded even more, largely via the horse-drawn street car.[15] As the lines stretched out, according to the *Sun*, "House builders followed it. Suburban settlements sprang up along its routes. It changed Baltimore from a compact little town to a great sprawling city, 15 miles from end to end."

[13] "The Growing Needs of Baltimore," *Sun*, October 8, 1889, 2.
[14] Horse-drawn street cars carried about thirty to forty passengers. Martha Bianco, "Franklin Julian Sprague: The Father of Electric Urban Mass Transit in the United States," Roger Biles, *The Human Tradition in Urban America* (Rowman & Littlefield, 2002), 71. One omnibus line in Baltimore carried up to 35 passengers. "When the Old Bosley Stage Line Hauled Baltimoreans Out The Hartford Road," *Sun*, June 6, 1909, 24.
[15] "The Growing Needs of Baltimore," *Sun*, October 8, 1889, 2.

But the slow speed of the horse-drawn street car and its cost for passengers limited its effectiveness. In the 1880s and 1890s, mechanically-powered street cars emerged, promising higher transportation speeds (up to about 15 miles per hour) and reduced fare costs. As described in Chapter Two, Baltimore had the first electric-powered street car line, begun in 1885 by Leo Daft, but it proved to be unsustainable. In the 1890s, however, both cable cars and electric trolley cars began operating in the city, with the cable cars eventually being converted to trolley cars. In 1899, *Sun* argued that a modern, electric streetcar system was the "chief need" of the city's taxpayers, residents, businessmen and laborers. By and large, the city got that system. Street car service expanded and the United Railways and Electric (UR&E) company snapped up all the streetcar lines in the city and began integrating and modernizing the system.[16]

Rise of the Automobile

At the turn of the century, the electric streetcar was the king of urban transportation. Horses were still important, and there were some other strange oddities, such as the "horseless-carriage." Still a novelty, the *Sun* carried stories about the "horseless carriage" in France in the mid-1890s, foreseeing that it would have a large impact on transportation, especially for hauling goods in the city, but that its use was limited in the United States by the poor state of country roads.[17]

Through the early 1900s and 1910s, automobiles became far less anomalous. In 1901, car enthusiasts formed the Automobile Club of Maryland, which was located in Baltimore. Around 1909, automobile prices and quality reached a level that, according to the *Sun*, could "tempt the great mass of people." They were still expensive at about $2,000 a piece (about $75,000 in 2017 dollars). Still, there had been a "mad rush" for automobiles in the few years before 1909, and by that date there were 2,400 in the city. Also by this point, the "gasoline-explosive" (internal combustion engine) automobiles had "far outstripped" the steamers. As the *Sun* described it, "all over the city streets and in all the country lanes

---

[16] "The Growing Needs of Baltimore," *Sun*, October 8, 1889, 2; Harwood, *Baltimore Streetcars*, 18.
[17] "Horseless Carriages in France," *Sun*, June 17, 1895, 2; "Horseless Road Wagons," *Sun*, July 12, 1895, 4.

there is the sniff of gasoline."[18] Automobile technology was also changing in other ways as well – from the adoption of rubber tires to lead-acid batteries – and these changes often made automobiles less daunting machines. As automobile use increased, governments produced laws to regulate these new machines. Initially limited to speeds of six mile per hour, drivers were soon given more lee-way to drive up to 25 miles per hour in some parts of the city by 1915.[19] The popularity of the automobile both affected, and was affected by, changes in the automobile industry. Within a decade of its start in 1899, W. Lee Crouch's company was one of several auto manufacturers in the city along with dozens of dealers. But after 1915, Ford's mass production swept away most small manufacturers. Mass production drove down prices, and the automobile became less an exclusive toy of the rich.

Government policies also facilitated an increasingly automobilized world. Maryland and other states took over the funding, planning and administration of roads in the early 1900s. The Automobile Club of Maryland and other regional and national clubs pushed for funding of roads and paving, and shaped legislation on automobiles.[20] Crucially, the state ended up tying automobile fees, and later taxes on gasoline, to road maintenance and construction.[21] Better paved roads also allowed a new form of mass transit: the motorized "omnibus" or "jitney bus," which first appeared in Baltimore around 1913. These buses used lead-acid batteries and provided service to the suburbs of Roland Park and Guilford.[22] As a result of these funds, as well as national funds from the 1916 Federal Aid Road Act, the state paved,

[18] Business that had to haul heavy goods in the city, such as the scrap dealers discussed in Chapter One, were early investors in automobiles. "Baltimore Saw First Auto in 1898," *Sun*, May 2, 1909, 15. Measuring Worth puts the relative price at $53,700 and the relative value at $110,000. See the website for details on the meanings of relative prices and values, but either is potentially useful for understanding this price from the past. www.measuringworth.com/uscompare/relativevalue.php

[19] "May Go 12 Miles an Hour," *Sun*, May 18, 1906, 7; "Auto Law Construed," *Sun*, March 21, 1915.

[20] "Baltimore Saw First Auto in 1898," *Sun*, May 2, 1909, 15.

[21] Christopher W. Wells, "Fueling the Boom: Gasoline Taxes, Invisibility, and the Growth of the American Highway Infrastructure, 1919–1956," *Journal of American History* 99, no. 1 (June 1, 2012): 72–81.

[22] "Motorbus Line Coming," *Sun*, October 19, 1913, 6; "The Jitneys Multiply," *Sun*, February 27, 1915, 14. On the other hand, road paving sidelined the traditional engine of mass movement on the streets: the horse. Paved roads were slippery for horses. Horses were still an important form of urban transportation in the early 1900s, but paving, in addition to competition for road space and other issues, helped marginalize them. "Autos and Roads and Horses," *Sun*, 6.

reconstructed and built hundreds of new miles of roads and highways in the state in the nineteen teens.[23] Similarly, the city of Baltimore paved hundreds of miles of its roads in the nineteen teens.[24] At the same time, city streets – which had previously been something of a multi-use common space – increasingly became the exclusive province of automobiles, physically, culturally and legally (through jaywalking laws, for example).[25] In 1911, the city completed University Parkway, its first road designed to accommodate faster moving traffic.[26] These actions built up a web of roads in the Baltimore region that, by the end of the 1920s, allowed automobile drivers to drive primarily on paved roads when traveling within the city, between the suburbs and downtown, and between the city and virtually all of the towns in the surrounding area, not to mention bigger cities like Frederick, Harrisonburg and Washington, D.C.[27]

The Rise of Traffic Congestion and the Automobile Suburbs

The reach of this paved web was no guarantee of problem-free automobile traffic. While the city grew in population and spread out in space with suburbanization (the municipality annexed many of these suburbs in 1918), its downtown grew up, with the help of high-rise architecture. These high rises drew more people downtown, for work and consumption, but created no extra space on the ground.[28] Building up and building out had an internal spatial contradiction, in other words, which manifested in traffic

[23] Maryland State Highway Administration, "Modern Transportation Milestones in Maryland, 1900-1960," accessed September 14, 2016, sha.md.gov/OPPEN/II-MODT.pdf. By 1915, the state had about 1,100 miles roads, most of which were concrete or macadam. "Maryland Roads Shown," *Sun*, July 19, 1915, 2.
[24] Anderson, *The Origin and Resolution of an Urban Crisis*. In 1914 the city laid almost 50 miles of paved roads. "Modernizing a City," *Sun*, January 1, 1915, 5.
[25] Norton, *Fighting Traffic*.
[26] "Parkway by Tuesday," *Sun*, August 20, 1911, 11.
[27] And many roads that were not paved used macadam or brick, so they were not just dirt or gravel. See Street Paving Commission of Baltimore City, "Map Showing Streets Paved With Improved Paving to December 31, 1915," (1916), Map and Atlas Collection (hereafter MA Collection, Milton Eisenhower Special Collections, Johns Hopkins (hereafter, MESC).
[28] Some cities had enacted zoning ordinances limiting the height of buildings, the Kelker report noted, but even those restrictions were not based on the availability of street space. Baltimore had zoning regulations that limited buildings to 2.5 times that width of the street they fronted. This was not lax by the standards of the day. At the time, the average height of downtown buildings was about four stories. But it was possible under zoning regulations to bring this average up to about 17 stories – four times the current level, the report noted, with a corresponding increase in traffic. Kelker, De Leuw and Company, *Report and Recommendations on the Routing of Street Railway Lines and Methods for the Improvement of Traffic Conditions in the City of Baltimore to the Traffic Survey Commission of Baltimore* (Baltimore: Waverly Press, 1926), 11–12.

congestion.[29] ("If I were to writing an article on how to increase traffic congestion," Lewis Mumford wrote in regard to Baltimore in 1925, "I should sum up my advice in two words: Build skyscrapers.")[30] The city still had the basic street layout that it had one hundred years before, when people got around on foot or hoof. Streets were generally narrow and wide sections, where they existed, were not consistent. Small city blocks and Baltimore's famous alleyways made for many streets and intersections. These factors limited the capacity of streets, created bottlenecks, increased the cost of street paving, and increased intersections that slowed the flow of traffic.[31] The great Baltimore fire of 1904 had resulted in some street widening, and, as mentioned, the city had paved many streets. But the steep climb in automobile registrations swamped these improvements. Indeed, the improvements had been an inducement to more automobile use. In 1916, the transportation director for the Public Service Commission predicted that traffic congestion would force Baltimore to build a subway within ten years.[32] Baltimore did not get a subway until 1983 (a very small one at that), and its rather robust streetcar system did little to slow the rate of automobile use. Between 1915 and 1925, passengers on Baltimore streetcars increased by 23%. But automobile registration increased by 307%.[33]

In the 1910s, residents lashed out at pedestrian deaths from automobiles, traffic congestion and the city's bend-over-backward accommodation of street building and widening. One of the key controversies was the widening of St. Paul Street, which drew protest from some Baltimoreans who saw it as a waste of taxes (both in the cost and in the destruction of taxable property) that primarily benefited

[29] Harold Platt has argued that electricity was a source of urban deconcentration (via electric services to homes and electric trolley transportation) whereas Richard Stott has suggested that electricity-powered elevators used in skyscrapers were a concentrating force. It was both: skyscrapers helped jobs and businesses concentrate in the central business district while residential development continued to spread outward. The result was congestion. Harold L. Platt, *The Electric City: Energy and the Growth of the Chicago Area, 1880-1930* (University of Chicago Press, 1991); Richard Stott, "Urban Electrification," *Reviews in American History* 20, no. 2 (1992): 211–15.
[30] "Mumford 15 Years Ago," *Sun*, January 15, 1941, 24.
[31] Kelker, De Leuw and Company, *Report*, 107–9. Alleyways could also reduce traffic congestion, however, because they allowed delivery vehicles to park off of the main street.
[32] "City and Suburban," *Sun*, August 1, 1916, 1.
[33] The rate of streetcar passenger increase is from United Railways, the main streetcar company in Baltimore. Comparing automobile use and mass transit use is difficult because one needs to compare trips – a statistic that was often recorded by mass transit companies, but was not available for automobiles outside of research studies that sought to ascertain this. Thus the comparison for early transportation is usually between transit passengers and registered automobiles, as is the case here. Kelker, De Leuw and Company, *Report*, 4.

drivers from outside the city.[34] This project eventually dovetailed with efforts to clear poor black people out of part of the downtown, as detailed in Chapter Five.

The city successfully executed the St. Paul Street widening, but like previous and subsequent attempts to increase capacity and facilitate flow, the alleviation it brought was neither far reaching nor permanent. Congestion got worse. In 1923, the mayor gathered a Committee on Traffic to figure out what could be done in the "congested district" of the downtown, which according to one member had "reached the point of saturation."[35] Colonel Sherlock Swann, who had spearheaded earlier traffic regulations and street widenings in Baltimore, chaired the committee. According to Swann, Baltimore was "unlike any similar area in any of the large cities of the United States" due to its interlacing of narrow streets and two-way railway tracks on virtually every street. Earlier street widenings in the downtown area had relieved some congestion temporarily, but traffic had continued to increase and drivers used the widened street for parking. Real solutions were not readily available. "The congested district is suffering with a cancer, and not with a boil," Swann noted. A boil might be lanced, but to solve a cancer, a more "radical operation" was needed. Yet Swann did not see the Committee as being in a position to provide a radical operation, which might include large-scale redevelopment of downtown streets or the construction of a subway system. Some proposed policies were not acceptable to the powerful downtown commercial interests, such as banning parking or even banning automobiles. Instead, Swann and the Committee sought policies that brought "immediate relief."[36] One idea was one-way streets, but these were difficult to implement given the two-way traffic of railways on the streets. Ultimately, the committee was left suggesting

[34] One observer claimed he saw 27 automobiles pass in three minutes, and claimed that only one or two, according to the observer, "paid taxes in Baltimore City." R.E.W., "Widening of St. Paul…" (letter), *Sun*, May27, 1914, 6.
[35] [Swann], Untitled Memo, [1923]. This typewritten memo (or possibly a speech) has no author, date or title, but it was clearly written by Swann in 1923. For the sake of identification, it begins: "Several misapprehensions seem to have gotten loose…" "Saturation" quote is from John Mackall (State Director of Public Works) to W.M. Lucius (Automobile Club of Maryland), August 22, 1923. A "very large" portion of the traffic was, according to one member, from people who did not live in the city but came to do business there. See John Mackall to *Baltimore American*, December 12, 1923, clipping. All in Folder Commission on Traffic – Correspondence, Box 2, Sherlock Swann Papers, Maryland Historical Society (hereafter MHS).
[36] [Swann], Untitled Memo, [1923].

changes to parking regulations, a few new street widenings, the removal of street cars from some streets, and bans on various pedestrian uses of streets.[37]

Even these suggestions were controversial, as a "minority group" within the Committee – comprised of automobile dealers and representatives of two merchant associations, the Real Estate Board and the Maryland Automobile Club– felt that the Committee report approached traffic congestion exclusively as an "engineering problem." "The majority were intent on forcing traffic to move," the group wrote, while "the minority were intent on preventing business from being harmed." The minority group's complaint boiled down to several specific parking regulations that they argued were too strict and would hurt businesses located nearby. For his part, Swann described the position of the minority group as one in which "business demands and the sensible utility of the automobile itself cannot be sacrificed even to ease up the present high pressure of traffic conditions." In this view, Swann argued, the problem of traffic was subsumed to the "maintenance of business at all hazards."[38] These arguments represented an aspect of traffic planning that became commonplace during the twentieth century: The tension between engineers, who looked to organize infrastructure around traffic efficiency, and downtown business interests, who looked to organize traffic infrastructure to serve their needs. Nevertheless, traffic engineers and urban developers were usually on the same page about one thing: the desirability of organizing urban transportation around the automobile.

Not all Baltimoreans, however, saw their interests as congruent with the automobile-centric downtown. Samuel Shriver, Vice President of the Fidelity and Guaranty Company, wrote to the mayor

---

[37] Committee on Traffic, *Report of the Committee on Traffic to His Honor Howard Jackson* (Baltimore, 1923), Folder 1, Box 178, Series 17, BRG 9 (Mayor's Office), BC Archives. On the committee were various government officials, engineers and representatives from the Merchants and Manufacturers Association, the Automobile Club of Maryland, the Federation of Labor and the United Railways.

[38] Minority Group, "Visions of the 'Minority Group' of the Traffic Committee Relative to Certain Features They Declined To Approve," no date, Folder 1, Box 178, Series 17, BRG 9, BC Archives. [Swann], Untitled Memo, [1923]. The tensions between these groups were evident on a number of details hashed out in the Committee. For example, Goldsborough, a representative of the Merchants and Manufacturers Association, was a big proponent of one-way streets, which he proposed instead of parking regulations. Goldsborough to Committee, August 20, 1923. Colonel Swann was stridently opposed to one way streets, which he saw as inefficient. Swann to Meekins (lawyer for the *Baltimore American*), December 12, 1921. All in Folder Commission on Traffic – Correspondence, Box 2, Sherlock Swann Papers, MHS. United Railways, party of the majority group, was in favor of prohibiting all parking, in line with its interests. J. LeRoy Hopkins (counsel for the Auto Club of Maryland) to Howard Jackson, May 21, 1924, Folder 1, Box 178, Series 17, BRG 9, BC Archives.

expressing his disdain for the Committee's plans, especially a suggestion to turn a small park into a 250 lot parking area. "Our question is how are 750,000 inhabitants of Baltimore, and many more thousands of the future, to secure easy transportation and ready access to and from its main centres [sic] of business activity," Shriver wrote, not "how are 250 owners of automobiles… to find a new place to store them during the day." Shriver suggested banning all parking and preparing for the day when personal automobiles would need to be prohibited from the downtown all together. Other professionals and businesses also weighed in against what they saw as the Traffic Committee's enthrallment to the automobile.[39]

These more radical positions on automobile use stalled and the small changes suggested by the committee did little to affect traffic congestion. In an attempt to better understand the traffic problem, in 1925 the city commissioned the first of several large traffic studies that focused on congestion and transportation. The resulting report by Kelker, De Leuw and Company showed that while automobile congestion was a rising a problem, transit commuting (and walking for industrial workers) still dominated the city and the vast majority of work commuters lived within a few miles of their places of work. These dominant modes of commuting were true of both industrial workers and workers in the Central Business District.[40]

Nevertheless, a trend toward automobile-based suburbanization and commuting was underway. The automobile allowed for more expansion of the metropolitan area. Commuters living further away from the city center were more likely to be automobile commuters. And as Baltimore grew outward,

[39] Samuel Shriver to Howard Jackson (Mayor), October 9, 1923. For a similar view, see Benjamin Beck (lawyer) to Jackson, October 10, 1923. Folder 3, Box 178, Series 17, BRG 9, BC Archives.

[40] According to the Kelker report, Baltimore's population was surprisingly concentrated around the CBD for a city of its population size. About 79% of the population (625,000) lived within three miles of the city center. In the 1920s, almost all work commuters lived in the city limits and mass transit was the main mode of transportation. Major focal points of commuting included both the downtown – with a combination of industrial, transportation, commercial and financial occupations – and the industrial areas that were located further away from the city center, almost all of them along the waterfront. Only 5% of workers in the CBD and surrounding area lived outside of the city limits, or in "suburban areas" as the report called them. In fact, there were many suburbs in the city limits, including classic ones like Guilford and Roland Park, but these sorts of suburbs have always been harder to define and take count of. Likewise, only 5% of commuters to industrial areas lived outside of the city limits. Commuters to the CBD were only slightly more likely to use passenger automobiles for commuting than workers in industrial areas (8.5% versus 7.3%). Streetcars and, for industrial center workers, walking, were the main ways to get from home to work. Kelker, De Leuw and Company, *Report*, 11, 42–48.

automobile registrations increased, quadrupling from about 20,000 in 1915 to over 80,000 in 1925. A separate study showed that by 1922, 25,000 suburbanites around Baltimore depended on automobiles for travel - the same as Detroit, "Motor City".[41] These commuters greatly increased traffic flow in the older neighborhoods of the city as they traveled into the Central Business District (CBD). In 1922, about 117,000 automobiles passed in and out of the CBD area, but by the time of the Kelker report in 1926, about 176,000 did so. Importantly, the increase in vehicle traffic between 1922 and 1926 was not mirrored by a similar increase in automobile passengers (i.e., the number of passengers per vehicle declined). This declining efficiency of passenger delivery by automobiles further contributed to congestion.[42]

The Kelker report forecasted an almost doubling of the traffic entering and leaving the CBD by 1930, and made several suggestions, which it said may appear "radical and drastic," to head off a growing traffic crisis. In fact, these suggestions were not radically different than the early traffic committee's suggestions. The Kelker report's suggestions included the re-routing of streetcars and buses; traffic signaling and through streets; the removal of obstructions, such as market stands, from or near streets; the widening and opening of new streets.[43] Despite adjustments to both mass and auto transportation, however, the report endorsed, and through this endorsement, hardened a critical asymmetry: "The number of privately owned vehicles using the streets in congested areas is difficult to control but the number of mass transportation units which use the valuable space in the streets need not be greater than that required to give good service." Thus, in what would foreshadow much of transportation planning to come, the report generally suggested ways to increase automobile traffic capacity and make it move more

[41] This was not a comprehensive list of cities. Los Angeles was not on it, for example. Nevertheless it was clear that Baltimore and Detroit had many more suburban automobile commuters than most other cities. In Cleveland, for example, only 5,000 suburbanites depended on automobiles, and in Nashville only 2,000. National Automobile Chamber of Commerce, "135,000 Homes in 60 Cities Depend on Motor Transportation," *Automobile Facts and Figures*, 1922, 15.

[42] Within two miles of the CBD, only 4% of commuters used automobiles. But nearly 17% of workers living within the city, but five miles away from the CBD, used automobiles. Kelker, De Leuw and Company, *Report*, 11, 22, 47–49.

[43] Ibid., 5–8.

efficiently, while making the mass transit system run efficiently, and provide fair rates, without expanding the system or putting it in competition with automobiles.[44]

In addition to the traffic planning that favored automobiles, Baltimore considered, but failed to develop, institutions that could plan for transportation and other issues on a metropolitan scale in the 1920s and 1930s. The chairman of the City Planning Committee, Joseph Shirley, was a proponent of regional planning. He hosted a conference on the idea in 1925, and in 1932, he made regional planning the goal of the Commission.[45] But the goal went unmet. In 1948, Baltimore City and the surrounding counties formed a metropolitan planning council. But, apparently consumed with immediate local planning issues, the council quickly atrophied and died. The idea was again revived in the mid-1950s due to the temptation of federal funding for such a group (from the 1954 Housing Act) and because of the escalating need to deal with traffic problems. In 1956, Baltimore Regional Planning Council was created. But it was weak, essentially an advisory group.[46]

It is not clear that a stronger, earlier instantiation of metropolitan planning would have changed the region's trajectory toward suburban sprawl and automobile dominance. But the lack of such an institution virtually guaranteed that metropolitan areas would head down the path that made automobile use not only prevalent, but necessary.[47] In 1932, the *Sun* carried architect Clarence Stein's lament about how subdivisions were being "located in accordance with the whim of the speculator," and as a result "there is a chaotic relation between the location of industry and the home of workers. Municipalities have been put to vast expense for transportation systems to connect the two." Thus, according to Stein, despite the "growing demand for peaceful escape from the dangers, noises and odors of traffic highways," roads

---

[44] Ibid., 12.

[45] "Regional Plan Next Goal of Shirley's Commission," *Sun*, December 15, 1932, 18. Baltimore hosted an early conference centered on the idea of regional planning. "City Planning Conference to be Held in Baltimore," *Sun*, January 4, 1923, 5.

[46] Minutes of the Exploratory Meeting on the Baltimore Metropolitan Area Planning Study, June 20, 1955, Box 12, Series 8, Abel Wolman Papers (hereafter AW Papers), MESC. "Baltimore Tries Planning With a Regional Council," Washington Post, June 3, 1957; Melvin Scheidt, "This Metropolitan Area," *Sun*, August 17, 1957, 10. The Baltimore Regional Planning Council was not made permanent until 1963. For the details of the legal and financial aspects of the BRPC and its studies through 1963, see Maryland State Planning Department, *The Counties of Maryland and Baltimore City: Their Origin, Growth, and Development, 1634-1963*, 1963, 75–76.

[47] For an excellent account of this path dependency in which infrastructure, as well as institutions, facilitated and then eventually necessitated automobile use, see Wells, *Car Country*.

for automobiles were being "extended endlessly according to obsolete and wasteful methods."[48] Not only was it costly for municipalities to chase after new residential developments with more and bigger roads, but cities were also perpetually behind, both in extending infrastructure and in developing infrastructure that could handle metropolitan automobile traffic. The normal state of metropolitan traffic, particularly in the urban core, was thus congestion and the automobile pollution that went with it. That very congestion, in turn, drove increasing numbers of Baltimoreans to seek refuge in the suburbs, and whetted their appetite for new roads to get there.

Automobiles and Air Pollution

In the early twentieth century, city residents were well aware that automobile produced fumes that were, at best, unpleasant and, at worst, health hazards. For example, after a 1929 Easter parade inadvertently coalesced with a morning traffic jam, the *Sun* described (in a rather long article) a joyless scene in which the "damp, raw air [was] filled with gasoline fumes," and 40,000 men, women and children sniffed carbon monoxide. "They didn't die from it," the *Sun* noted, "but when the time came to go home a lot of them looked rather ill."[49]

Despite every-day experience and disquiet about automobile fumes, expert concerns about air pollution before World War II focused primarily on smoke (from both residential and business buildings) and industrial fumes. In Baltimore, early attempts at pollution control around the turn of the century had provided a lot of political heat but little light.[50] Indeed, the skies over Baltimore continued to darken. In the late 1920s, business associations, civic groups and the BCHD reinvigorated concerns about air pollution, investing in scientific studies, passing ordinances and developing institutions to deal with the problem. In 1929, the Baltimore Association of Commerce's Air Pollution Committee had claimed, according to the *Sun*, that it wanted to study ways of preventing air pollution from "exhaust gases from automobiles and sulphuric acid from factories."[51] But the major air pollution studies from the late 1920s

[48] "Builder's Time Lag," *Sun*, June 6, 1932, 6.
[49] "40,000 in Parade Sniff Auto Gases," *Sun*, April 1, 1929, 20.
[50] Szymanski, "Regulatory Transformations in a Changing City."
[51] "Ellison Will Back Smoke Ordinance," *Sun*, September 26, 1929, 7.

and 1930s in Baltimore never mention automobiles. Most focused on smoke and its health effects. The BCHD's James Shrader and the U.S. Public Health Service carried out several studies in the city in this period, showing that there was "a large relative loss of light due to smoke," and that smoke conditions were affected by wind, humidity and season.[52] One 1928 study showed that 1,530 tons of "atmospheric content" (particulate) were deposited every year in the city, equivalent to about thirty railroad cars of dirt. This made Baltimore "the dirtiest city in the world," according to the *Sun*. The health commissioner argued that while the effects of smoke on property values and cleanliness got most of the attention, there was "no doubt" that air pollution was "deleterious to health."[53] Studies at the time linked the health effects of smoke to problems with bone growth and rickets in children, as well as a general loss of "vitality" that made people vulnerable to disease.[54]

Consonant with the focus of these studies, air pollution control focused exclusively on smoke and industrial fumes before World War II. The city passed a new smoke control ordinance in 1931, enforced by the Bureau of Public Works, and in 1932, the BCHD created the Bureau of Industrial Hygiene, which had as part of its mission the study and control of air pollution nuisances from industries.[55] The BCHD's studies and abatements of "atmospheric pollution" increased from two per year in 1935 and 1936, to 55 in 1940, but they were all directed at specific plants and the problems created for workers and, to a lesser extent, nearby residents.[56]

Even studies of traffic congestion in the 1920s and 1930s rarely mentioned vehicular pollution.[57] According the Kelker report, for example, congestion was a problem because it slowed down traffic, was

---

[52] James E. Ives, "Loss of Light Due to Smoke in Baltimore, MD. from October, 1929, to September, 1930," *Public Health Reports*, 1933, 113–125.

[53] By contrast, other extremely dirty cities such as Pittsburgh had only 1,300 and London had 426. "City Called One of Dirtiest in the Country," *Sun*, April 29, 1928, 20.

[54] Fred O. Tonney and Clarence R. DeYoung, "Smoke Eradication to Save the Health Value of Urban Sunshine," *American Journal of Public Health and the Nation's Health* 21, no. 4 (April 1, 1931): 344–54,.

[55] BCHD, *Annual*, 1932, 218-219. In this year, the BCHD investigated industries involved in oil refining, varnish manufacturing, lead smelting, and coffee roasting. In 1934, it investigated air pollution from sulfur dioxide from two chemical plants and a refrigerator repair shop. These problems were corrected. BCHD, *Annual*, 1934, 202. The BCHD investigated "atmospheric pollution" before 1932 as well. BCHD, *Annual* 1930, 64-65, 68-69.

[56] BCHD, *Annuals*, 1930-1940.

[57] A story from this period does talk about the rise of traffic engineers and their unique qualifications to deal with many things related to roads, including air pollution. "Engineer Said Hope of Traffic," *Sun*, March 14, 1926, AR8.

inefficient and thus ultimately an economic loss. The report did state that congestion was a "hazard to pedestrians and motorists" and that it caused "discomfort and nervous strain" for those who entered a congested area. But it made no specific mention of air pollution, nor other types of pollution such as noise.[58]

Beyond these major studies of urban air pollution and traffic congestion, however, some experts did become concerned about motor vehicle pollution in the 1920s and 1930s. The biggest concern surrounded carbon monoxide, which was already known to be problem in housing when fuel was not burned properly in stoves and heaters.[59] But a new addition to automobile technology in the 1920s also raised concerns: leaded gasoline.

Lead Gas and the Suburbs

Lead had already proved to be an important material for facilitating the use of automobiles. Lead-acid batteries made it easier and more reliable for automobile owners to start their gasoline-powered vehicles, for example. But gasoline-powered engines had other troubles, the worst of which perhaps was engine knock – a mistimed combustion of the air-fuel mixture that resulted in a noisy, jarring loss of power and waste of gas. Engine knock became more of a problem as automobile engines grew in size, which became increasingly common in the 1920s, in part as a result of General Motors marketing strategy to build bigger more luxurious cars to muscle out Ford's smaller more utilitarian automobiles.[60] In general, car companies were faced with the choice of creating smaller, more efficient engines that used higher grade gasoline (as the Europeans and Japanese did) or building larger engines that relied on anti-knock compounds. American car companies and consumers ultimately opted for the latter.[61] The anti-knock agent that gave the most bang for the buck – or was it the least bang? – was tetraethyl lead. General

---

[58] Kelker, De Leuw and Company, *Report*.

[59] "Will Study Exhaust Gas," *Sun*, August 19, 1928, C2. J. J. Bloomfield and H. S. Isbell, "The Problem of Automobile Exhaust Gas in Streets and Repair Shops of Large Cities," *Public Health Reports* 43, no. 13 (1928): 750–65.

[60] Rosner and Markowitz, "A'gift of God'?," 344; Kovarik, "The Ethyl Controversy-How the News Media Interpreted the 1920s Controversy over Leaded Gasoline and the Alternatives," 67.

[61] Nriagu, "The Rise and Fall of Leaded Gasoline," 15–16.

Motors discovered the agent and teamed up with DuPont and Standard Oil, under the Ethyl Corporation, to produce and distribute it.

Leaded gasoline was particularly useful for travel in the Baltimore suburbs. The affluent class's large-engine automobiles were especially prone to knock when driven on inclines. Leaded gas made driving up hills easier. It was the "greatest invention since the self-starter" (i.e., the lead-acid battery) one Ethyl Gas advertisement argued, because it enabled one "to drive over the hills with greater power and ease." "Have you tried the new gasoline that is taking the hills by storm?" another one asked. "Try it on your pet-hill!" urged another.[62] The Ethyl Corporation ran these ads and many others in the Baltimore *Sun*. It ran some in other cities, too, but Baltimore was special: In 1924, Standard Oil targeted the city, along with Washington, D.C., for its initial campaign to sell tetraethyl gas.

According to the *Wall Street Journal*, "Development of the anti-knock fuel is in response to a demand for a gasoline of this type at many localities in the [Standard Oil's] territory, particularly around Baltimore, because of the hills." Baltimore's suburbs were well-known for their difficult topography, valleys and dangerous grade crossings. The city had built bridges to span some of the dips in the landscape in an attempt to make driving in these areas easier. But steep roads remained. In the nineteen-teens, Baltimore's automobilists turned to "benzol" (a mixture of benzene and gasoline) because it knocked less than regular gasoline. But the supply could not keep up with demand. The high demand in the Baltimore region prompted Standard Oil to start its first large-scale marketing and retail of ethyl gas there. On the first day of business in 1924, 3,550 motorists stopped by service stations to pump the red-dyed fuel into their cars. Although it cost about three cents more than ordinary gasoline, it was cheaper than benzol and became very popular in Baltimore.[63] By July, 1924, hundreds of gas stations in the Baltimore area carried ethyl gas (Figure 50).

[62] Ethyl Gas advertisements in the *Sun*: April 27, 1924, FA13; May 4, 1924, 104; July 3, 1924, 16. Although advertisements and articles about ethyl gas were often clearly targeted at affluent automobilist, they did not usually focus specifically on commuting or suburban living. One exception was "Autoist Saves Time on Hills By Ethyl Gas: More Power, Smoother Running Claimed as Advantages by Commuter," *Oakland Tribune*, February 6, 1927, O-3.
[63] "Standard Oil of N.J. Has Anti-Knock Gas," *Wall Street Journal*, September 18, 1925, 9. See a similar article in *Petroleum World*, Vol. 22, January to December, 1925, 444. The first gallon of ethyl gas was supposedly sold in

Figure 50: Advertisement for ethyl gasoline (lead gas) from the Baltimore *Sun* in 1924. The advertisement emphasizes the importance of lead as an anti-knock agent that makes driving on hills easier -- perhaps for pleasure driving or for driving around the hilly suburbs of Baltimore. The advertisement also shows several hundred gas stations that were already supplying ethyl gas, a testament to the demand for the product and Standard Oil's early targeting of Baltimore and Washington, D.C. as places to market lead gas. **Source**: Standard Oil advertisement, *Sun*, July 3, 1924, 16.

1923 in Dayton, Ohio. Nriagu, "The Rise and Fall of Leaded Gasoline," 15. But it appears the first big marketing and retail campaigns were in Baltimore and Washington, D.C. In January, 1924 the *Sun* noted that ethyl gas was now on the market. "Ethyl Gas Different," *Sun*, January 20, 1924, AS16. For a description of the hilly terrain and attempts to mitigate it in Baltimore's suburbs (newly annexed in 1918), see "Under the Dome," *Sun*, January 11, 1931, 18.

Lead Gas and Public Health Science

Standard Oil started distributing leaded gasoline in other cities, but the company immediately faced controversy after it was reported that tetraethyl lead was responsible for a number of serious lead poisoning incidents in the workplace, including Standard Oil's laboratories in 1924.[64]

Scientists and the Ethyl Corporation quickly acknowledged that tetraethyl lead was a poison that posed a risk to workers. The Corporation said as much in its own advertisements.[65] The more controversial issue was whether lead gasoline was a community health hazard, for consumers at gas stations or, more broadly, communities exposed to automobile exhaust. The latter argument was made by Yale physiologist Yandell Henderson who believed (correctly, as it turned out) that exhaust would poison the air and, when it fell back to earth, the soil, leading to a long-term public health crisis of chronic lead poisoning. In 1924, Henderson called for a halt to sales of leaded gas in New Jersey, Maryland and Midwestern states where it was known to be sold.[66] New York City banned the substance until 1928.[67] Meanwhile, Standard Oil continued to sell leaded gas in Maryland, stating that it would do so until it had carried out more research on the health hazards of the gas.[68] Letter writers to the *Sun* expressed dismay that Baltimore did not ban leaded gasoline,[69] but the director of the Bureau of Chemistry in the Baltimore City Health Department, James Shrader, convinced the health commissioner that a ban was unnecessary. Shrader based his advice, according to the *Sun*, on "an investigation at a number of filling stations in [Baltimore] and in Government laboratories in Washington."[70] A few months later, Thomas Midgely, the inventor of tetraethyl lead and vice-president of General Motors, came to Baltimore for the American Chemical Society conference and defended his invention against the charge that it was a community health hazard.[71] While residents continued to express concern about the gas in letters to the *Sun*,[72] Shrader

---

[64] "11 New Gas Patients Taken to Hospital," *Sun*, October 30, 1924, 2.
[65] "Says Ethyl Should Be Continued," *Sun*, December 14, 1924, AS17.
[66] "Stopping Sale of Gasoline Containing Lead is Urged," *Washington Post*, October 29, 1924, 1.
[67] "New York Outlaws 'Looney Gas' Fuel," *Sun*, October 31, 1924, 1; "Permit Sale of Ethyl Gasoline in New York," *Oil and Gas Journal*, Volume 27, 1928, 36.
[68] "Sale of Ethyl-Gasoline To Be Continued in State," *Sun*, October 30, 1924, 2.
[69] "Official Action Demanded" (letter), *Sun*, October 31, 1924, 12.
[70] "Ethyl Gasoline Not Barred," *Sun*, November 4, 1924, 3.
[71] "Ethyl Gas Not Dangerous, Society is Told in Report," *Sun*, April 7, 1925, 30.

continued to publicly reject that Henderson's concerns about lead gas pollution were valid for Baltimore.[73]

Nationally ethyl gas remained controversial, largely as a result of Henderson.[74] As a result, the Surgeon General called for more research on TEL, and on May 5, 1925, the Ethyl Corporation suspended distribution of the gas with the idea that, during the moratorium, the Corporation, public health scientists and government institutions would carry out studies and hold conferences on the health hazards of TEL.[75] J.H. Shrader and several Johns Hopkins professors were vocal participants in this debate and, in some cases, were deeply involved in studies about leaded gasoline.[76] Emmet Reid, an organic chemist at Johns Hopkins, discounted Henderson's claims about leaded gas pollution, arguing that the gas had been used in the city for a year and a half (as of May 1925) without problems, and that it did not pose as much of a health hazard as carbon monoxide from automobiles.[77] (The following year, another Johns Hopkins chemist, Harrison Howe, would argue that tetraethyl lead would be a boon to public health because it would "abolish carbon monoxide through perfect combustion.")[78] Most prominently, Johns Hopkins physiologist William Howell chaired the official Surgeon General's study, which included seven other prominent scientists.

Shrader had offered up the services of the BCHD to Howell's study. In particular, Shrader wanted to investigate the conclusions of a recent study by George Voerg, the city chemist for Cleveland, which had found that people in that city were inhaling about 200 parts per million of lead in "ordinary dust."[79]

---

[72] "Discusses Professor Henderson's' Address in New York on the Evil Effects of Ethyl Gas" (letter), *Sun*, April 28, 1925, 12.
[73] "Use of Ethyl Gas Safe, Shrader Says," *Sun*, April 29, 1925, 5
[74] "Ethyl Gas Action is Delayed Months," *Sun*, May 21, 1925, 2. The neurologist Charles Dana was another scientists who publicly and vigorously opposed the use of tetraethyl lead. "Would Stop Sale of Ethyl Gasoline," *Sun*, May 7, 1925, 9.
[75] "Will Suspend Delivery of Ethyl Gasoline Today," *Sun*, May 5, 1925, 2.
[76] "Hopkins Men to Aid Tetra-Ethyl Probe; Shrader Will Represent Municipality in Conference At Washington Tomorrow," *Sun*, May 19, 1925, 2.
[77] "Radical Change in Auto Engine Type Forecast," *Sun*, May 9, 1925, 26.
[78] "Sees End of Carbon Monoxide," *Sun*, March 7, 1926, AR9.
[79] Unfortunately, this measurement is not expressed in a way that makes comparison across time easy since we do not know what the concentration of dust was in the sample or in the city at that time generally. I have not been able to find more information on Voerg's study. Also, according to one news report, one of the BCHD's studies did include collections by J.J. Bloomfield of the USPHS of particulate that would be analyzed for impurities and

Voerg believed the chief sources of lead in dust were foil tobacco wrappers and rubber automobile tires, which wore down over time. Shrader, however, believed that a more likely source of lead was the "enormous quantity of paint on structures, which, containing lead, was constantly wearing away and disappearing in the dust in the air." But Shrader also wanted to test the idea that leaded gasoline could contaminate air. To test this, he proposed filling some automobiles with leaded gasoline, driving them in a designated area, and testing the air. But the committee decided to use Dayton and Cincinnati, Ohio for its field studies. In the end, however, the report also drew not only on these field studies but the lack of lead poisoning in places, such as Baltimore, where leaded gas had been in use for years in order to argue that tetraethyl lead was safe. Published in 1926, the committee's report concluded with a cautious exoneration of tetraethyl lead as a public health threat, although the Surgeon General did institute an upper limit for lead content in gasoline.[80]

After the study's conclusion, the Ethyl Corporation lifted the moratorium on leaded gasoline and its use expanded rapidly. By 1927, leaded gas had achieved nation-wide distribution.[81] Motorists bought about 300 million gallons of ethyl gas in 1927, which doubled to 600 million in 1928, equivalent to 2,700,000 pounds of lead. By 1932, sales had reached 2.2 billion. The share of leaded gas in gasoline sales also increased. It was about 2.5% in 1927 to 12.5% in 1931.[82]

The cautious dimension of the Surgeon General's report fell by the wayside as newspapers and proponents of tetraethyl lead declared it the winner of the public health battle.[83] In Baltimore, the BCHD carried out one last study of leaded gasoline, a survey of gas stations in 1930 to check on the "methods used and precaution taken" in handling ethyl gas. Shrader concluded that "it appears that those who are engaged in this occupation are apparently cognizant of the possible dangers from careless handling." The

---

poisons. It is possible this included an analysis for lead, although I have not been able to find any other information on the chemical analysis of gases and particulates from this study. "Test Made Here for Air Pollution," *Sun*, April 15, 1927, 7.

80 "Offers to Aid U.S. in Ethyl Gas Test," *Sun*, May 23, 1925; "City Health Officials Studying Effect of Smoke and Dust Here," *Sun*, January 7, 1926, 3. J. P. Leake et al., "The Use of Tetraethyl Lead Gasoline in Its Relation to Public Health," *Public Health Bulletin* 163 (1926).

81 "Ethyl Gasoline Distribution," *Wall Street Journal*, March 22, 1927, 5.

82 "New Use of Lead Increases Fast," *Wall Street Journal*, July 22, 1929, 5; "Gasoline Sales Increase," *Christian Science Monitor*, January 2, 1932, 13.

83 "Tetraethyl Found Safe for Auto Use," *Sun*, January 20, 1926, 5.

stations had precautionary signs warning the public against 'improper use" of leaded gasoline.[84] By the early 1930s, the *Sun* was reminiscing about the old "bugbear" leaded gasoline poisoning had been. According to the paper, these concerns seemed silly given the "large proportion" of motorists who used it and were "still alive."[85]

In Baltimore, lead gasoline use resulted in serious air pollution. In some parts of the country, ethyl gas amounted to 50% of the gas sold in 1929.[86] This high rate of use probably included places like Baltimore where there was high demand and well-established distribution and marketing infrastructure for the gas. Filling stations sold about 44,691,877 gallons of gasoline in Baltimore in 1929.[87] Leaded gas contained about three grams of lead per gallon at this time.[88] So in that year, automobiles burned through about 134 metric tons of lead, or about 35% of the average annual leaded gasoline consumed in the city in the 1950s.[89]

---

[84] BCHD, *Annual*, 1930, 69, 100.
[85] "Ethyl Was a Bugbear, But We Are All Alive," *Sun*, January 21, 1934, AS6.
[86] "New Use of Lead Increases Fast," *Wall Street Journal*, July 22, 1929, 5; "Gasoline Sales Increase," *Christian Science Monitor*, January 2, 1932, 13.
[87] Gallons of gasoline sold are based on sales data and historical prices on gasoline. U.S. Census, *Fifteenth Census of the United States: 1930, Distribution Volume I, Retail Distribution Part II -- Reports By States, Alabama-New Hampshire* (U.S. Government Printing Office, 1934), 1054; Department of Energy, "Average Historical Annual Gasoline Pump Price, 1929-2015," accessed September 1, 2016, energy.gov/eere/vehicles/downloads/fact-915-march-7-2016-average-historical-annual-gasoline-pump-price-1929.
[88] Exact numbers on the lead content of gas are not easy to come by before the 1940s. A study the Department of Interior in 1924 stated that ethyl gasoline used three cubic centimeters of lead per gallon. Royd Ray Sayers et al., "Exhaust Gases from Engines Using Ethyl Gasoline" (U.S. Dept. of the Interior, Bureau of Mines, December 1924), Lehigh University Library. (The author of the previous article, R.R. Sayers was a major investigator of lead gasoline in this period; 25 years later, he joined the BCHD as an occupational health scientist). Another article from the same year claimed lead was used in about a 1 to 1,000 proportion with gasoline, or a little less, which would have been about 2.8 grams. "Whitewash for Ethyl Gas," *Petroleum Age*, November 15, 1924, 20. The census of chemicals stated that ethyl gasoline was about 0.06% tetraethyl lead in 1924 and 1925, which would have been about 600 ppm, or about 1.68 grams. United States International Trade Commission, *Synthetic Organic Chemicals : United States Production and Sales* (GPO, 1925), 125; United States International Trade Commission, *Synthetic Organic Chemicals : United States Production and Sales* (GPO, 1926), 142.The Lead Industry Association stated in 1931 that about two grams were used per gallon. Association, *Useful Information about Lead*, 97. A few years later an article stated that the lead content of ethyl gasoline was between 0.9 and 3.0 cubic centimeters. "What is Gasoline?" *The Consumer*, November 1, 1935, 13-16. In 1927, the Surgeon General limited lead content to three cubic centimeters (about 3.17 grams). There was also probably a lower limit of effectiveness: Lead content numbers from 1947 to 1981 never dropped below about 0.9 grams/gallon and averaged about 1.9 grams/gallon for regular gas and 2.6 for premium. Ella Mae Shelton, Marvin L. Whisman, and Paul W. Woodward, "Trends in Motor Gasolines: 1942-1981" (Department of Energy, Bartlesville Energy Technology Center, 1982), www.osti.gov/scitech/biblio/6834004. Thus lead content was probably a minimum of 0.9 and a maximum of 3.17 grams in the 1920s and 1930s. It seems that the average may have been close to three grams in the 1920s and perhaps closer to two or 2.5 grams in the 1930s.
[89] 134,075,631 grams = 134 metric tons.

Environmental Feedbacks and Environmental Inequality

Most automobile traffic in Baltimore, about 176,000 motor vehicles a day in 1926, converged on the central business district, producing heavy traffic flows and congestion and, by extension, heavy pollution in and around the CBD.[90] Heavy traffic volumes (average daily traffic) produced more pollution by increasing the number of engines exhausting pollution in an area. Traffic congestion – slow travel, frequent stops, traffic jams and so on – also contributed to pollution. Congestion resulted from a combination of traffic volumes that exceeded the capacity of streets, high traffic density (the number of vehicles per mile) and other factors, such as lack of traffic control. As traffic converged on the city center, it slowed, expelling more fumes as automobiles puttered along at a crawl or sat idling in the street. In addition to increased time in an area, congestion added to pollution because slow vehicle speeds and stop-and-go driving were inefficient (so more gasoline was burned per mile). The incomplete combustion that accompanied inefficient engine use also produced more pollutants, especially carbon monoxide. Lead had a more complicated relationship with congestion than carbon monoxide because a higher percentage of lead from gasoline was exhausted at higher speeds. Congestion slowed traffic speeds. But acceleration also boosted the percentage of lead exhausted, and frequent acceleration went along with stop-and-go driving condition. Holding speed constant, stop-and-go conditions would have *tripled* lead emissions, by one EPA estimate.[91] In short, every way of increasing traffic flow – increasing street capacity, increasing speeds and simply cramming more vehicles onto the road – was a factor that exacerbated lead pollution from automobiles.

The burden of this lead pollution was not shared equally in the 1920s and 1930s. Most of these were working class neighborhoods and slums, inhabited by African Americans, Russian Jews, Italians, Poles and other whites. There were two exceptions. The neighborhood to the northwest had both poor and middle-class African Americans, though the poor tended to live closer to the CBD. And the neighborhood

---

[90] The 176,000 number is for the "18 hours of a normal week day." At peak rush hour, 14,000 vehicles entered or left. Kelker, De Leuw and Company, *Report*, 4. This number is the sum of passenger autos, taxicabs and buses, which were 123,906 and 5,840 and 1,111 respectively. Ibid., 22.

[91] Christine M. Maxwell and Daniel W. Nelson, *A Lead Emission Factor for Reentrained Dust from a Paved Roadway* (Environmental Protection Agency, 1978), 30.

directly north, Mount Vernon, was an old, high-society neighborhood in the urban core.[92] As detailed in previous chapters, this social geography was the result of a process of social differentiation – segregation and suburbanization, in particular – that had been accelerating since the late nineteenth century. Along with racial and economic exclusion, transportation technology was a key contributor to that social differentiation. The electric street car and the automobile afforded much greater residential dispersion.

But while streetcars and automobiles *allowed* suburbanization, several factors *drove* it. Two of the most important were social exclusivity and environmental health (or "quality of life") concerns.[93] Early planned suburbs around Baltimore such as Roland Park alternated advertisements boasting of protective restrictions against "deleterious influences" – which included, though not explicitly stated in advertisements, restriction on blacks and Jews – with advertisements highlighting the suburbs as havens from urban environmental disamenities, such as heat, noise and dust (Figure 51). The lack of pollution in suburbs and the abundance of green space were constants features of media depictions of the suburbs and realtors' marketing of the suburbs.[94] As the *Sun* noted in 1924, thousands of people had taken Henry Thoreau's maxim to heart – that "everybody ought to live at least five miles from a city" – and had become commuters. They had chosen a "house surrounded by a plot of ground, to dig or not, as they

---

[92] For a map of where social groups lived in Baltimore around this time period, see the map "Maryland's Dominant Distributors," (Baltimore Distributing Company, 1933), MA Collection, MESC, https://jscholarship.library.jhu.edu/handle/1774.2/38693.

[93] Another was a lower tax rate. These factors were not mutually exclusive. One article mentioned that low tax rates in the suburbs allowed white collar suburbanites to afford automobiles and reap the benefits of suburban living, including "rural quiet," "green fields" and a "healthy atmosphere" for their children who would develop into a "sturdier race of boys and girls." "Suburbs Lure the Thrifty," *Sun*, April 1, 1923, FS8.

[94] "Protective Restrictions Have Made Roland Park" (advertisement), *Sun*, May 16, 1915, 10; Roland Park Company advertisement, *Sun*, May 3, 1914, 12; "Building the Suburbs," *Sun*, November 5, 1906, 9. For an example of later advertisements for suburban housing free from the "smoke and noise of the city" see Realty Company, Inc., advertisement, *Sun*, May 2, 1948, S14. Cheaper housing was another reason given for suburbanization around the turn of the century. This primarily meant that middle-class people could sometimes get the same type of house in the suburbs for cheaper than in the city. As a *Sun* article noted, Baltimore had quite affordable housing and there were many costs to suburbanization, including commuting. In any case, the article concluded, "thanks to modern improvements in transportation" city people could "exchange the noise, dust and high rents of the city for the more wholesome conditions of the country." "Rents in City and Country," *Sun*, September 21, 1900, 4. Another article, looking back on the changes in the city, noted that the lack of regulations to control blight and pollution "occurred during a period when many other incentives to move were offered. Modern attractive homes in the suburbs were available on easy terms and the automobile gave convenient communication. The opportunity to live in a detached house, with its grass, trees, flower and sunshine, was exceedingly alluring." *Sun*, "Our Blighted Sections," *Sun*, June 9, 1933, 14.

please, trees and village, if not country atmosphere, to any enticement the city" offered.[95] Similarly, the head of the Automobile Club of Maryland argued in 1930 that the automobile allowed people to move away from the city, where their children could be brought up "amid the beauties of nature and against the dangers of the city." Even those who continued to live in the city could get out to the country for fresh air and quiet.[96]

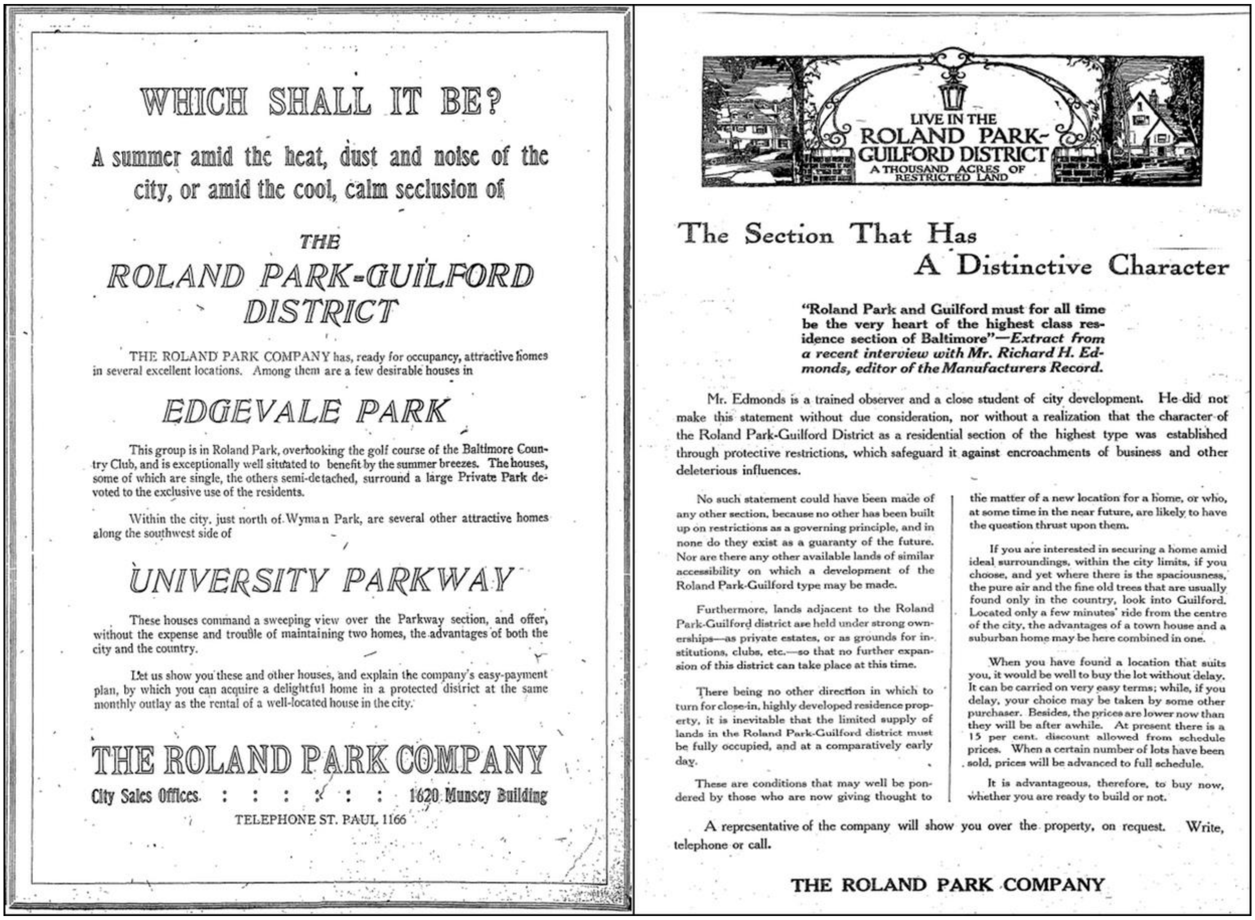


Figure 51: Roland Park and Guilford, two early planned suburbs, tried to draw people from the city to the suburbs by emphasizing that they could escape from the environmental problems (left) of the city as well as well as some of the social problems of the city (right). These suburban developments emphasized how their protective restrictions would safeguard against "deleterious influences." These restrictions included the exclusion of African Americans and Jews. Although the advertisements did not mention these racial and ethnic exclusions explicitly, they hinted at it, and the exclusions were no secret. **Source:** *Sun*, 1915 and other dates.

As automobile use increased in cities, automobiles themselves increasingly became contributors to the disamenities of urban living that drove people to the suburbs. People attributed noise, pollution, and other problems to automobiles, and suggested that these problems pushed people out of the city. In what

[95] "What Ho, the Commuter!: His is the Life of 'Taking Hills on High'? Making the Train or Snorting in on a Motor Cycle," *Sun*, July 27, 1924, M1.
[96] "Urban Areas Decentralize," *Sun*, April 28, 1929, 35.

was perhaps the quickest feedback loop, one author argued, in 1913, that the trucks hauling materials, day and night, to build the Roland Park suburb were causing such a racket that they were contributing to the rapid abandonment of Baltimore – its transformation into a "city of vacant houses" – for the suburbs. Another letter argued broadly that suburbanization around 1910 was driven by the desire to escape urban disamenities, most importantly the "thoroughly vile" noisiness of the streets. The letter writer put the blame for this on poorly designed streets, but it was a complaint that was also related to and easily transformed into a complaint about automobiles. Consistent with the way the suburbs were marketed, these arguments about the environmental drivers of suburbanization existed alongside arguments that the spread or integration of black Baltimoreans was the cause of suburban flight. Some people saw these as complementary factors, while others argued that it was environmental disamenities, not racial animus, that drove suburbanization.[97]

In the 1920s and 1930s, as the automobile-based suburbs increased and the jobs of those suburbanites remained downtown, traffic became a perennial urban problem. General pronouncements about the role of automobile disamenities as a driver of suburbanization became common in Baltimore and other cities.[98] One doctor argued that "every clattering car and rapid-fire truck" harmed people who were sick and that the "nerve-racking sounds" of the city were partly to blame for the "drift to the suburbs." In 1937, M.E. Coyle, the general manager for Chevrolet, argued (without a hint of irony) that the automobile had made "commuter life livable for thousands of people who found happiness in the more open spaces – away from city congestion" where their children could play in "healthful surroundings" "safe from city traffic."[99]

Familiar to all city dwellers, according to the *Sun* in 1939, was the process in which the "motor car and traffic congestion in the cities have driven those urban workers who can afford it to the periphery

[97] Charles Morgan, "Another Protest against the Auto Trucks of the Roland Park Company," *Sun*, June 26, 1913, 6. Ellen La Motte, "Why Not Clean Up the Streets in the Residential Sections So They Will Appeal to Persons Moving to the Suburbs?" *Sun*, October 3, 1910, 6. "Quiet at All Costs," *Sun*, September 20, 1929, 10.
[98] And even when people made more general points about the role of air pollution, noise and other problems as drivers of suburbanization, automobiles were frequently important contributors to those complaints whether people realized it or not.
[99] "Suburb Made Possible by Modern Automobile," *Sun*, November 14, 1937, AS15.

of the city and, in many cases, to remote country sections."[100] In the late 1930s, for example, residents of Mount Vernon complained vociferously against traffic noise and pollution. One resident warned that if nothing was done about the noise from automobiles, Mount Vernon would be "doomed" and there would be an "exodus."[101] In the 1940s and 1950s, it became commonplace to describe the movement to the suburbs as driven primarily, or in part, by some combination of congestion, noise and pollution related to automobiles.[102] Automobiles thus did double-duty for suburbanization: They both facilitated sprawling suburbanization and – because they were a major source of noise and air pollution, among other disamenities – they spurred people to the leave the city for the suburbs.

Conclusion

The use of lead in automobile technology helped transformed the metropolitan landscape, as well as environmental health contexts of different groups in the metropolitan landscape. Lead-acid batteries and leaded gasoline aided the adoption of the automobile, making the machines easier to use, more pleasant and more dependable. Suburban Baltimoreans did not have to stop and crank their automobiles by hand to start them, and they could drive up the hill of Druid Hill or Roland Park without fear that their engines would lose power. The adoption of the automobile for suburban commuting radically changed the city. Automobiles allowed people to move even further away from city centers, which, in the early 1900s, were plagued with smoke, noise and other environmental disamenities. Metropolitan areas got much bigger, not just because of increasing populations, but because automobiles allowed a level of sprawl that was not possible with streetcars. Because the jobs that suburbanites worked in remained downtown, the automobile suburbs still connected to the city centers. Both urban and suburban dwellers who used automobiles contributed to numerous traffic-related problems in the city, adding to the ledger of urban

[100] "Blight and Bankruptcy," *Sun*, January 4, 1939, 8.

[101] Unpublished letter of Gertrude Sappington to the *Sun* and the Mount Vernon District Improvement Association, October 24, 1938, in Folder Correspondence July 1938-January 1939, Box 9, Mount Vernon District Improvement Association Collection, MHS. While a complete exodus of Mount Vernon never happened, many wealthy people did move out. Twenty years later, the neighborhood was slated for urban renewal, along with many "slums."

[102] The middle class left the city for the suburbs, according to the *Sun*, "because, thanks to noise, dirt, traffic hazards and lack of recreational space (perhaps we should add high taxes), life in the city lost its appeal." "Report on Blighted Areas," *Sun*, January 18, 1946, 12. For other examples, see "Baltimore's Future," *Sun*, November 30, 1947, 12; "Transferring the Scene of Congestion," *Sun*, October 26, 1950, 18; "Suburbs Growing Faster than City," *Sun*, July 30, 1950, 26; "Cities Need Renewal of Body as Well as Spirit," *Sun*, January 2, 1966, 67.

environmental disamenities. As these disamenities continued unabated, or worsened, more people used automobiles to escape to the suburbs.

The radical challenge of automobile technology to city life was not met with equally radical policies or plans to deal with problems from automobiles. While residents, business people, scientific experts and politicians considered automobile congestion a serious urban problem, even a dire threat to the city, the response was anemic. Despite some attempts to manage automobile problems, Baltimore and other places chose a path that reconfigured metropolitan life around the automobile, often at breakneck speed. Automobiles ran over – sometimes literally – attempts to contain them. As a result, motor vehicle pollution, including lead pollution, became a serious problem. As an early adopter of leaded gasoline, Baltimore's experience – its apparent lack of community lead poisoning from motor vehicle exhaust – helped exonerate leaded gasoline as a community health threat, despite the understanding of lead as highly toxic chemical. The subsequent proliferation of leaded gasoline and the automobiles that used them has since become one of the great environmental disasters of the twentieth century.

But it was not only a disaster in the sense that leaded gasoline came into wide use. It was also a disaster because of the highly unequal exposures that resulted from the use of automobiles in metropolitan areas. Suburbanites benefited from their lead-assisted vehicles, but they left much of the pollution from the vehicles in the rear view mirror as they motored home. For residents who remained in the urban core, traffic pollution was a serious problem. Neighborhoods near the most heavily traveled and congested streets were primarily made up of poor and African American residents who were constrained in where they could live by lack of money and by racial discrimination. This relationship between traffic and poor or African American residents became even more pronounced over time as I detail in the next chapter.

Chapter 7 – The Poisonous Umbilical Cord: Leaded Gasoline and the Commuter-Polluter Suburbs

In the early 1970s, a man, "MS," woke up every morning in his suburban air-conditioned bedroom, walked through the trees and flowers of his yard, eased into his car seat, and chugged down the expressway to his downtown office. In the city, noise and exhaust fumes assailed his ears and lungs. MS was happy to return home in the evening and even happier that his children were not subjected to the unhealthy environment of the city. Unfortunately, another man, "MI," lived in the city, just a few blocks from the very expressway that MS traveled along every day. MI was poor; he faced discrimination. His house had no air conditioning and so, in the hot summer, he had to leave the windows open, which let in traffic noise and exhaust fumes from the expressway. MI's children were exposed to this pollution in the house at night. During the day, his children played in the street, since there was no local park, where they were also exposed to pollution from exhaust and contaminated dirt.

Such was the tale told in "One Environment Unequally Shared – A Narrative," which was included in the Environmental Protection Agency's 1972 report on the "Environmental Problems of the Inner City." The report was one of the earliest in-depth assessments of environmental inequality. The narrative (which I have paraphrased above), did not end well. MI ("Mr. Inner City") was bothered by his surroundings, but could not afford to move elsewhere. His children's environmental experience, "compounded by the poor quality of their schools, and general discrimination dim[med] their outlook on the world, and any prospects for a happy future." Meanwhile, the children of MS ("Mr. Suburbanite") continued to enjoy their healthful surroundings.[1]

While excruciatingly didactic, and a touch environmentally deterministic, the EPA's narrative did capture several aspects of environmental inequality in metropolitan areas, most importantly the way that suburban commuting burdened inner city children with motor vehicle pollution. But the story also

---

[1] Linda Bryant and Tony Collins, "One Environment Unequally Shared A Narrative," in United States Task Force on Environmental Problems of the Inner City, *"Our Urban Environment and Our Most Endangered People;": A Report to the Administrator of the Environmental Protection Agency* (U.S. Government Printing Office, 1972), 8–10.

perpetuated a notion about metropolitan development that was, at best, simplistic and ahistorical: the idea that suburban commuting and inner city pollution were primarily, or even necessarily, mediated by "expressways" (i.e., limited-access highways designed for high speed automobile travel).[2] In fact, many of the expressways in cities were only a decade old by the time the of the EPA report.

In Baltimore and other cities, rapid, sprawling suburbanization took place in the post-war era. Both in Baltimore and the U.S. generally, the change in population in the suburbs from one decade to the next was greatest between 1940 and 1950. This metropolitan change did not require expressways, but it did require suburban-to-urban work commuting and automobiles, which teamed up to create heavy, congested traffic in the inner city. The interstate highway system, which included many urban expressways, did eventually greatly facilitate suburbanization. But contrary to what some prominent urban historians have suggested, urban interstates did not open the floodgates to mass suburbanization because most were not even completed before the 1960s.[3] Nor did mass transit yield mass suburbanization in the 1940s and 1950s. While streetcars had been important to early forms of suburbanization, neither they nor the buses that replaced them were up to the task of providing access to the new, sprawling suburbs of the post-war era. Rather, mass suburbanization was made possible through the use of automobiles on roads built without mass suburban-to-urban commuting in mind, and,

---

[2] Expressways and freeways were both limited-access highways built for high speed automobile travel. They were sometimes built at grade and sometimes built above or below grade. Although transportation plans, legislation and regional definitions sometimes distinguished expressways and freeways, they were essentially the same. Interstates were large highways designed to connect places across state lines. The interstate system of highways created by the 1956 Federal Aid Highway Act were primarily limited-access highways and in metropolitan areas the sections built under this act were often referred to (and were) expressways or freeways. I use the terms expressway and freeway interchangeably in this chapter. In use the term "interstate" to refer to the highway constructed with funding from the 1956 Highway Interstate Act. In the context of metropolitan settings, "interstates" were also expressways.

[3] Several influential histories of American cities suggest that interstate building was critical to mass suburbanization. For example, one states that interstates made practical (for affluent whites) Henry Ford's solution to urban problems, which was to "solve the problems of the city by leaving the city." Judd and Swanstrom, *City Politics*, 192. Another states that the interstates were the "most powerful agent of change" for the post-war city that saw the decline of the downtown and rise of the suburbs. Sam Bass Warner and Andrew Whittemore, *American Urban Form: A Representative History* (MIT Press, 2012), 120. Given that mass suburbanization had been under way for 15 to 20 years by the time the first interstates connected downtowns to the suburbs, these claims are questionable, even if we rightly grant interstates an important place in metropolitan change. For a similar argument to mine, see Beauregard who argues against the role of interstates as the driving force behind mass suburbanization. He also suggests that the role of the FHA and VA loans in mass suburbanization are overstated but "defensible." Robert A. Beauregard, "Federal Policy and Postwar Urban Decline: A Case of Government Complicity?," *Housing Policy Debate* 12, no. 1 (2001): 141.

especially, on city streets built long before the automobile. The result was immense automobile congestion. While investments in traffic control helped reduce some congestion, traffic controllers struggled to contain the wave of automobiles crashing on the shoals of the inner city every day. Moreover, traffic control did not provide an alternative to automobile traffic and in some ways it intensified the use of automobiles and the abandonment of rail transit.

This hand-in-glove relationship between rapid suburbanization and heavy, congested traffic is significant because it compounded long-term inequality. The period from the 1940s to the 1960s was rife with racial discrimination in mortgage lending and housing development. Since the Civil War, disparities in home ownership rates between blacks and whites narrowed, but they increased again from 1940 to 1960, before narrowing again.[4] These differences in homeownership contributed to long-term, intergenerational inequality in wealth between whites and blacks.[5] Heavy use of automobiles and roads enhanced inequalities in housing by allowing rapid suburbanization. But it also produced its own inequality: The environmental health inequalities caused by pollution from automobiles were borne disproportionately by inner city residents. Air pollution from leaded gasoline was particularly pernicious, producing serious consequences for many children in the inner city. Children raised in the outer city and the suburbs, on the other hand, were exposed to fewer pollutants, including lead. Like housing wealth, these differences in environmental health contributed to long-term inequality as children exposed to higher levels of lead suffered from permanent learning disabilities and other problems associated with lead exposure throughout their lifetimes.

---

[4] William J. Collins and Robert A. Margo, "Race and Home Ownership from the End of the Civil War to the Present," *The American Economic Review* 101, no. 3 (2011): 355–359.

[5] Many analysts have argued that differences in homeownership rates, especially differences between rates in the newer suburban areas of the 1940s-1960s contributed to long-term wealth inequality between racial groups. Michael K. Brown, "Divergent Fates: The Foundations of Durable Racial Inequality, 1940-2013" (Demos, 2013), www.demos.org/sites/default/files/imce/Brown.pdf; George S. Masnick, "Home Ownership Trends and Racial Inequality in the United States in the 20th Century" (Joint Center for Housing Studies, Graduate School of Design and John F. Kennedy School of Government, Harvard University, 2001); Melvin Oliver and Thomas Shapiro, *Black Wealth / White Wealth: A New Perspective on Racial Inequality* (Routledge, 2013). It should be noted, however, that gaps in the value of housing between whites and blacks *narrowed* between 1940 and 1960. William J. Collins and Robert A. Margo, "Race, Home Ownership, and Family Structure in Twentieth-Century America," *What Has Happened to the Quality of Life in the Advanced Industrialized Nations*, 2004, 187–213. But this does not take into account differences in ownership rates for wealth from housing equity. Nor does it take into account different appreciation rates over many decades.

Suburban Dependence on Traffic Congestion and Work Commuting

During the Great Depression, cities had little money for new streets or street widenings that were typically used as a stop-gap for mounting traffic congestion. But a depression-induced lull in automobile purchases and use averted a full-blown traffic crisis. As workers flocked to cities for war-related industries during World War II, however, congestion problems erupted. Congress held hearings on the matter out of fear that congestion was cutting into productivity, and that it might be a problem in the event cities needed to be evacuated. The director of the Maryland state traffic division called the congestion "unprecedented," noting one road where traffic increased by 540 percent. Automobiles moved along "inch by inch, literally," another engineer stated. The main driver of this congestion was the increased workforce at Bethlehem Steel, at Sparrow's Point in southeastern Baltimore City, and at Glenn L. Martin aircraft factory in Baltimore County to the east of the city. Congestion was bad in the city as workers both commuted from the city to these factories and from these industrial areas to the central business district for work.[6]

After the war, things only got worse. War time rationing had curbed both automobile and housing production. But with those restrictions lifted, and many Americans more affluent than ever, there was a surge of suburban development. In addition to affluence and automobiles, the government policies described in Chapter Four – FHA and VA loans in particular – encouraged suburban growth. Eventually, another huge federal policy greased the wheels of suburbanization: the Interstate Highway Act of 1956.

While interstates certainly played an important role in suburbanization, in most cities they did not do so until the 1960s, since few interstates penetrated cities before 1960. By that point, the rate of population increase in the suburbs was slowing. The rate of suburban population change was highest in the 1940s, but the 1920s and 1950s were also high (Figure 52).[7] During these earlier decades, state and

[6] Eastern Avenue was particularly bad for congestion. Other major factories included Chevrolet Motors and Western Electric Company. U.S. Congress, *National Defense Migration: Part 15, Baltimore Hearings*, 5889–5985.

[7] Because there are many definition of suburbs and suburbanization, there are other possible ways of measure suburbanization. But the rate of change in the population of the suburbs (operationally defined as the metropolitan area outside the central city) is the standard way geographers and economists have measured suburbanization. Another measure, the change in the population density gradient, locates the fastest rate of suburbanization between

local governments built highways, bridges, tunnels and, occasionally, expressway-like roads, but nothing like the interstates that were to come. And yet suburbanization happened, and it happened rapidly. But far from the now-iconic vision of Joe Suburb speeding past urban ghettos on his way to the office in some skyscraper downtown, "rapid" suburbanization looked far more like a line of Joe Suburbs sitting in their automobiles, inching their way through narrow urban streets. The everyday creep of commuting yielded a brisk flight to the suburbs over the years.

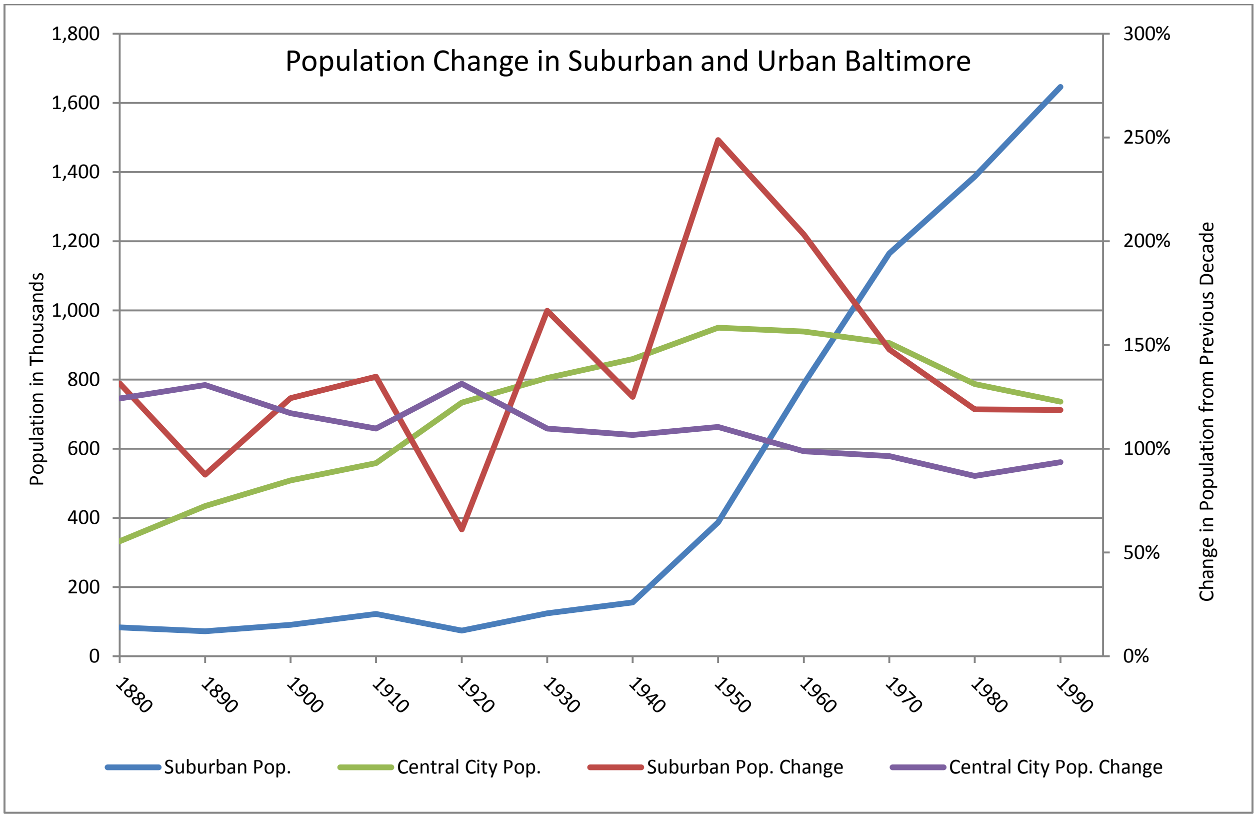


Figure 52: Rate of change in the suburban population, urban (central city) in Baltimore, measured as the percentage change in population from one decade to the next. The graph shows that the most rapid periods of suburbanization in the twentieth century were 1920-1930 and 1940-1950. The third fastest was between 1950 and 1960. These periods of rapid suburbanization happened before the completion of interstates. **Source:** Susan B. Carter, *Historical Statistics of the United States: Population* (Cambridge University Press, 2006). **Graph**: Leif Fredrickson.

All cities suffered from congestion in the post-war years (and before), but Baltimore had particular problems. Not only had Baltimore's streets not been built to handle automobiles, they had not been built to handle through traffic. As an urban center of merchant, and then industrial, capitalism – not to mention an important cultural and political center – the gravitational pull of the city had long been

1920 and 1950. Peter Mieszkowski and Edwin S. Mills, "The Causes of Metropolitan Suburbanization," *The Journal of Economic Perspectives* 7, no. 3 (1993): 135–147.

roads and rails to the city, and specifically to the port. But manufacturing moved suburbs, the range of regional transportation by truck expanded, and passenger vehicles went further afield for business and pleasure. Increasingly, people needed to drive through the city, not just into it. But as a port city transformed by railroad networks in the nineteenth century, Baltimore had limited options for roads through and into the city due to railroad lines and the inner harbor. These were not impossible obstacles to route roads over or under, but the expense and time required was an inhibition on building through roads. For many travelers, Baltimore became less a destination than an obstacle. But there was little choice for those trying to cross from one side of Baltimore County to the other, or driving up the Eastern Seaboard from D.C. to Philadelphia.[8] On the other hand, the city also remained a destination and departure point for commerce. It was the key interface between water and land transport in the Mid-Atlantic region. A mélange of commuter, commercial and through traffic thus packed the city's streets.[9]

Baltimore's traffic was notoriously bad in the 1940s and 1950s. The city's reputation as a bottleneck ranged the entire eastern seaboard, from Maine to Florida, according to the city's traffic department. [10] Driving in, into or through the city, automobiles confronted local traffic, Arabbers (street merchandisers using horse-drawn carts) pedestrians, stone and brick streets, double-parked cars, and a rudimentary traffic control system. It was a "creeping, confused, and often bumpy ordeal," as one historian put it.[11] In 1953, Life ran a story that characterized downtown Baltimore as the nation's worst traffic jam.[12] And in 1959, Baltimore Regional Planning Council wrote that congestion delayed "large numbers of private and commercial vehicles" on a daily basis.[13]

Suburban commuters were major contributors to this congestion. Commuters drove to the city for a number of reasons. One study of Baltimore in the 1950s found that 40% of trips were for work, 20% for

---

[8] U.S. Congress, *National Defense Migration: Part 15, Baltimore Hearings*, 5889.
[9] Expressway Consultants, "Interstate Highways 70N and 95: The East-West and Southwest Expressways, Preliminary Engineering Report" 1961, 10, Folder 2, Box 22, Series 2, BTR 22 (Baltimore City Planning Records), BC Archives.
[10] Baltimore Department of Transit and Traffic, *Annual Report*, 1960, 4, MR, Pratt.
[11] Harwood, *Baltimore Streetcars*, 4.
[12] John Stanton, "The Battle of the City Streets," *Life*, March 30, 1953, 136.
[13] Baltimore Department of Planning, *Retail Trade* (December 1957); Baltimore Regional Planning Council, *Freeway Plan* (Maryland State Planning Commission, May 1959), 11, both in MR, Pratt.

shopping, 15% for social reasons and the remainder for other purposes. During peak rush hour, however, work trips made up 60-70% of commuters.[14]

The importance of commuting for shopping decreased in the post-war period. In the 1940s, many suburbanites continued to rely on Baltimore's downtown for much of their shopping. But commuter shopping dwindled as more retailers relocated to the suburbs. This was both a result and cause of congestion. Before 1945, there was little in the way of suburban shops commensurate with downtown Baltimore. But people going downtown to shop caused congestion. Congestion and a related problem, parking, in turn dissuaded some shoppers from going downtown. In response, in the late 1940s retail businesses and malls started building or relocating in the suburban fringe.[15]

Relocating individual retail businesses could happen relatively quickly, but the broader employment opportunities did not follow on the heels of those who moved to the suburbs. This did eventually happen. But the massive suburban development that occurred in the 1940s and 1950s depended on access to the city's labor market. Jobs were not generally waiting in the suburbs for people to move to them and, with the exception of retail and some service jobs, there is little indication that many jobs followed suburbanites until after 1960. Before that, the suburbs required an umbilical cord to the city in order to make a go of it. As late as 1960, 60% of people living in the Baltimore suburbs (outside of the municipal boundary) depended on work in the city for their livelihood.[16] The proportion was almost certainly greater before 1960, although I have not been able to find any figures on it. Thus the removal of the work commuters would have reduced the scale of the golden age of the suburbs by over half. Moreover, the effect of removing those who depended on the city for work would have been much greater

---

[14] James Booth and Robert Morris, "Transit vs. Auto Travel in the Future," *Journal of the American Institute of Planners* 25, no. 2 (May 1959): 90–95.

[15] In 1945, downtown Baltimore had little competition from the peripheral locations for retail and other sorts of business. There were no shopping malls on the outskirts of the city. Those living in the outer city or the suburbs came to the downtown area to watch movies. And travelers usually stayed at the big hotels downtown rather than the modest motels that had popped up here and there on the outskirts. Harwood, *Baltimore Streetcars*, 7. After 1945, according to the *Sun*, retail business in the suburbs expanded at "a tremendous scale," with only slightly more retail space in the downtown than the suburbs by 1956. Frank Henry, "Baltimore Faces A 20 Year Operation: A City With Heart Trouble," *Sun*, June 24, 1956, A1.

[16] Marc V. Levine, "A Third-World City in the First World: Social Exclusion, Racial Inequality, and Sustainable Development in Baltimore," *The Social Sustainability of Cities*, 2000, 123–156;

than the removal of the commuter workforce because there were economic multiplier effects that resulted from the suburbanites who brought income and wealth to the suburbs from the city. They supported an early suburban workforce (e.g., the service industries that popped up relatively quickly in the suburbs).[17]

Call the Doctor Part I: Road Building and Widening

Traffic congestion was a pervasive issue in the media and politics in the 1940s and 1950s. It was strongly connected to other concerns about the spread of blight and the implosion of the downtown. A common metaphor was the circulatory system: clogged arteries (the streets) threatened to stop the beating heart of the city, its downtown. What to do? Although there were occasional calls for metropolitan planning, and even metropolitan government, these did not go anywhere in this period outside of the creation of the Baltimore Regional Planning Council in 1956, which only had the power to study the problem and make recommendations.[18] Attempts to deal with traffic congestion thus centered on road building, mass transit and traffic control.

As they had for some time, state and local governments expanded and improved roads in response to rising traffic congestion. The state also accrued new powers to build roads in a constitutional amendment that fortified the ability to take land through eminent domain for highway projects. This amendment was passed during the war. The state also sought to build new kinds of roads. In 1947, the legislature passed the Expressway Act, which allowed, for the first time, for the creation of controlled-access highways (and included a $200 million dollar bond to build them).[19]

State and local governments did build a few of these proto-expressways, but protest and the interminable planning process delayed many of these roads. In 1944, Baltimore hired New York City's

---

[17] A more contemporary study from Chicago found that about 45% of the multiplier effect (the indirect jobs created) of an industry located in the city center was captured by the suburban areas where many of its workers were located. Joseph Persky and Wim Wiewel, *When Corporations Leave Town: The Costs and Benefits of Metropolitan Job Sprawl* (Wayne State University Press, 2000), 32. For another study of this dynamic, see Ronald L. Mitchelson and James S. Fisher, "Long Distance Commuting and Income Change in the Towns of Upstate New York," *Economic Geography* 63, no. 1 (January 1, 1987): 48–65. Unfortunately, I have not been able to find any studies from the 1940s to the 1960s that estimate the multiplier effect for suburban commuters.

[18] For a good example of the circulatory system metaphor as well as a call for more long-term planning after 225 years of the city having "grown haphazardly," see Frank Henry, "Baltimore Faces A 20 Year Operation: A City With Heart Trouble," *Sun*, June 24, 1956, A1.

[19] Baltimore Metropolitan Council, "Transportation System Development in the Baltimore Region and Maryland," December, 2005, at www.baltometro.org/phocadownload/Publications/TransSysDevelopment.pdf

famous highway hawk, the city planner Robert Moses, who developed a plan for a cross-town expressway that would serve suburban commuters, instead of the through traffic targeted by previous cross-town highway plans. But huge protests that continued for decades killed this and other plans for an east-west expressway across town.[20] The road building completed by the city was extremely modest by later standards – not the sort of things that would be recognizable as "expressways" even though they were often called that. And even these modest alterations to the city's streets were often met by intense objections.[21] In Baltimore County, the planning commission proposed a beltway and began work on it in 1953, though it was not completed until 1962. The state also built the Harbor Tunnel Thruway under the Patapsco River. Completed in 1958, the tunnel helped divert some of the traffic that had previously had to travel through the city. Many other projects were in the planning stages in this period but were not completed or even begun until the 1960s. Road improvements, especially big ones such as the Harbor Tunnel, undoubtedly helped thwart even more intense congestion, but they did not curtail it much.

Call the Doctor Part II: Mass Transit

Another possible solution to Baltimore's traffic congestion was the development of the city's mass transit system. In the early 1900s, Baltimore was known for having a good streetcar system. While the automobile increased in importance in the 1910s and 1920s, the city's mass transit system was still dominant. The Great Depression hurt both automobile and transit use, but the dip in automobile registration contrasted with the plummeting use of transit. Following this, World War II rationing (which included gasoline, rubber tires and other inputs to automobile manufacturing) rolled back automobile ownership a little more but greatly boosted mass transit. But transit's resurgence was ephemeral. Passenger usage plummeted again shortly after the war (Figure 53 and Figure 54).[22] Traffic control might

[20] Robert Moses et al., *Baltimore Arterial Report* (New York City: Robert Moses, 1944). "Encouraged on Freeway," *Sun*, March 2, 1945, 8; "Opponents End Freeway Fight," *Sun*, March 28, 1945, 14; James Dilts, "A Brief History of Baltimore's Transportation Planning," Folder 49, Box 7, Series 7A, MAD Records, LLSC.

[21] "New Expressway is the State's Number One Road Project," *Sun*, February 10, 1945, 6; "Park Expressway is About Ready," *Sun*, January 5, 1948, 26; "City Plan Commission Overrides Berry's Views," Afro-American, September 28, 1946.

[22] War and depression had some conflicting effects on the use and purchase of the good. One article mentions that since the Federal Government slashed the "suburban time-tables" of commuter trains, people in Baltimore started

mitigate traffic congestion, but only mass transit, and particularly rail transit, offered the possibility of greatly reducing the volume of automobile traffic. Thus it is crucial to understand not only why mass transit never developed as a serious challenge to automobile dominance, but why it seriously declined after World War II.

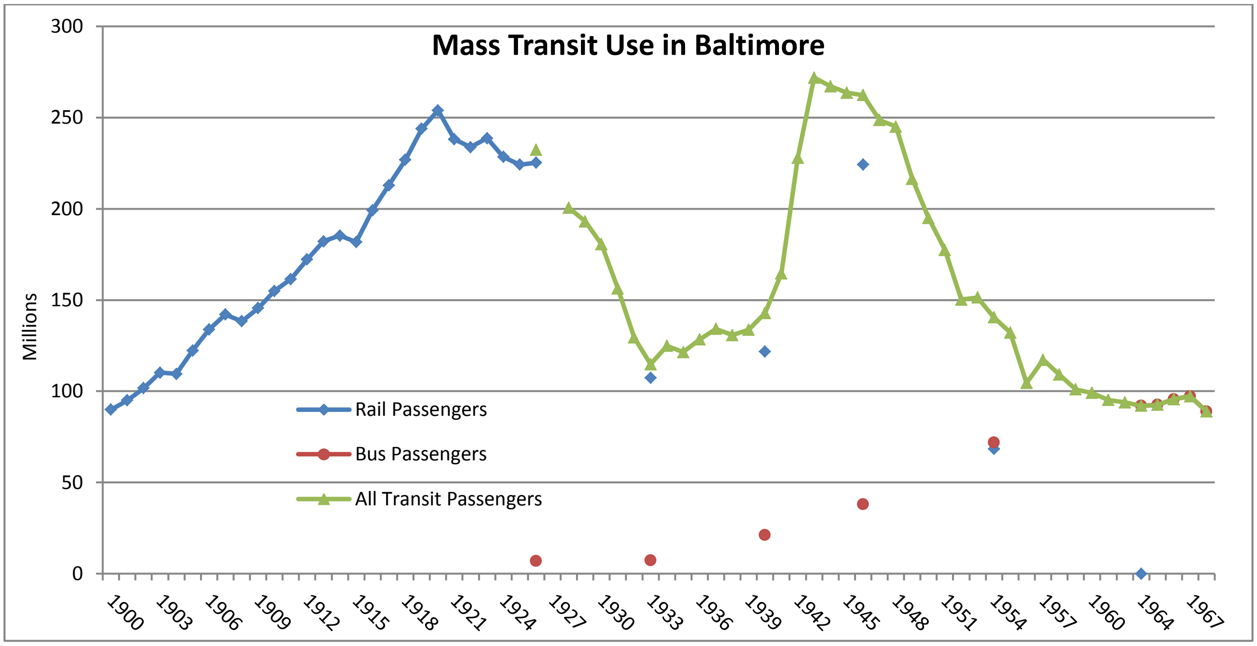


Figure 53: Passengers using mass transit in Baltimore City. As the graph shows, transit use declined during the Great Depression, was revived during World War II and then plummeted again. In and after the 1940s, bus transit became increasingly important, eclipsing rail (streetcar) transit by 1954. **Sources**: Baltimore *Sun*; Kelker, De Leuw and Company, *Report and Recommendations on the Routing of Street Railway Lines and Methods for the Improvement of Traffic Conditions in the City of Baltimore to the Traffic Survey Commission of Baltimore* (Baltimore: Waverly Press, 1926); Committee on Mass Transportation, *Report to the Mayor of Baltimore* (1955); Maryland House of Delegates of the General Assembly, *Report of the Grand Inquest of the State of Maryland into the Background, Causes and Possible Ending of the Current Strike in the Baltimore Transit Company* (Annapolis, Md.: General Assembly, 1956); Wilbur Smith, "Baltimore Metropolitan Area Transportation Study," 1964; Federal Highway Administration, *Evaluation of a Bus Transit System in a Selected Urban Area: Final Report* (Bureau of Public Roads, Federal Highway Administration, 1969). **Graph:** Leif Fredrickson.

---

buying the Standard Eight motor car to commuter to their homes in the suburbs. "Commuters Use Auto," *Sun*, March 17, 1918, CA14.

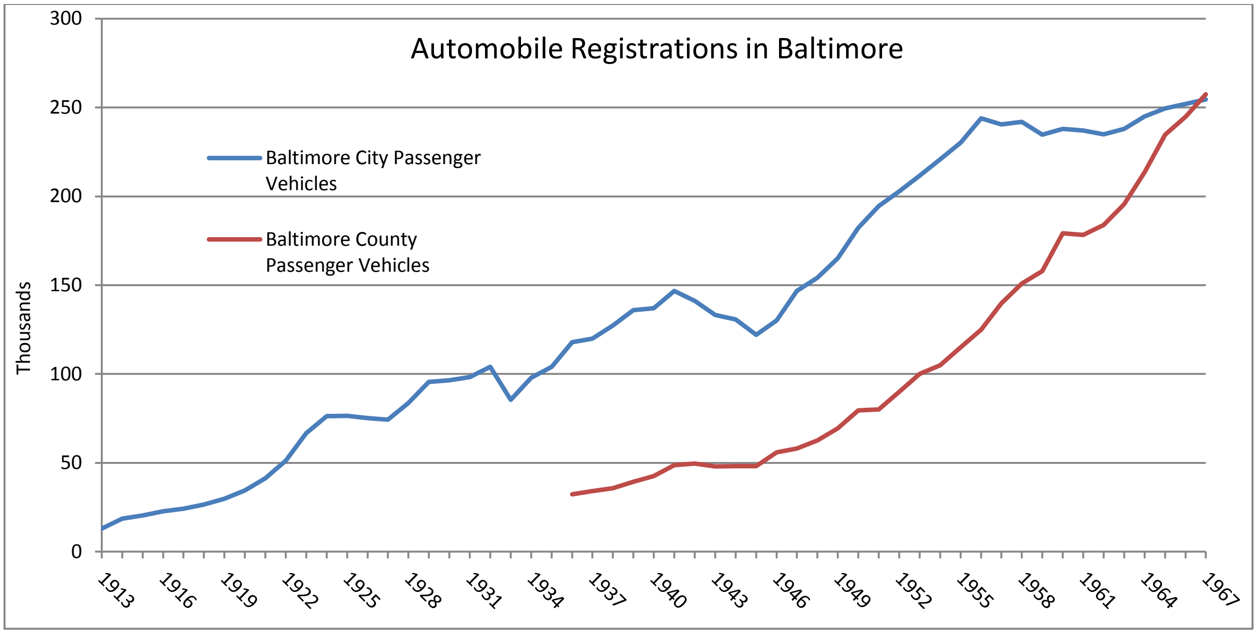


Figure 54: Vehicle registrations in Baltimore City and Baltimore County. Although the Depression and World War II slowed the adoption of the automobile, automobile use did climb steadily in comparison to transit use. After World War II, automobile registration climbed particularly rapidly in both Baltimore City and County as a result of mass suburbanization. **Sources**: Baltimore Sun, *The Sun Almanac for 1913* (Baltimore: A.S. Abell Company, 1914); Kelker, De Leuw and Company, *Report*.; Automobile Manufacturers Association, *Facts and Figures of the Automobile Industry* (1923, 1924, 1927-1935, 1937 1941, 1944, 1969, 1971); National Petroleum News, volume 19, 1927, 46; State of Maryland, Department of Motor Vehicles, *Annual Reports* (1939-1940, 1945-1956), Maryland Room, Enoch Pratt Library; *Maryland Statistical Abstracts* (1960, 1965, 1968, 1973-1991); Wilbur Smith, "Baltimore Metropolitan Area Transportation Study," 1964; Baltimore Regional Planning Council, "Overall Program Design" (1971), in Folder 13, Box 11, Series XII, BCDP Records, LLSC; State of Maryland, *Report of the Committee on Highway Financing to the Governor and Legislative Council of Maryland*, 1967; Environmental Protection Agency, *Examination of Issues Related to Two-Car Regional Emission Control Strategies* (Ann Arbor, Mich.: EPA, 1973). **Graph:** Leif Fredrickson.

During the Depression, Baltimore's streetcar company, United Railways, went bankrupt and was bought by the Baltimore Transit Company (BTC). BTC scraped through the Depression and rebounded during World War II, buoyed by the influx of war workers and the hobbled automobile industry. The BTC had kept its streetcars that had been idled by lack of demand during the Depression and was able to soak up much of the increasing demand in the early 1940s.[23] But this period of relief was short-lived. The heavy use of the streetcars had been good for the company, but had also put considerably wear and tear on the streetcars.[24] War time rationing had also inhibited the maintenance of streetcars, tracks and buses. The lack of investment in upkeep had put even more money into the pocket of BTC, some of which it had put into deferred maintenance accounts. Once the war ended, the company was faced with the decision of what to do with this capital. In particular, the question of whether to re-invest and expand its streetcars

[23] "Baltimore Transit Overview."
[24] Harwood, *Baltimore Streetcars*, 18.

system or shift toward buses. This question was not new to the company nor was it unique to Baltimore's transit situation. For at least a decade, the BTC had been mulling over which mode of transit, or what balance of modes, would be best for development.[25] But the decision was weightier given the size of the capital investment and given what looked to be an impending deluge of automobiles.

In 1945, a national transit company called National City Lines bought a controlling interest in the Baltimore Transit Company and in less than a year ousted the former BTC president and installed one of its executives from another city. Although streetcars served most of the places people wanted to go in Baltimore in 1945, the BTC quickly requested permission from the Public Service Commission to convert most of its streetcar service to buses.[26]

National City Lines (NCL) began as a bus transit company in Minneapolis in the 1930s. It soon spread to other cities and it picked up major corporate investors including General Motors (which made buses, not just cars), Firestone Tires, Standard Oil and the Mack Truck Company. In all of the cities where it gained control of the transit company, it worked to phase out streetcars and phase in buses. National City Lines and the transit companies it came to own argued that buses were the future of mass transit, primarily because they offered greater flexibility – in terms of changing destinations, routes, express service, and everyday maneuvering in the street – and ultimately that they would provide faster and cheaper service. Rail, on the other hand, required fixed investments in routes that would not necessarily be the most efficient as the metropolis changed and grew. And streetcars did not have the ability to adjust to everyday issues that inevitably surfaced in packed streets of urban centers. With their tracks in the street, streetcars were subject the vicissitudes of automobile traffic without being able to respond to jams and street obstructions in the way that automobiles could.

Although many government officials, members of the public and shareholders expressed concerns about the shift toward bus transit, many others supported it. The arguments in favor of bus transit were

---

[25] Emily Jaskot, "Warren v. Fitzgerald, 189 Md. 476 (1947): A Crossroads in Baltimore's Mass Transit History," *Legal History Publications*, January 1, 2009, digitalcommons.law.umaryland.edu/mlh_pubs/15.

[26] Aaron Glazer, "Fade to Gas: The Conversion of Baltimore's Mass Transit System from Streetcars to Diesel-Powered Buses," *Maryland Historical Magazine* 97 (Fall 2002): 337–57. On streetcars serving places Baltimoreans wanted to go, see Harwood, *Baltimore Streetcars*, 11.

not new and even if there was uncertainty about the strategy, its business logic was plausible. The Public Service Commission quickly signed off on the BTC's new direction.[27] Over the next two decades, the BTC removed streetcar lines, replaced some with buses, abandoned some areas completely, and created some new bus lines. In 1946, there were almost six times as many streetcar passengers as bus passengers, but by 1954, bus passengers exceeded streetcar passengers. In 1963, the last streetcar in Baltimore was put out of service. Overall transit ridership nose-dived from its peak during World War II (Figure 53). By 1970, the BTC had gone bankrupt and was taken over by the state transportation authority.

The relationship between National City Lines, the phase out of streetcars and the decline of mass transit in general has been the focus of much controversy and a little conspiracy. One of the charges levelled against Nation City Lines and its subsidiaries was that they colluded to shift urban transit systems to bus lines in order to afford outlets for their corporate investors. The BTC, for example, immediately switched to getting its buses from GM, rather than Ford, and its tires from Firestone, rather than another tire company after NCL took over.[28] One state investigator argued in 1951 that the rapid conversion to buses in the BTC system was only explainable if it was financed by the "Mother's Club" of manufacturers of buses, tires and gasoline.[29] By that point, the NCL had already been charged and convicted in federal court of violating anti-trust laws by making exclusive contracts with the corporations that owned it. But a broader charge – that NCL and its corporate owners, especially GM, conspired to kill off the streetcar system (and were effective in doing so) – continued to bubble for decades. Researchers who have studied the issue have generally concluded that the broader charge is without basis.[30] Most

[27] "Transit Hearings Open Before PSC," *Sun*, July 11, 1946, 28; "Prompt OK on BTC Plan Urged on PSC," *Sun*, August 1, 1946, 28.
[28] Aaron Glazer, "Fade to Gas."
[29] Maryland Commission to Study and Report on the Transportation System Operated by the Baltimore Transit Company, *Report of Majority and Separate Report of Commissioner Herbert Levy* (Baltimore: Press of the Daily Record, 1951), 65.
[30] See, for example, Sy Adler, "The Transformation of the Pacific Electric Railway: Bradford Snell, Roger Rabbit, and the Politics of Transportation in Los Angeles," *Urban Affairs Quarterly* 27, no. 1 (September 1, 1991): 51–86; Scott L. Bottles, *Los Angeles and the Automobile: The Making of the Modern City* (University of California Press, 1987); Post, *Urban Mass Transit*.

importantly, streetcar systems in just about every city collapsed in the post-war period whether NCL had anything to do with them or not.[31]

However, one historian of Baltimore's mass transit system, Aaron Glazer, has argued that the BTC's shift to buses cannot be explained by economics and so must be explained by something else, namely the interests of GM (and other corporate owners) in creating an automobile-centric world, whether that made business sense for the Baltimore Transit Company or not. Glazer argues that ridership and the BTC's finances were in excellent shape coming out of World War II, when streetcars dominated the transit system. And he points out that the bus-centric system that emerged was a failure and that Baltimore and other cities eventually returned to rail transit systems (light rail).[32]

This argument, however, fails to take into account the majors issues faced by streetcar systems coming out of the war. There is no question that NCL was an aggressively bus-oriented company, or that it engaged in suspicious and at times illegal business with its holding companies. But there is also little question that the streetcar system faced two serious sources of trouble, both related to automobiles and suburbanization.[33] First, heavy traffic congestion in the city slowed streetcars to a crawl.[34] Congestion constrained automobile travel as well, but automobiles had more flexibility to leave at different times and to take alternate routes. There was little streetcars could do in the face of obstacles and, in the 1940s, there was little that Baltimore City's traffic police did to protect the ability of streetcars to use the street without obstruction. These street conflicts were not new, but they became more intense as more people in the Baltimore metropolitan area used automobiles and as more commuters converged on the city center on a daily basis. The BTC's position was essentially that if you could not beat automobiles, you had to join them.

[31] In addition to empirical arguments, it strains belief to think that these corporations were going to the trouble of creating urban bus transit systems that they could sell supplies to if they did not think those systems were economically viable.
[32] Aaron Glazer, "Fade to Gas."
[33] Glazer's article does not mention the suburbs at all.
[34] They were also dangerous to get on and off in heavy traffic.

The second source of trouble for streetcars was the rapid, unplanned sprawl of the suburbs. The more sparsely populated an area, the more difficult it was to make transit profits there. Similarly, leapfrogging developments created gaps that had to be filled with expensive track, but which provided no revenue for companies.[35] To a large extent, residents in these areas had already made a commitment to automobiles anyway because transit companies did not build expensive track out ahead of suburban development.[36] In short, after World War II, transit companies stared down the barrel of increasing inner city traffic congestion, a scenario in which streetcars were likely to be losers, and of rapid suburbanization, which streetcars could not possibly keep up with. There is little doubt that BTC ownership by NCL accelerated its shift toward buses. It is possible that they could have stretched out the life of some of their most heavily used streetcar lines. But there were many, many streetcar lines (and for that matter bus lines) that were simply not profitable, as the BTC regularly demonstrated to the Public Service Commission.[37] From the point of view of business investment, their shift away from streetcars lines was thus understandable.

Facing severe traffic congestion in the 1950s, Baltimore's Mayor D'Alessandro made it his number one pledge that if he were re-elected he would solve the mass transit problem. Once re-elected in 1954, he gathered a committee, headed by eminent sanitary engineer Abel Wolman, to study the problem.[38] Wolman's group described what had, by this point, become a common aspect of mass transit analysis: Transit companies were caught in a "vicious circle" where automobile use decreased passengers and traffic congestion increased operating costs, which caused transit companies to increase fares or reduce service in order to remain profitable, which accelerated the abandonment of transit for the automobile. The BTC had increased fares and decreased miles of operation (from about 39,000 in 1946 to

---

[35] . These were the problems the architect Clarence Stein had predicted, as noted in the previous chapter.
[36] "Plan For Bus Held Costly," *Sun*, October 20, 1947, 13; "Progress and the Speed of Public Transportation," January 16, 1947, 14; "Transit Service," November 16, 1956, 16. Residents complained that the BTC did not extend lines into the suburbs, harkening back to the days when United Railways had connected all residents to places of employment. But these objections failed to account for how much more spread out the metropolitan area had become via the automobile. "Commuters' Transport," *Sun*, 1958, May 20, 16.
[37] See, for example, "Transit Firm Seeks to Drop Three Routes," *Sun*, July 30, 1952, 32.
[38] "Transit Pledge," *Sun*, May 27, 1956, 20.

28,000 in 1954). And the number of passengers had also declined. In other words, declining passenger use was not merely a product of people choosing not to ride transit, it was a product of severe cuts to service.[39]

This vicious circle did not just apply to modes of transport; it also had a spatial component. As traffic congestion increased (traffic engineering only ever brought temporary relief, Wolman noted), the "fortunate flee to the suburbs where the use of the auto is a necessity, thus adding to the number of vehicles on the streets and compounding the problem, while new areas of blight are created in the city." And the suburbs were particularly unprofitable for the company to serve. That was where the company usually made its biggest cuts to service and increases in fares.[40]

What was to be done? Wolman argued that the city's Department of Traffic and the Public Service Commission (PSC) did not seem to have the power or inclination to deal with the issue. The Department of Traffic considered mass transit outside its scope. And the PSC could do little more than approve cuts in service and rate hikes requested by the BTC. The PSC could not order proactive changes in the BTC regarding extensions or changes in service, as these were managerial powers the PSC did not have.[41] Ultimately, the issue for Wolman was that the mass transit system needed to be operated for the "public welfare," and, at least in the case of mass transit, the "profit motive was an inadequate yardstick by which to measure necessities, types and quantity of public service." Regulation was not enough. The needs of city might well require "some unprofitable transit services." And this was "especially true in

[39] Wolman also noted that the BTC had "minimized its administrative and operational costs," but the "effect of these economies on the riding public [was] not clear." Committee on Mass Transportation, *Report to the Mayor of Baltimore* (1955), Folder 2, Box 20, Series X, GBC Records, LLSC. "Every time service is curtailed, someone else gets his automobile out of the garage and drives downtown, thereby adding another mite to the traffic congestion," as the paper put it ("Bus Shortage," *Sun*, November 3, 1956, 10). The BTC argued declining passengers caused cuts in service while "the public says that a decrease in service and efficiency induces the decline in riding and public goodwill." *Baltimore Transit Company et al.* v. *Public Service Commission*, 206 Md. 533 (1955) 112 A.2d 687, March 24, 1955. Between 1940 and 1954, the rail mileage of BTC fell from 175.5 to 71.1 miles, while the bus mileage grew from 94.3 to 241.3. In addition, streetcars ran less often, so the actual vehicle miles traveled fell even more, from 23,652,000 in 1940 to 7,666,000 in 1954. Bus mileage grew from 6,570,000 to 17,046,000. There was an overall loss of mass transit vehicle miles traveled in this period from 32,873,000 to 28,540,000 (the unaccounted for numbers are the trolley buses). American Transit Association, "Transit Facts" (Chicago: Public Administration Clearing House, 1955), 39.

[40] Committee on Mass Transportation, *Report to the Mayor of Baltimore*, 8, 10, 88.

[41] Ibid., 15.

fast-growing suburban areas." Wolman thus suggested the creation of a Metropolitan Transit Authority that would own and operate the mass transit system.[42]

In public, the BTC argued that heavy taxes were hurting its business and, by extension, its service. When the BTC's president Dale Barratt had briefed Wolman's committee on transit, however, he did not mention tax relief. Instead, he pointed to two looming threats to BTC profitability. First, fare increases were reaching a "saturation point." This was essentially the company's version of the vicious circle argument, minus any particular concern about service cuts. The second threat was rising labor costs. According to Barratt, the BTC had to follow changes in wage rates that were set by automobile and steel industry contracts.[43] The problem was much bigger than tax relief. So big that Barratt wanted not a relief from the government, but government control. He advocated public ownership of the transit system, with the operation being carried out by a private company (the BTC). As Barrett saw it, the BTC was in a position to make money for another ten years. Tax cuts would help with that. But eventually, the situation would get worse and "the private company will stop building for the future and begin to 'bleed' the company." The longer the city waited, Barrett argued, the less there would be to salvage. But if the city took control, it could issue bonds to modernize the system, in whatever way it saw fit, and let a private company run the system.[44] The BTC's support for public ownership – it did oppose public management, but even on that issue it was hardly a vigorous opponent – suggesting the long-term profitability issues it faced were quite real.

---

[42] Ibid., 17–25.

[43] As the BTC (and other transit companies) faced profitability problems, conflicts with labor became more acute. BTC workers had already struck in 1952, and the BTC had been working to reduce its workforce. Union representatives who briefed Wolman's group argued that the BTC's cuts in its labor force threatened the viability of the company. The BTC was deferring maintenance and cutting workers who had normally helped smooth out problems in service. In addition, fewer workers meant slower transitions from streetcar to bus lines. As the Committee reported, the transit schedules became disrupted and "the public suffers." In addition to threatening the long-term viability of company, these problems probably catalyzed some residents to shift to using automobiles rather than transit. Division 1300 of the American Federation of Labor, "Memorandum before the Transit Commission," September 1, 1955, Folder Baltimore Mass Transportation Committee, Box 8.15, Series 8, AW Papers, MESC.

[44] Meeting with Committee on Mass Transportation, "Meeting with Mr. Dale W. Barrett," August 25, 1955, Folder Baltimore Mass Transportation Committee, Box 8.15, Series 8, AW Papers, MESC. The BTC continued to request tax breaks, however, perhaps particularly as it saw that its preferred route, public ownership, was not panning out. Barrett to D'Alessandro, October 16, 1957, Folder Department of Transit and Traffic (2), Box 303, Series 23, BRG 9, BC Archives.

Mayor D'Alessandro, who had initially been wary of public ownership of the transit system, eventually went with Wolman's suggestion and pushed for a Metropolitan Transit Authority that would own and operate the system. But while the BTC did not put up a fight against this proposal, other business interests did, especially the Greater Baltimore Committee (GBC). The GBC, as noted in Chapter Five, was strongly opposed to government programs that it saw as expensive for taxpayers, which included public housing and also public ownership of transit. It argued instead for "through-highways" and urban renewal to revitalize the city. Opposition from the GBC, a cold shoulder from the *Sun*, as well as in-fighting among some politicians who promoted different public ownership plans, killed D'Alessandro's bill that would have allowed Baltimoreans to vote on a public takeover of the transit system.[45] Over the next ten years, the public ownership idea was resurrected several times, but never successfully instituted.

The BTC did get its tax break, but it continued to disinvest in its system while completing the total phase out of rail transit. The last streetcar ran in 1963. The shift to buses did not rally the transit system. Traffic congestion continued to hurt transit more than private automobiles. The city created priority lanes – "busways" as they were called – in an attempt to create rapid transit. The lanes did increase bus speeds by 20 to 50%.[46] But the removal of buses from car lanes resulted in even greater increases in speeds for cars compared to buses.[47] Not only did buses not create a robust transit alternative to automobiles, busways seem to have ceded even more ground to personal automobiles. Ridership continued to plummet through the BTC conversion to buses. By 1958, there were fewer transit passengers than there had been in 1900, despite a municipal population that was almost twice as large and a metropolitan population that was four times as large. Other cities saw similar declines in transit. In 1965,

[45] "Public Ownership of Busses Rapped," *Sun*, March 28, 1956, 42; "Transit," *Sun*, April 2, 1957, 40; "Mayor Gets Challenge on Transit Issue," *Sun*, April 7, 1957, 40. D'Alessandro attacked the *Sun* the for having "wrecked my effort to solve the transit problem" and then criticizing the mayor for failing to make good on his campaign promise about mass transit. "Mayor on Transit," *Sun*, April 6, 1958, 14.
[46] Baltimore Department of Transit and Traffic, *Annual Report*, 1960, 4, MR, Pratt.
[47] Federal Highway Administration, *Bus Use of Highways: State of the Art*, National Cooperative Highway Research Program Report 143 (Washington, D.C., 1973), 227.

only about 20% of work trips in Baltimore used transit – a middle of the pack number, bounded by New York (54%) at the high end and Los Angeles (8%) at the low end.[48]

From the point of vehicular pollution, not only did the shift to buses do little to curb personal automobile use, buses themselves contributed substantially to air pollution, including lead pollution. Eventually diesel fuel, which did not use tetraethyl lead, came to be the fuel of choice for buses in Baltimore, as in most cities. Diesel produced its own environmental health problems through fine particulate emissions and noisy engines. Diesel pollution was more visible and audible than lead, but lead pollution from buses was at least as dangerous.[49] In the 1940s and 1950s, diesel and gasoline were used about equally – a hair more gasoline was used than diesel in 1950 – and by 1955 about three times as much diesel was being used than gasoline.[50] Between 1950 and 1955, the BTC's buses burned about 13 million gallons of leaded gasoline, releasing about 28 metric tons of lead into the atmosphere. Gasoline use in buses petered out after the 1950s, but it was a significant source of lead pollution in the 1940s and 1950s.[51]

In 1970 the state finally bought the Baltimore Transit Company to be run by a Metropolitan Transit Authority. But much as Barratt had predicted, there was little to take over.[52] Meanwhile, as the

---

[48] Eric Schenker and John Wilson, "The Use of Public Mass Transportation in the Major Metropolitan Areas of the United States," *Land Economics* 43, no. 3 (1967): 362.

[49] Diesel fuel, which yielded more miles per gallon than gasoline, had its own serious human health problems, of course, namely respiratory illness from particulate matter. Diesel fuel was slower to catch on in the United States than Europe before World War II because gasoline prices were relatively low in the U.S. During WWII, the U.S. military began using more diesel. And after the war, as gasoline prices increased, diesel fuel vehicles penetrated the market for heavy trucks and buses. But the shift was slow for a while because diesel using vehicles were more expensive than gasoline vehicles. Nationally, about half the new commercial buses sold in 1950 were diesel and by 1956, 54% of the commercial fleet of buses were diesel. (School buses, which drove less than commercial buses, were slower to phase out gasoline buses). James M. Laux, "Diesel Trucks and Buses: Their Gradual Spread in the United States," in *The Economic and Social Effects of the Spread of Motor Vehicles*, ed. Theo Barker (Palgrave Macmillan UK, 1987), 105.

[50] I have not been able to find data on gasoline and diesel usage before 1950.

[51] Fuel use and comparisons are based on tax receipt data from House of Delegates of the General Assembly of the State of Maryland, *Report of the Grand Inquest of the State of Maryland into the Background, Causes and Possible Ending of the Current Strike in the Baltimore Transit Company* (Baltimore, 1956), 64, MR, Pratt. From 1947 to 1953, the tax rate was five cents per gallon. From 1954 to 1965, the tax rate was five cents per gallon. Special Joint Committee on Transportation, *Interim Report* (Annapolis: Maryland General Assembly, 1983), 60-61, MR, Pratt. Tax rates for diesel fuel are harder to find, but they seem to have been the same as gasoline, at least in the 1950s. See Committee on Mass Transportation, *Report to the Mayor of Baltimore* (1955), 94.

[52] The MTA invested in modernizing the system and, with the help of the energy crisis, transit ridership improved a little. "Baltimore Transit Overview," at www.btco.net/bthist.htm

transit system in Baltimore had declined and stagnated in the 1960s, the shift to automobiles continued, helped along by the GBC's great hope for a cure to traffic problems: expressway building.

Call the Doctor Part III: Traffic Control

Before the era of interstate building got underway in the 1960s, however, there was another major proposal to solve traffic congestion: traffic control. Through the 1940s, Baltimore was a laggard in traffic control, paying one or two policeman to handle traffic control in the city. When the city finally created a department-level traffic agency in 1953, it was the last large city to do so.[53] When Mayor D'Alessandro was elected in 1950, he came to power in part through a promise to deal with the city's serious traffic problems. D'Alessandro recruited Henry Barnes, the head traffic engineer for Denver, with the promise of great leeway, a good budget, and a higher salary than any other city official in Baltimore.[54]

Barnes came in to Baltimore on the heels of a report by the state that the Baltimore Traffic Commission was doing little to help transit and that the city had primarily enacted ordinances with the "private automobile" in mind. Even those ordinances on the books that helped transit, such as no loading zones, were not enforced by the police and Traffic Commission in Baltimore.[55] But Barnes was lukewarm on mass transit, and he was caustic toward rail transit. "I have no objection to streetcars," Barnes told *Newsweek*, "except that they run on streets."[56] Streetcars could not serve the suburbs, Barnes believed, they were inflexible and they interfered with automobile traffic in the city. . He believed a good bus system would discourage suburban sprawl and avoid urban congestion that would come from too much reliance on rail transit. It was Barnes who devised Baltimore's "busway" system. But Barnes also believed that private automobiles should rule the roadway if that is what consumers preferred. Thus

---

[53] Baltimore Department of Transit and Traffic, *Annual Report*, 1960, 4, MR, Pratt.
[54] From 1953 to 1960, the budget for the Traffic Department increased from 360,000 to about 1,600,000. Baltimore Department of Transit and Traffic, *Annual Report*, 1960, 4, MR, Pratt. On Barnes's salary, see Staff, "A Guide to Careers: No. 53 – Traffic Engineering," *New Scientist*, November 28, 1957, 42.
[55] Maryland Commission to Study and Report on the Transportation System Operated by the Baltimore Transit Company, *Report of Majority and Separate Report of Commissioner Herbert Levy*, 22–23.
[56] "Our Traffic Mess," *Newsweek*, December 27, 1954, 22. In his autobiography, a Barnes quote next to a photo of a Baltimore streetcar read: "I often said I didn't mind streetcars except for the fact they ran on streets. We finally got rid of these Baltimore ones." Henry A. Barnes, *The Man with the Red and Green Eyes: The Autobiography of Henry A. Barnes, Traffic Commissioner, New York City* (Dutton, 1965), 192.

Baltimore's transit buses only got a rapid transit lane of their own if automobile traffic volumes were not high.[57]

Barnes attacked Wolman's Commission, not only because Barnes did not think the commission provided a real solution to transit problems, but also because Wolman's report had suggested that traffic control engineering did little more than smooth the flow of vehicles into the city center.[58] For Barnes, traffic control was everything. Unlike many traffic engineers, Barnes was not sanguine about the idea that cities could pave their way out of traffic problems. "If you built enough highways to accommodate all who want to drive," he said," you'd have not city left for them to come to."[59] Similarly, Barnes believed too much was made of Baltimore's narrow downtown streets.[60] Barnes did not oppose building and widening roads, but he believed that what the city really needed was traffic control.[61]

Barnes believed that traffic congestion problems could be fixed in cities of any size, with the same set of tools: "paint (lots of it); signs (many thousands); modern traffic signals; no-parking rules; one-way streets; law enforcement; public relations; and redesign of streets to meet present standards." Barnes did reconfigure Baltimore's traffic system in dramatic ways. In his first month as Traffic Commissioner, he issued a dizzying 350 orders, relating to signs, one-way streets, traffic warning, parking, traffic studies, truck bans and tree limb trimmings. He used ten times as much paint – lead paint – as he had used in Denver. He installed the city's first parking meters, the first city-owned parking lot and cracked down on double parking. He banned heavy trucks from some streets and funneled them into truck routes on others. One of his most prominent reconfigurations was the widespread use of one-way

[57] Henry Barnes, "Rapid Transit Possibilities for the Baltimore Metropolitan Area," November 1958, Baltimore Department of Transit and Traffic, Transportation Library, Northwestern University.
[58] "Barnes Assails Transport Plan," *Sun*, March 6, 1956, 36.
[59] "Barnes on Autos," *Sun*, October 15, 1960, 12. On this point, Barnes and Wolman were in agreement. As Wolman's Commission put it, "Even the widest city street ultimately reaches its maximum 'pipe line' capacity." Committee on Mass Transportation, *Report to the Mayor of Baltimore*, 5.
[60] Henry Barnes, Baltimore *Traffic Study* (May 15, 1953), 5-8, MR, Pratt.
[61] Henry Barnes, Baltimore *Traffic Study* (May 15, 1953), 5-8, MR, Pratt.

streets. These smoothed traffic flow by reducing turns across traffic. But they also usually required the removal of streetcar lines from those streets.[62]

Traffic Pollution

Barnes's intense focus on making traffic flow was not always well-received. He frequently suggested moving monuments and paving green spaces to ease traffic movement. The destruction of green space was upsetting enough to Abel Wolman that he sent a personal note to the mayor about it. "I like to believe that there are more things to the design of a City than the rapid movement of automobiles," Wolman said. "We are all devoting a considerable amount of time to the salvage of the inner area of the City," Wolman wrote, and these sorts of plans undermined that salvation and could not "under any pretense provide a permanent solution to the movement of cars."[63] But it was not just the re-engineering of the city for traffic that was a problem. It was also that traffic congestion persisted, and even increased, in some parts of the city. Barnes's solutions often fixed local congestion problems. But they also shifted problems around, were easily overwhelmed by automobile use, and made conditions worse by doing little to help transit and by facilitating the shift away from rail transit.

Thus despite some improvements, many Baltimoreans in the 1950s protested the heavy traffic conditions on residential streets. Especially common were complaints of the dangers of heavy to traffic to children crossing or playing near streets. Residents also complained about noise and fumes from vehicles, especially buses and trucks. In 1951, a state commission urged the BTC to try to do something about the "considerable criticism" from the public about odors and noxious fumes emanating from its buses.[64] As with buses, truck traffic had increased as a result of the shift away from rail transportation. Truck

---

[62] "Barnestorm: 350 Orders Issued in New Attack on Traffic Snarls," *Evening Sun*, August 12, 1953, clipping in Folder Dept. of Traffic Commissioner Henry Barnes (4), Box 304, Series 23, BRG 9, BC Archives; Barnes, "How to Untie Traffic Knots," *The Lamp*, 1954. *The Lamp* was Standard Oil's quarterly magazine; Baltimore Department of Transit and Traffic, *Annual Report*, 1959, 9.

[63] Wolman forwarded the following letter to D'Alessandro with the note, "I dislike pestering you with these things – but I have very strong feelings on this subject." Wolman to Curran, May 26, 1955, Folder Department of Transit and Traffic Complaints (1), Box 304, Series 23, BRG 9, BC Archives. Wolman was specifically referring to Barnes's repeated calls to cut down trees and remove parkways along Charles and University streets. "Move to Banish Parkway Scored," *Sun*, April 1, 1954, 10.

[64] Maryland Commission to Study and Report on the Transportation System Operated by the Baltimore Transit Company, *Report of Majority and Separate Report of Commissioner Herbert Levy*, 21.

registrations in Baltimore City doubled from about 21,000 in 1946 to 42,000 in 1955.[65] Nationally, truck hauling climbed from 115 billion ton-miles in 1948 to 279 billion ton-miles in 1959. Even more so than buses, trucks continued relying on gasoline engines through the 1950s, pumping out lead pollution in their exhaust.[66]

Traffic complaints to the city often came from residents of the urban core, usually the middle-class, fearful of the effects on the health and wealth on their neighborhoods. No less than the Dean of the School of Hygiene and Public Health at Johns Hopkins, Ernest Stebbins, wrote in decrying the "serious increase in air pollution" on a middle-class residential street in Bolton Hill. Residents along Edmondson Avenue, a working-class area, complained that the Traffic Commissioner's replacement of street cars with buses created noise and air pollution problems. A resident of Charles Street bemoaned that his neighborhood seemed doomed to "go up in the gasoline fumes of today." Heavy traffic on residential roads, however, often flowed through poor and African American neighborhoods. One of the most controversial issues was the city's funneling of virtually all east-west truck traffic in the city onto North Avenue, a street that was contiguous with several lower middle-class white neighborhoods and that bisected huge black neighborhoods in both east and west Baltimore. One angry citizen argued that all Barnes had done was to transfer traffic problems to the North Avenue area, where residents had to endure "blasts of carbon monoxide... a noxious gas that has been known to sicken people and even kill them." This pollution was particularly onerous, according to the letter writer, because the area had "more than the usual quota of small children" whose health would be affected.[67] A similar worry could have been leveled about lead-tainted fumes from trucks.

---

[65] *Automobile Facts and Figures* (Automobile Manufacturers Association, 1955).

[66] Diesel truck were not even close the majority of new truck sales in the 1950s. Laux, "Diesel Trucks and Buses," 106. On the rise of trucking, see Shane Hamilton, *Trucking Country: The Road to America's Wal-Mart Economy* (Princeton University Press, 2008).

[67] Stebbins to Barnes, January 19, 1959. Stebbins' specific complaint was that the consolidation of bus lines had increased traffic on the street. The deputy transit commissioner simply wrote back to say that the city could not avoid residential areas in planning bus routes. Zorzi to Stebbins, January 30, 1959. On Edmondson Avenue, see letter asking if the city was going to try to keep this "one section of west Baltimore… a first class residential section" or let it become a slum due to the heavy truck traffic and the noise and "stink" that came with it. Weyrich to Barnes, July 30, 1954. All in Folder Dept. Transit and Traffic (2). One resident of another truck-congested area wrote to say that while Baltimoreans appreciated the benefits traffic engineers brought to Baltimore, "we are also

Complaints about vehicular air pollution were usually about "fumes" or, in some cases, carbon monoxide, but in at least one case, a resident wrote to the mayor about lead pollution. Hagbard Ekerold, a recent transplant to Baltimore from northern New York, wrote in 1958 that while Baltimore was a "wonderful city from a cultural viewpoint" it had "one big drawback, which is especially noticeable for newcomers from God's fresh air away from large cities: deadly, lead-loaded exhaust fumes from the overwhelming automobile traffic." As a result, Ekerold had yet to see a "real healthy, rosy face in the street." Ekerold, who had worked in transit planning, offered up his services to the mayor and argued that cities needed to move toward banning automobiles in the city center. Ekerold received a reply from the mayor, saying Ekerold's letter would be given to the "appropriate city departments" and thanked him for his input. While nothing seems to have come from the interaction, Ekerold's letter showed that Baltimore's city administrators could not claim ignorance of concerns about leaded gasoline pollution.[68]

Complaints about automobile pollution show that it was a problem for many people in the city. But the record of complaints is not the record of the burden of automobile pollution. Knowledge, priorities and resources affected who made complaints, and the filtering of government record keeping and newspaper publishing affected what complaints were retained.

Maps of housing in relation to major streets and estimated lead emissions can give us a more objective sense of the burden of lead pollution, and automobile pollution and disamenities in general. One measure of this burden is how close people lived to streets. Many studies in the 1970s and 1980s found that lead levels in air and soil were higher with closer proximity to streets. Lead particles that were blown

---

interested in the children of Baltimore." Along with an emphasis on children's health, this letter struck a common criticism that traffic engineers subjugated all issues to the efficient flow of automobiles. Pastor Robert Bozel to Mayor D'Alessandro, October 14, 1954. For complaints about heavy truck traffic on North Avenue, see Morris Cooper to Mayor D'Alessandro, December 12, 1954; Laurence Moltz to Mayor D'Alessandro, December 3, 1954 (Moltz, chairman of the North Avenue Citizens Committee, claimed to represent 50,000 residents) and other letters in Folder Dept. of Transit and Traffic, Commissioner Henry Barnes (2). All folders in Box 303, Series 23, BRG 9, BC Archives. Maurice Azreal to Barnes, circa December 1955, Folder Department of Transit and Traffic Complaints (1), Box 304, Series 23, BRG 9, BC Archives. In addition to letters above, see "Fight on Trolley Lines Shift Looms," *Sun*, August 13, 1954, 18 (on Edmondson Avenue), and "Heavy Truck Decree Given," *Sun*, August 9, 1953, 20; Meyer Brown (letter to editor), "Trucks on North Avenue," *Sun*, September 23, 1954, 22; "Barnes Sets Truck Study After Route Complaints," *Sun*, July 26, 1957, 24 (on North Avenue).

[68] Ekerold to D'Alessandro, April 18, 1958; D'Alessandro to Ekerold, April 23, 1958, Folder Department of Transit and Traffic Complaints (6), Box 304, Series 23, BRG 9, BC Archives.

out of tailpipes dispersed through the air and eventually fell to the ground in a process called deposition. The concentration of lead in the air decreased at an exponential rate with the distance from the center of the road as the lead was deposited on the ground. Thus, the amount of lead in soil also decreased exponentially with distance from the road. For example, one study found that 25% of the lead emitted from automobiles was deposited on the ground within 150 feet of roadways and 50% was deposited within 640 feet.[69]

Figure 55 maps white and black dwelling units in Baltimore's 8,020 census blocks in relation to whether the units were within a 640 foot "buffer" of pollution from major streets. The streets used in the map are those identified as major streets based on a large study of traffic in the city by the Wilbur Smith Company in 1962. The map shows that a 640 foot buffer from major streets virtually covers the inner city, with spaces in between buffers becoming larger in the outer city. In 1960, most of the black housing units were in the inner city and the housing units in the outer city were predominantly white. And although not pictured, since there is no data on Baltimore County's census blocks, the pattern of the outer city – low density of roads and overwhelmingly white – continued. Thus, the burden of pollution as suggested by the 640 foot buffer fell disproportionately on black households. There were, however, still many white housing units within the 640 foot buffer. These include several in the inner city, such as the middle/upper-class neighborhoods of Mount Vernon, Charles Village and Bolton Hill (north of the CBD), and the working-class neighborhoods in the southern and eastern part of the inner city. There were also a few areas of black housing concentration outside of the inner city, though several of these were also covered by much of the 640 foot buffer. Similarly, a larger scale map showing Baltimore's inner city with 150

[69] Battelle Memorial Institute et al., *The Health and Environmental Impacts of Lead and an Assessment of a Need for Limitations* (U.S. Environmental Protection Agency, 1979); Kirsten Schwarz et al., "A Comparison of Three Empirically Based, Spatially Explicit Predictive Models of Residential Soil Pb Concentrations in Baltimore, Maryland, USA: Understanding the Variability within Cities," *Environmental Geochemistry and Health* 35, no. 4 (2013): 495–510. The study of lead deposition within 150 and 640 feet is discussed in Environmental Protection Agency, *Air Quality Criteria for Lead* (U.S. Environmental Protection Agency, 1977), 6.14-6.15.

street foot buffers shows that both black and white residential areas overlapped with the smaller, but more polluted, strips of pollutions that accumulated near major streets (Figure 56).[70]

[70] The analysis in this section is based on the following data sources: U.S. Census, *Census of Housing: City Blocks: Baltimore, Md.* (Washington, D.C.: GPO, 1961); Minnesota Population Center, *National Historical Geographic Information System: Version 2.0.* (Minneapolis, MN: University of Minnesota, 2011), www.nhgis.org; Wilbur Smith, "Baltimore Metropolitan Area Transportation Study," 1964; Federal Highway Administration, "Highway Statistics: Summary to 1995" (Washington: GPO, 1997); U.S. Bureau of Mines, *Motor Gasolines, Summer 1960* (Bartlesville, Okla.: U.S. Dept. of the Interior, Bureau of Mines, Petroleum Research Center, 1960).

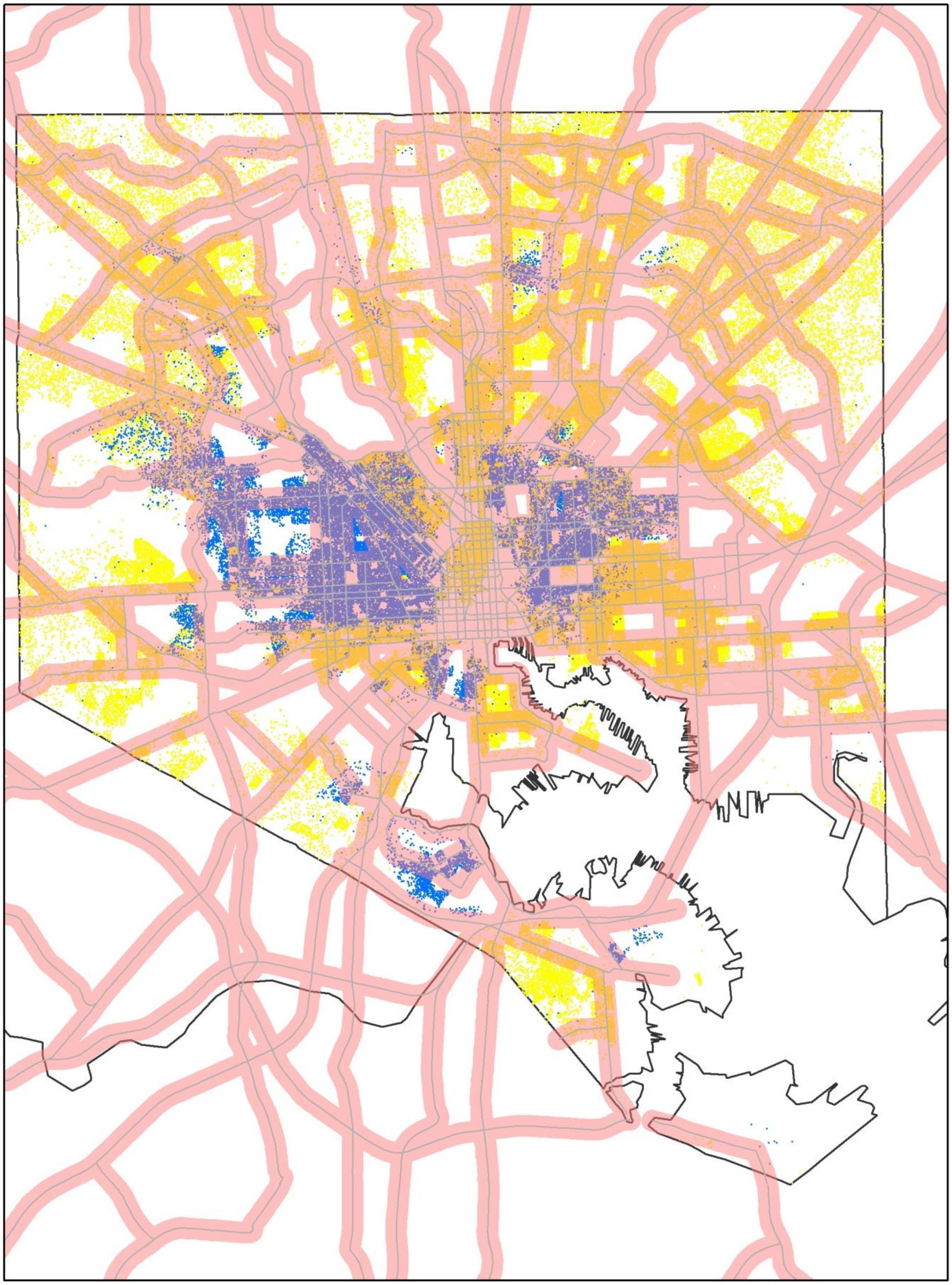


Figure 55: Dot density map of dwelling units by race overlaid with 640 foot buffers of major streets (pink lines) in Baltimore City in 1960. One dot = one dwelling unit. Yellow dots = white units. Blue dots = black units. The map shows that housing units in the inner city and black housing units were disproportionately close to major streets, and thus likely to be more exposed to lead emissions. **Sources**: See footnote 70. **Map**: Leif Fredrickson.

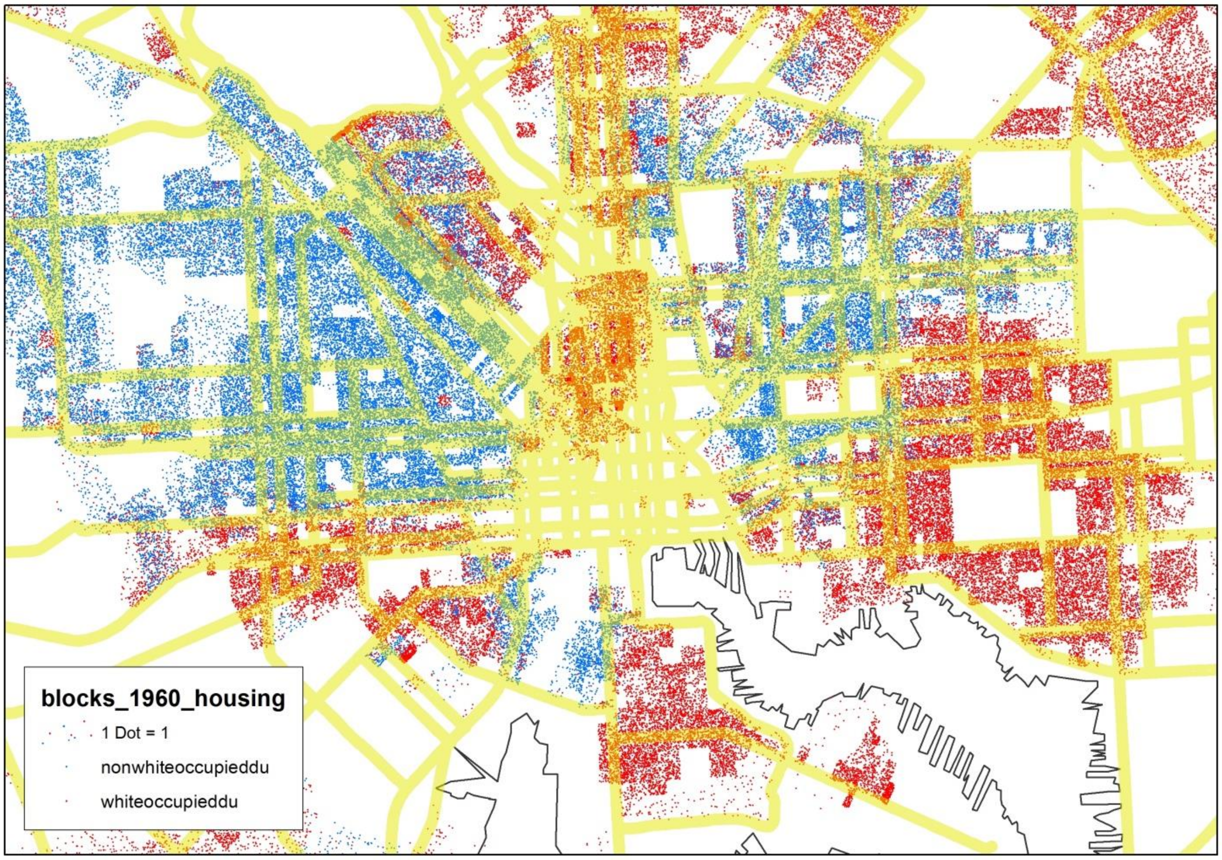


Figure 56: Dot density map of dwelling units by race overlaid with 150 foot buffers of major streets (yellow lines) in inner city Baltimore 1960. One dot = one dwelling unit. Red dots = white units. Blue dots = black units. As the map shows, many high density residential areas, both black and white, were within 150 feet of major streets where there would have been high lead deposition. The 150 foot buffer only approximates the lead burden, since lead deposition varied by the volume and type of traffic on the streets, and lead also dispersed further than 150 feet. **Sources:** See footnote 70. **Map**: Leif Fredrickson.

Incorporating estimates of lead emissions coming from different segments of roads can also give us a sense of the burdens of pollution across spatial and racial groups.[71] I combined data on the amount of traffic, traffic conditions, the characteristics of automobiles and leaded gasoline, and prevailing winds to approximate lead emissions and lead deposition in buffers on each side of streets.[72] Figure 57 shows a

[71] Race is the only non-housing data included in the block data, so I have not been able to analyze class, gender or other social characteristics. In the future, I may use census tract data for such an analysis, but because tracts are spatially much bigger than blocks, and because they contain dozens or hundreds of blocks, I would lose much of the fine-grained analysis that block-level data allows. I also may use block data on tenancy, contract rent, and housing condition as a proxy for class, but with the exception of tenancy, I have not been able to add this to my data set of over 8,000 blocks yet.

[72] For lead emissions, I used the model from Environmental Protection Agency, "Supplementary Guidelines for Lead Implementation Plans: Updated Projections for Motor Vehicle Lead Emissions" (Office of Mobile Sources, 1978). This model includes inputs for average daily traffic, vehicle fuel efficiency, lead content of gasoline, percent lead exhausted by vehicle speed, driving condition (free flowing or stop-and-go), and speed-adjusted fuel economy. The sources for these inputs are in footnote 70. For lead dispersion and deposition, I used the model from Lynam (1972) discussed in Environmental Protection Agency, *Air Quality Criteria for Lead* (U.S. Environmental Protection Agency, 1977), 6.14-6.15. Finally, I divided the amount of lead dispersed to each side of a street segment's buffer

graphic representation of lead pollution with the percentage of black housing units in each census block. This map suggests that the burden of pollution, adjusted by traffic and weather factors, affected both highly white and highly black areas of the city.

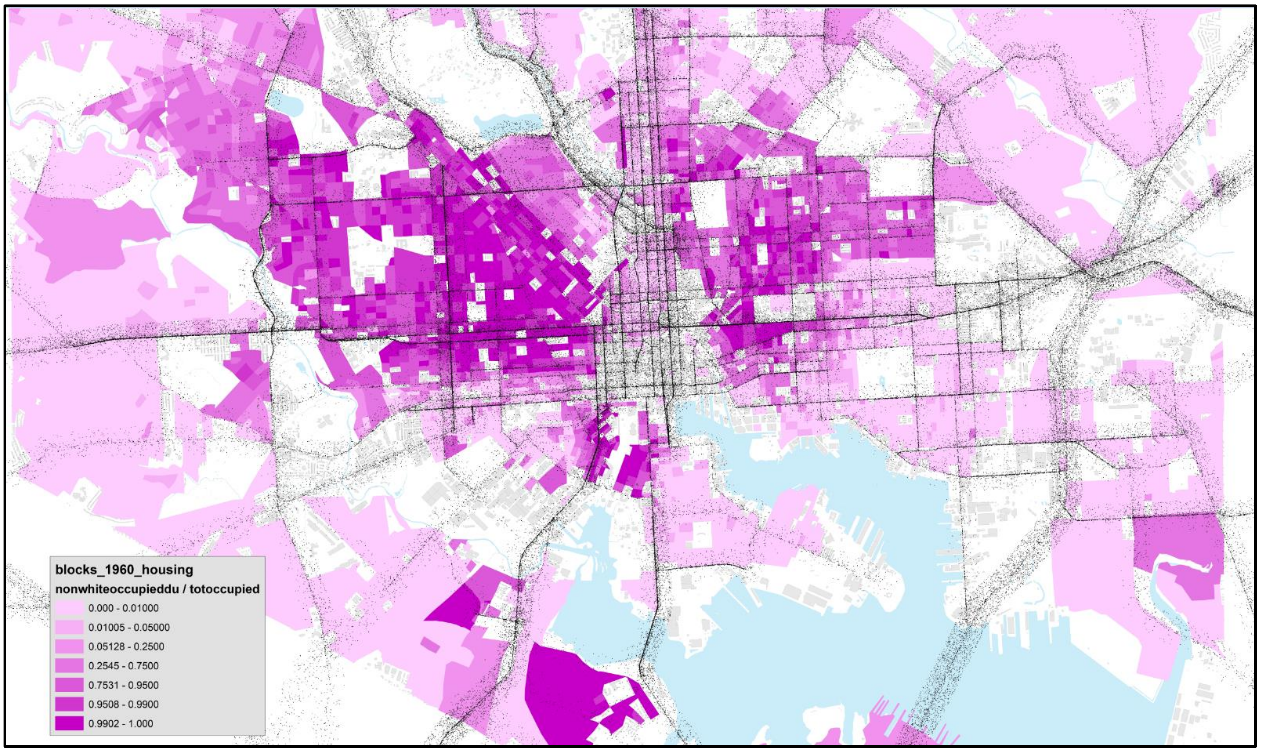


Figure 57: Percent of black dwelling units in each census block overlaid with an estimate of lead pollution from automobiles. Lead pollution is represented by the density of black dots. Lead pollution represented here is lead *not* removed from the air by deposition, and is a rough estimate of the concentration of lead remaining in the atmosphere. Technically, one dot equals one gram, but the map should be read more as the relative amount of pollution in different areas since precise estimates of lead emissions and dispersion are complex. The map shows relatively high lead levels in both heavily black and heavily white areas, as well as commercial and industrial areas without residents. It is important to note that the percentage of black or white residents in a block does not tell us how dense those blocks were, which is crucial to understanding the burden of lead. In addition, dwelling unit density is not the same as the population density, because black units usually contained more people than white units. And the exposure of children is different than population exposure, since the black population included a higher percentage of children. These issues of lead exposure are dealt with in the tables and discussion below. **Sources:** See footnote 70. **Map**: Leif Fredrickson.

---

by the proportion of prevailing wind blowing approximately perpendicular to the street. I averaged the proportion of time winds blew in the cardinal and ordinal directions from climatological data collected in the city between 1928 and 1951 (after 1951, the government discontinued the weather station in the city). This data is from the U.S. Weather Bureau, *Climatological Data: Maryland and Baltimore Section*, annuals 1928-1951. For the statistical analysis, I used estimates of the amount of lead deposited on the ground, not the amount of lead in the air. Ambient air concentrations of lead are more difficult to estimate than deposition near the road because fine particles are more subject to wind, turbulence and other atmospheric conditions. However, the deposition of larger particles is one of the key factors that influences ambient air concentrations, so the inverse of the deposition estimates one of the key factors in declining concentration. Environmental Protection Agency, *Air Quality Criteria for Lead*, 1.19. More generally, ambient concentrations exponentially decline with distance just as deposition does, so any model of exponential decline with distance approximates the dynamics of ambient lead concentrations near roads. Thus the inverse of deposition can be used as a rough measure of lead in the air, as I do in Figure 57.

As the foregoing maps illustrate, the burden of lead pollution was by no means categorically associated with areas where black housing was concentrated. This is borne out by statistical analysis. In general, blocks with high lead burden (measured as the amount of lead deposited per area of block) were not strongly associated with either the racial composition of the blocks or their tenancy (renter versus owner occupier).[73] Examining the lead loads of census blocks shows that there was a great deal of variability across sections that housed primarily white, primarily black, or mixed households. Figure 58 illustrates the stark segregation of housing in Baltimore, with thousands of blocks clustered at the extremes of racial composition. About two-thirds of Baltimore's approximately 6,400 census blocks with dwelling units were 99 to100% white or black. Most of these extremely segregated blocks were white – almost 4,000 in all. At both ends of the racial composition spectrum, and in the more mixed blocks in between, many blocks can be found with very high to very low lead burdens.

[73] Although the purpose of the analysis presented here is not to develop a predictive equation for the lead pollution from automobiles, I did regress percent black and percent renter (by block) against the lead loading (amount of lead per square foot of block) for all the residential blocks (N=6,430). The R-squared of this regression was 0.05. The standard error of the estimate was 41.48, with a range of the predicted variable (lead load) from 0 to 391.03. The coefficients were 7.57 (standard error 1.43) for percent black and 25.22 (standard error 1.71) for percent renter. The normal probability and residual plots show that the lead load data are strongly skewed to the right and that there may be a non-linear relationship between percent black and lead load. Overall, this preliminary regression analysis suggests that percent black and percent renter may be statistically significant, if weak, predictors of lead load, with percent renter being a stronger predictor. However, a better analysis will depend on transforming some of the data, including some of predictor variables and dealing with the potential issue of spatial auto correlation. I hope to explore this more in the future.

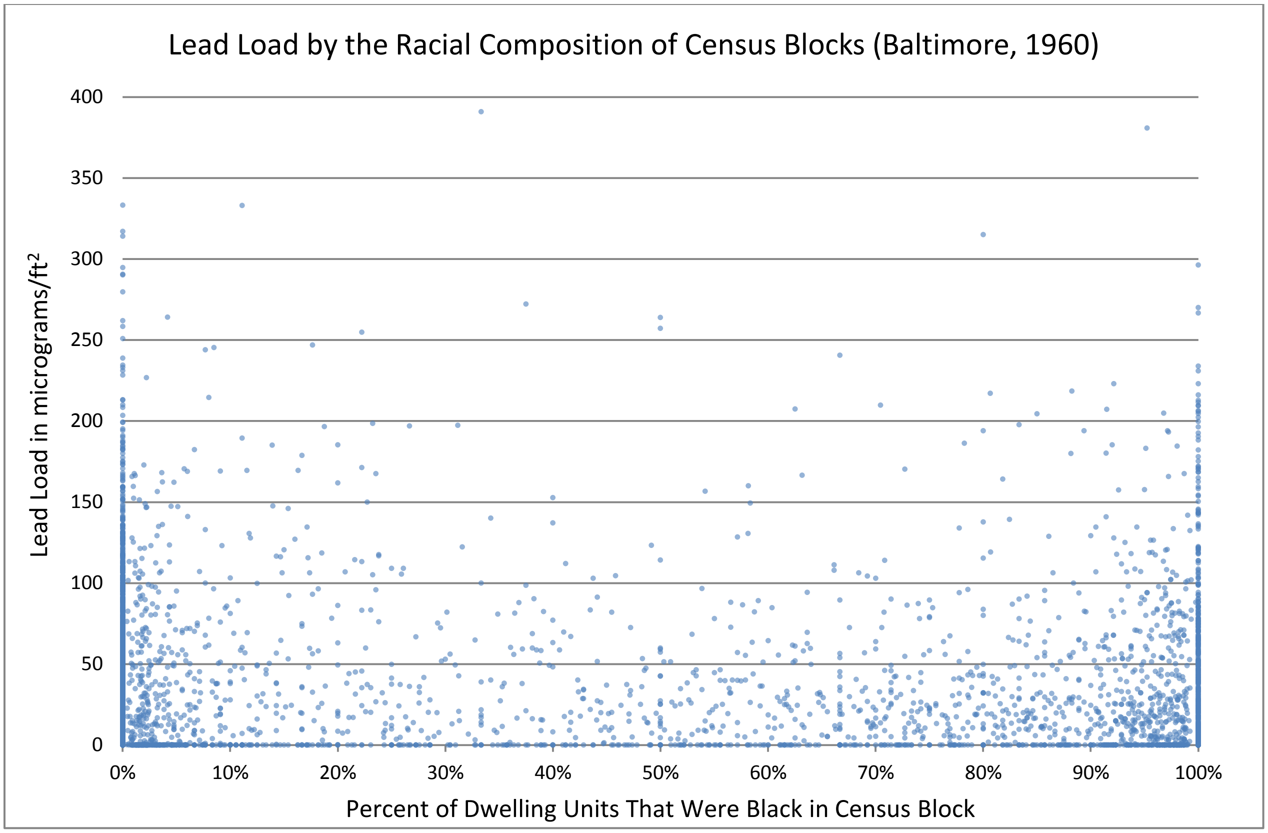


Figure 58: Lead load (micrograms per square foot of block area from 150 buffer) plotted against the percentage of black occupancy in Baltimore City blocks in 1960. The graph shows that Baltimore census blocks were highly segregated and that there was high variation in lead loads across different racial compositions of blocks. Because so many cases are clustered at the extreme ends of the racial composition spectrum, the differences between lead loading in overwhelmingly white and overwhelmingly black blocks is difficult to see. Other types of data analysis make these differences in lead loading more apparent. **Sources:** See footnote 70. **Graph:** Leif Fredrickson.

While the high variability of lead burdens across blocks of different racial make-up is evident, blocks that were mostly white did tend to have lower lead burdens than blocks that were mostly black. The clustering of blocks at the poles of racial composition in Figure 58 make this difficult to see, but examining the average and median lead loads of blocks stratified by racial composition (99%, 95% and 75% or more black and white) reveals this pattern (Table 2). Whether looking at all residential blocks or just residential blocks that had some overlap with the buffer (i.e., a non-zero lead load), the predominantly black blocks had high average lead levels compared to predominantly white blocks. The disparity increased at higher levels of segregation, with 99% black and 99% white blocks showing substantial differences in average lead burdens. Mixed blocks (the blocks remaining after removing the predominantly black and white blocks) had average lead levels in between predominantly black and predominantly white blocks. Despite these differences in means, the high variation is still evident in the standard errors. The means are all statistically significantly different. The strongest statistical difference in means across these strata is between the predominantly black and predominantly white blocks.[74] In general, it seems that the unequal burdens of lead were more a product of a large number of predominantly white blocks with low lead burdens than a product of predominantly black blocks having high burdens compared to all other blocks.

Looking only at the densest blocks suggests that low-density blocks are responsible for relatively lighter lead burdens of predominantly white blocks (Table 2). In the densest blocks, there are no significant differences across means, and although predominantly black blocks still have the highest average lead loads, predominantly white blocks have higher lead loads than mixed blocks.[75] In general, dense blocks had higher lead loads than residential blocks in general. Dense blocks were overwhelmingly located in the inner city, and their higher lead loads were what would be expected given the heavy traffic and density of streets in the inner city. Low-density blocks were more likely to be located in the outer part of the city and have lower lead-burdens. These blocks, which were overwhelmingly white, contributed to the lower average lead levels in white versus black residential blocks. In short, highly segregated white blocks in the outer city seem to have been the main source of the inequality in lead burdens between predominantly white and black blocks.

---

[74] A one-way analysis of variance for the racially stratified groups in the "residential" and "residential, some overlap," categories all resulted in p-values less than 0.001.
[75] A one-way analysis of variance for the "residential, dense" racially stratified groups resulted in a p-value greater than 0.5.

Lead Loading by Race and Housing Characteristics of Baltimore Census Blocks					
	Total (N)	Lead Load (μ/ft^2/day)[e]			
		Mean	Standard Error	Median	Standard Deviation
Residential[a]	6,377	28.22	0.53	11.50	42.58
99% Black[b] or more	539	42.85	2.34	22.08	54.28
99% White or more	3,892	22.31	1.07	19.34	47.33
1-99% Black/White	1,946	35.97	0.99	19.73	48.82
95% Black or more	854	40.65	1.77	20.95	51.65
5% White or more	4,191	23.43	0.58	7.25	37.78
5-95% Black/White	1,332	35.31	1.30	19.41	47.55
75% Black or more	1,330	38.30	1.35	20.39	49.13
75% White or more	4,517	24.89	0.59	8.14	39.76
25-75% Black/White	552	31.21	1.86	17.56	43.61
Residential, some Overlap[c] (R.O.)	4,029	44.43	0.73	29.10	46.21
R.O., 95% Black or more	636	53.34	2.11	38.85	53.25
R.O., 95% White or more	2,415	40.66	0.86	26.83	42.15
R.O., 5-95% Black/White	978	47.93	1.59	31.43	49.72
Residential, Dense[d]	1,755	50.20	1.14	34.69	47.57
Dense, 95% Black or more	461	52.13	2.32	37.75	49.92
Dense, 95% White or more	786	50.00	1.67	35.46	46.75
Dense, 5-95% Black/White	508	48.77	2.07	32.52	46.68

Table 2: Analysis of lead loading from automobile pollution as it related to the racial composition and density of housing. **Notes:** **(a)** I use "residential" to refer to blocks that had at least one occupied dwelling unit. "Residential" does not signify that these blocks were primarily residential. They may have been dominated by commercial, industrial or other land uses. **(b)** The U.S. Census categorized housing by "white" and "non-white" dwelling units. In Baltimore, the non-white, non-black population constituted about 0.87% of the non-white population. Thus "non-white" is virtually interchangeable with black. "Black" and "White" blocks are those that had 95% or more black or white dwelling units, respectively. "Mixed" are the remaining blocks. **(c)** The buffer is the distance from the center line of the street. For these analyses, I have used a 150 foot buffer. The overlap is the area of the buffer and the area of the block that intersect. Blocks that had at least some overlap are included in the category "overlap." **(d)** I have used 15 dwelling units per acre or more as the criteria for "dense" housing. **(e)** The lead load or lead burden is the estimated lead deposition in the block divided by the block's area. I estimated lead deposition based on the model of lead emissions, dispersion and wind data referenced in note 72. I then multiplied this estimate by the proportion of the 150 foot buffer that intersected the block (done in ArcGIS with Intersect tool). Then I added up all of the proportional contributions of each buffer intersecting a block, since many blocks had multiple buffers that intersected them. Finally, I divided this sum by the area of the block. It should be emphasized that that the lead load based on the 150 buffer underestimates the lead load since it does not include all of the lead deposited from traffic pollution. As noted, another 25% of the lead emissions would have fallen out of the air within 640 feet. I used a 150 buffer as an attempt to balance the trade-offs of using smaller and larger buffers. A smaller buffer will be prone to more errors since the digitized boundaries of census blocks and streets are probably imperfect. A 20 foot buffer thus might give misleading results especially if the street bisects very different types of blocks (which is quite common). A larger buffer, such as the 640 foot buffer I mapped has some disadvantages because deposition becomes more variable further away from the street as a result of wind and the complicated effects of a built environment. It would also probably reduce variability in exposure, at least in the inner city, since coverage is much bigger. In other words, it eliminates some of the disproportionate impact of living close to a street by spreading the effects out. Thus for the first analysis I chose the 150 foot buffer, but in the future I may explore the same analysis with other buffers or combinations of buffers. **Sources:** See footnote 70. **Table**: Leif Fredrickson

Another way to examine the environmental inequality of lead, and to get a sense of its impact, is to estimate the exposure of lead to households, individuals and children. One problem with only looking at census blocks is that blocks had different numbers of dwelling units and people in them. It was not abstract census blocks that were poisoned, but people, and specifically children. Census block data do not include population data, but the blocks are contained in census tracts that do contain population data. Applying averages of people per dwelling unit and the percentage of children in a tract to the blocks gives us a workable estimate for the block. We can then use the block's overlap with the buffer to estimate the exposure within that block. These are imperfect estimates, but they help give us a sense of exposure.

As Table 2 shows, black dwelling units, individuals and children were each disproportionately likely to be exposed to lead pollution (as measured by the 150 street buffer). In absolute numbers, there were far more white dwelling units exposed than black dwelling units. While black dwelling units only made up 29% of the city's occupied dwelling units, they constituted 38% of the dwelling units exposed. Similarly, the proportion of individuals in the exposed population that were black (46%) was higher than the proportion of black individuals in Baltimore City's total population (35%). Most importantly from the point of view of lead's effects, black children (under five years of age) made up 59% of the exposed child population compared to 46% of the total child population of Baltimore . The number of children exposed for both white and black groups, however, was quite high: 24% and 39% respectively.

Lead Exposure in 150 Foot Street Segment Buffers by Race and Age					
Occupied Dwelling Units by Group					
	Total	Black	Black % Total	White	White % Total
All in City	275,597	80,454	29%	195,143	71%
Dwelling Units in Blocks with Overlap	181,474	59,423	33%	122,051	67%
Exposure (Weighted by Buffer Overlap)	85,159	32,162	38%	52,997	62%
Percent of Group Exposed	31%	40%		27%	
All Individuals by Group					
	Total	Black	Black % Total	White	White % Total
All in City	939,024	325,589	35%	610,608	65%
Exposure (Weighted by People per D.U. in Tract)	279,623	127,758	46%	151,865	54%
Percent of Group Exposed	30%	39%		25%	
Children (Under 5 Years) by Group					
	Total	Black	Black % Total	White	White % Total
All in City	102,609	47,712	46%	54,897	54%
Exposed (Weighted by Percent Children in Tract)	31,704	18,780	59%	12,923	41%
Percent of Group Exposed	31%	39%		24%	
Average Lead Deposition per Child Exposed (μ/ft^2/day)		69.04		79.84	

Table 3: Estimated lead exposure (for 150 foot buffer) for dwelling units, individuals and children by race. The table shows that when weighting exposed dwelling units by the average number of people in each dwelling unit and the average proportion of the population that were children (both by race and by census tract), racial disparities in exposure were even greater than what is suggested by dwelling unit exposure. However, among the children exposed, white children tended to have higher levels of exposure. **Sources:** See footnote 73. **Table:** Leif Fredrickson.

When examining the average lead exposure of children in these 150 foot buffers, however, the story is different: white children were exposed to higher average lead loads than black children.[76] White children had an estimated exposure of about 80 micrograms (μ) per square foot per day, while black children had an estimated exposure of about 69 μ/ft^2/day. These exposures levels are in the range of what would be expected on terms of deposition near a road. But the exact numbers are less important than the

[76] For these lead loads, I have used the area of buffer intersection to calculate lead per square foot rather than the area of the block. This is because the analysis of lead exposure for dwellings and individuals is based on the proportion of the intersection in that block.

relative differences. The maps of lead dispersion, especially Figure 57, suggest some reasons for this. First, outside of the inner city, major streets were lower density but they produced lots of lead pollution because of high traffic volumes and high speeds. The population in the outer city was low density compared to the inner city. So fewer children were exposed to heavy traffic, but those that were experienced high levels of exposure. The outer city was predominantly white, so this pattern influenced the overall exposure of white children. In the inner city, there were concentrations of white residents in south, north and east Baltimore. Like the outer city, these places had a lower density of major streets, but they included some of the roads with the highest lead emissions. These roads included Baltimore's first expressway, the Jones Falls coming in from the north, and several major highways that entered the city from the south and east. Thus, again, fewer white children were exposed to lead in the inner city. But white children also tended to live in areas bisected by roads that produced very high levels of lead.

Overall, these data show the unequal exposure of African Americans to lead pollution from traffic in Baltimore City. These disparities would almost certainly be greater if we included the suburban population outside the municipal boundary, since traffic volume, road density, and population density were lower there and the area was predominantly white. But while racial disparities are apparent, many white people were also exposed to lead. In addition, among the children exposed to lead within 150 feet of the roadway, white children experienced higher average lead burdens. The data also suggest other important patterns. Inner city areas had higher lead burdens than the outer city. And while there was not an analysis for income or occupation due to the lack of data at the block level, many of the highly exposed areas in the inner city were low-income and/or working-class black and white neighborhoods. Wealthier areas in the outer city experienced less lead exposure. Some affluent white neighborhoods in the inner city, however, did also experience very high lead levels. But they also tended to have fewer children in them as a proportion of the population.

Conclusion

Although African Americans and inner city residents were subject to disproportionate levels of vehicular pollution, Baltimoreans of many backgrounds saw traffic congestion as an existential threat to the urban core, one that threatened to drive down property values, kill business, and continue the exodus of people to the suburbs. Although some experts argued for a more radical approach to mass transit as an alternative to the automobile – public ownership and management of mass transit for the public good, rather than for profit – the city ultimately pursued an attempt to control traffic. Baltimore's program, and the engineer that ran it, drew national attention, but the results were far from transformative.

Congestion was a problem for many reasons, but it was a problem for metropolitan transportation only in comparison to idealized transportation systems, not transportation systems that were realistic at the time. Cramming automobiles onto roads was an effective way of facilitating mass suburbanization. A huge expansion in street capacity may have produced more even more suburbanization than what took place during the 1940s and 1950s.[77] But this is to compare the congested traffic system to a system that was not a real alternative at the time. Expressways could not be created at the drop of a hat in response to the rising demand for suburban living in the post-war period. And mass transit systems were not up to the job. Aside from improvements via traffic control, a system with less traffic congestion was simply a system with fewer automobile users, especially commuters, which would have meant less suburbanization. The only way to transport more people to and from the suburbs was to jam more automobiles onto the roads. Unlike increased capacity, traffic cramming could be created quickly, it only took more people heading out onto the streets to drive. This cramming of cars onto streets, especially old streets in the inner city, created congestion – literally traffic jams. From the point of view of an individual driver, congestion was an obstacle to travel. But at the level of the transportation system, "congesting" the roads was an effective way of increasing the volume of vehicles flowing on the roads. Seen this way, congested automobile traffic was not a byproduct of a transportation system, it was part of the way the transportation system worked. It was a brute force method of increasing traffic volume. But it was a system that *did* work, in the sense that it effectively delivered commuters to and from the suburbs and allowed the expansion of the suburbs.

[77] It is not at all clear that they would have, however, given the studies that found that congestion did not have a strong effect on the transportation choices of commuters. Stanley J. Hille and Theodore K. Martin, "Consumer Preference in Transportation," *Highway Research Record*, no. 197 (1967).

Both commuting and congestion were central to suburbanization and both contributed to environmental inequality. Commuting produced high traffic volumes in the inner city and commuters left that pollution behind when they went home. Congested driving exacerbated automobile pollution, along with other disamenities of life in the inner city, including noise.

Mobility, both social and geographic, has been central to conceptions of both modernity and the American Dream. Geographic mobility has also long been seen as crucial to effective political power and participation in the market as both consumers and workers. By extension, inequalities in mobility produce political, economic and social inequalities. In addition to housing segregation, historians have argued that unequal access to the powerful technology of the personal automobile has reproduced inequality.[78] But this is only part of the story, because not only have some groups disproportionately gained from mobility via the automobile, other groups have shouldered a disproportionate burden of the externalities of heavy automobile use, including exposure to lead. Unfortunately, the third strategy for reducing congestion, building bigger roads, did little to reduce congestion in the long-term, and exacerbated environmental and social inequalities.

[78] James J. Flink, *The Automobile Age* (MIT Press, 1990); Catherine Lutz and Anne Lutz Fernandez, *Carjacked: The Culture of the Automobile and Its Effect on Our Lives* (St. Martin's Press, 2010); Cotten Seiler, *Republic of Drivers: A Cultural History of Automobility in America* (University of Chicago Press, 2009); David Imbroscio, "Beyond Mobility: The Limits of Liberal Urban Policy," *Journal of Urban Affairs* 34, no. 1 (February 1, 2012): 1–20.

Chapter 8 – Expressway Solutions and Freeway Failures: Automobile Pollution, Housing Deterioration and Interstate Protests

While many Baltimoreans complained about automobile fumes and pollution in the 1940s and 1950s, there was little acknowledgment of the problem by city officials at the time. Industrial pollution problems dominated official discourse and policy. But academic health experts in Baltimore, as well as in state and local governments in other places, especially California, did begin researching and discussing the problem of automobile pollution, especially in the 1950s.

In the meantime, governments at all levels embarked on a massive program of highway building. In Baltimore as in other cities, the decline of mass transit and the inability of traffic control to provide a definitive to solution to traffic congestion kept the standard response to traffic congestion in play: build more roads and make them wider. But this response became more aggressive after Congress approved the creation of an interstate highway system in 1956. Funding for the interstate highway system accelerated many plans already underway in Baltimore and other cities for expressways.

In Baltimore and other cities, governments sought to reduce traffic congestion not only because it was a nuisance to residents and drivers, but also because they saw heavy traffic and traffic congestion as a cause of housing and social deterioration. This deterioration, the theory went, led to "blight" and ultimately to "slums." There was plenty of evidence, as noted in the previous chapters, that that the danger, noise and fumes from traffic contributed to the exodus from the city and to the decline in property values of houses that were located close to streets with heavy and congested traffic. This effect of traffic on housing compounded environmental and social inequality as well. At the metropolitan level, it reduced housing values in the city relative to the suburbs. And with the urban core, it reduced property values near major streets. Declining property values caused owners to disinvest, potentially increasing lead paint hazards. And over time, this deteriorating housing shifted to lower-income residents, who were then exposed to more air pollution from the traffic on nearby roads.

Proponents of expressway building argued as early as the 1940s that large roads built into and across the city would not only improve traffic, they would also improve housing. By reducing congestion, they would reduce traffic disamenities that contributed to blight. In addition, expressway building could be directed through blighted areas and slums to eliminate them.

But the expressway largely worsened the disease and further exacerbated social inequality. Planners targeted blighted and slum areas, which were disproportionately inhabited by low-income and African American people. The threat of expressway building, which hung in the air for years or decades for some neighborhoods that lay in the path of proposed routes, further exacerbated housing deterioration. If expressways were built, they often displaced many people – again, disproportionately the poor and black.

Residents that lived near expressways also suffered from high levels of traffic pollution. Despite the claims of a number of air pollution experts, traffic engineers and transportation policymakers, interstates did not decrease automobile pollution by decreasing congestion. Higher volumes of traffic soon canceled out any benefits from reduced congestion, which was itself often fleeting. And for lead, higher travel speeds yielded more lead particles exhausted from automobiles.

In Baltimore, some of the planned expressways were built, but some faced considerable resident opposition. Residents opposed expressways because they displaced people, and also because they threatened to generate more pollution, including lead air pollution. In their battles against expressways, residents were helped along by increasing concern and knowledge about pollution as well as new regulations. Regulation of lead emissions lagged behind some other pollutants (in part due to industry opposition to regulation), but lead emissions did become an important part of the argument against an expressway in Baltimore. At the same time, growing concerns about lead emissions and their relationship to environmental inequality in the early 1970s helped catalyze the federal government to force the phase-out of leaded gasoline. But while the phase-out of leaded gasoline and the halting of some expressway building helped curb lead pollution, cities were still stuck with soil soaked in lead from decades of heavy leaded gasoline use.

Air Pollution and Public Health

As automobile use increased in the twentieth century and cities fell in to a constant battle against congestion, concerns grew about air pollution from motor vehicles. But industrial air pollution still dominated the concerns of experts through the 1950s. Factories pumped out goods at an incredible rate during World War II and with those goods came more pollution. During the war, foundries gave off "bluish-white smoke" that blotted out the sun on bad days. In addition to industry, refuse burning added considerably to air pollution.[1] The industrial ramp up of the war, and concomitant pollution, was followed by a number of severe pollution events that brought more attention to the problem of air pollution. In 1948 in Donora, Pennsylvania, a suffocating inversion combined with industrial emissions to produce a dark and deadly pall of pollution. Twenty people died. These incidents gained widespread coverage in the *Sun*. Notable air pollution events in other places, such as London, also contributed to the growing awareness and concern about air pollution.[2] Meanwhile, Baltimore had its own problems. Shortly after Donora, South Baltimore was treated to a "black snowfall." Soot rained down, accumulating an eighth of an inch thick in some places.[3] The following month, Baltimore was hit by a two-day smog that reduced visibility to several hundred feet at times and almost ground the shipyards to a halt.[4] Media stories of smoke and air pollution often suggested residents believed conditions were getting worse.

As a result, politicians and bureaucrats, especially the Baltimore City Health Department, mobilized to do more about air pollution. A Governor's Commission on Noxious Fumes recommended an annual appropriation for the study and control of air pollution.[5] While only a fraction of the recommended amount was funded, it was enough to push the city and the BCHD toward a community air pollution

---

[1] "Calm Blamed for Smokiness," *Sun*, October 19, 1944, 17.
[2] The *Sun* carried dozens of articles on the Donora incident, beginning with "15 Deaths Blamed on Smog in Mill Town near Pittsburgh," *Sun*, October 31, 1948, 10.
[3] "South Baltimore Has Rain of Soot," *Sun*, November 10, 1948, 24.
[4] "Smog Cover City, Upper Bay; Hampers Shipping in Harbor," *Sun*, December 30, 1948, 22.
[5] "Report of the Maryland Commission on Noxious Fumes – 1949," *Baltimore Health News*, May-June 1950, 37-40. Huntington Williams was a member of the commission. The commission also recommended a state-wide air pollution program, as pollution did not respect political boundaries.

program.[6] Although health commissioner Huntington Williams eschewed relying on the "heavy police hand" for compliance,[7] the department did take some strong regulatory action in this period, most prominently against several lead smelters.[8] In 1956, passage of the Air Pollution Control ordinance also expanded the BCHD's powers. It prohibited any "person, firm, corporation or agency" from operating or using "any equipment, process, structure or space, indoors or outdoors, static or mobile" from emitting any "noxious acid, gas, vapor, odor" or other substance into the air in such a way to be "detrimental to the health or safety of the public or to interfere unreasonably with the comfort of the public." It also gave the BCHD powers to promulgate rules and required BCHD approval for new plants or changes to existing plants that affected air pollution.[9]

By the end of the 1950s, Williams believed the top three long-standing public health problems were industrial hygiene, lead paint poisoning and air pollution.[10] But while the air pollution incidents in Donora, London and Los Angeles got the attention of Williams, he believed that the acute deaths caused by these events "practically never" happened because Baltimore's topography and climate allowed it to "wash itself clean." Air pollution was likely to be a problem, Williams thought, first because it was a nuisance (as it had long been) and second because chronic exposure to some air pollution chemicals might be cause of lung cancer. However, Williams believed there was much stronger evidence that lung cancer

[6] BCHD, *Annual*, 1950, 241. The Commission on Noxious Fumes called for $100,000 to fund air pollution study and control, but the state only appropriated $10,000. In 1952, the BCHD received $13,000 and in 1953 it received $25,000 after requesting $63,000. BCHD, *Annual*, 1952, 287. By 1948, the BCHD had a "smog analyzer" that could measure lead, among other pollutants. "Baltimore Has Its Staff of Smog Analyzers," *Sun*, November 8, 1948, 12.
[7] Huntington Williams, "Air Pollution Control: A Statement from the Commissioner of Health to the City Council," *Baltimore Health News*, October 1952, 57-62.
[8] One plant was smelting dross and flux at high temperatures without any equipment to collect fumes. Atmospheric lead levels five hundred feet away from the plant exceeded allowable limits for occupational exposure. The BCHD got the company to move its lead reclamation operation to another plant with dust controls. It also required a newly built lead smelting operation to install filters. Charles Couchman and Wilmer Schulze, "Atmospheric Pollution Control Work of the Baltimore City Health Department," *Baltimore Health News*, May-June 1950, 35. In 1952, the BCHD also went to court over another new lead secondary lead smelter. Owned by the Hanover Metal Company, the building had been permitted as a "storage space" but was subsequently found to be smelting lead, with no protection for workers and significant contamination of air around the smelter. For the first time in its history, the BCHD issued a "immediate closure notice." When the plant continued operating, it was summoned to court and fined. BCHD, *Annual*, 1952, 283. "$100 Fine Levied for Lead Fumes," *Sun*, August 19, 1953, 36. This was a different new secondary smelter than the one listed above (it was permitted in 1951).
[9] "Air Pollution Control Ordinance" (City Ordinance No. 358), BCHD, *Annual*, 1956, 206, 334-335.
[10] Williams also listed two other problems for public health: getting adequate salaries for public health nursing staff and getting more appropriations for the BCHD. "Public Health Affairs Summary – 1959," (a survey that Williams had filled out). Folder Mental Health, Box 3.6 Other Health Problems, Series III, GHW Papers, AMCM Archives.

was caused by smoking, and so he thought smoking prevention should get more attention than air pollution.[11] Williams saw air pollution as an important problem, but he believed it the BCHD had it under control, even while some city council members accused the department of taking a "passive, lackadaisical approach" to air pollution.[12]

In terms of official discussion of air pollution and official practice, concern about vehicular air pollution was virtually absent in the 1940s and 1950s.[13] None of the nuisance abatements in this period were directed at automobiles. The wording of the Air Pollution Control ordinance did not specify that it was intended only for industrial pollution, and its broad inclusion of "people" and "mobile" sources made it applicable to automobiles. But there is no evidence that it was used for vehicular pollution control, and discussions of the ordinance suggested the BCHD considered it an ordinance aimed at industry.[14]

Outside of Baltimore's official discussion and practices, however, there was growing concern about vehicular air pollution in the 1950s. The study of Donora had included estimates of the carbon monoxide given off from automobiles, and the contribution of automobiles to air pollution in Donora was mentioned in the *Sun*.[15] There were other media mentions of vehicular air pollution, including a discussion of leaded gasoline pollution in Paris.[16] But it was air pollution problems in Los Angeles that drew the most attention to automobiles. Beginning in 1943, Los Angeles experienced a series of

---

[11] "A Statement by the Commissioner of Health of Baltimore City on the Significance of Atmospheric Pollution," May 17, 1960, Folder Preventative Medicine 1958-1959, Box 3.6 Other Health Problems, Series III, GHW Papers, AMCM Archives. Specifically, Williams mentioned benzpyrene, a produce of automobile exhaust, as a potential carcinogen.

[12] "Mayor Bars Joint Smoke-Fume Plan," *Sun*, June 3, 1952, 38. The city council Health Committee also argued that the smoke control and noxious fumes programs of the DPW and BCHD respectively, out to be consolidated into a single air pollution bureau. Both the BCHD and DPW opposed that plan, as did Abel Wolman, the famous sanitary engineer then at Johns Hopkins.

[13] Once exception was a 1953 statement from the BCHD's supervisor of air pollution control notingthat air pollution was primarily the result of "heavy industrial growth," but that it was also caused by heating units and "automobile exhaust gases." "Mr. F.C. Hettinger Becomes Supervisor for Air Pollution Control," *Baltimore Health News*, December, 1953, 163.

[14] "Air Pollution Control Ordinance" (City Ordinance No. 358), BCHD, *Annual*, 1956, 206, 334-335.

[15] "Donora Smog Made 6,000 Ill U.S. Finds – Recurrence Feared," *Sun*, October 14, 1949, 1.

[16] A correspondent in Paris reported on that city's air pollution problems, which public health officials there described as slowly suffocating its residents to death. "The most dangerous factor in this polluted atmosphere," the correspondent wrote, is that the air was "laced with that very toxic gas, tetraethyl lead." Joan Graham, "But the More Paris Changes…" *Sun*, October 12, 1952, 19. Another mention of motor vehicles as an important source of air pollution in the media was, Carroll Williams, "City-Problems Group Urged," *Sun*, May 26, 1953, 09.

malignant smogs.[17] In the mid- to late 1950s, studies in Los Angeles found that automobiles were the biggest contributors to many types of air pollution in that city.[18] In 1958, the surgeon general stated that air pollution principally associated with automobiles had shown a "definite association" with cancer. The American Association for the Advancement of Science blamed most air pollution on automobiles and trucks.[19] Experts concerned about air pollution suggested a variety of solutions, including pollution control technology, regulation, metropolitan planning and studies.

Johns Hopkins physicist Francois Frenkiel was an important contributor to research on motor vehicle pollution. His research showed that automobiles were the biggest source of air pollution in Los Angeles. As far as controlling automobile pollution, Frenkiel argued for technological changes in fuel, exhaust and engine systems. He also suggested investigating driver behavior and public transportation options. And he suggested that "an extensive use of expressways and roads without traffic lights would greatly reduce the contribution of motorcars to over-all urban pollution." The latter recommendation was based on his research that showed that automobiles emitted more hydrocarbons when idling or decelerating. Higher constant speeds would burn more hydrocarbons although this benefit, Frenkiel noted, could be offset by the increased nitrogen dioxide created by burning hydrocarbons.[20]

Frenkiel's study, and his suggestions, including reduction in stop-and-go traffic were reported in the *Sun* among many other papers in 1958.[21] Other studies of automobile pollution from the 1950s and 1960s also suggested that traffic congestion amplified dangerous motor vehicle emissions (and the reverse, that higher speeds or free flowing traffic decreased emissions).[22] These claims subsequently

---

[17] K. C. Heidorn, "A Chronology of Important Events in the History of Air Pollution Meteorology to 1970," *Bulletin of the American Meteorological Society* 59, no. 12 (1978): 1589–1597.
[18] Ben Price, "Air We Shouldn't Breathe," *Sun*, March 11, 1956, FW3.
[19] "Air Pollution, Cancer Link Cited By Surgeon General," *Sun* November 9, 1958, 1.
[20] Francois Frenkiel, *Atmospheric Pollution in Growing Communities* (Washington, DC: Smithsonian Institution, 1957), in Folder Air Pollution, Box 11.4, Series 11, AW Papers, MESC.
[21] James MacNees, "Zoning Asked in Pollution," *Sun*, March 19, 1958, 11; "Air Zoning is Urged to Curb Pollution," *New York Times*, March 19, 1958, 33; "City of Future Must End Pollution, Doctor Says in Smithsonian Study," *Cincinnati Enquirer*, March 23, 1958, 15; "Doctors Fear Car Exhaust," *Sun*, December 30, 1963, 5.
[22] Arie J. Haagen-Smit, "Smog Control," *Engineering and Science* 26, no. 2 (1962): 9–14; A. H. Rose et al., "Comparison of Auto Exhaust Emissions in Two Major Cities," *Journal of the Air Pollution Control Association* 15, no. 8 (August 1, 1965): 362–66.

became part of the way that the state and federal governments justified the massive expansion of interstate highways in an age when pollution from automobiles was also a rising concern.

Interstates and Transportation Planning

By the time Frenkiel's ideas about expressways and vehicular pollution were carried in the papers, the Jones Falls Expressway had been approved by Baltimore city council and was set to work its way into the heart of the city from the suburban valleys to the north. For the state, the expressway promised to help with through traffic. For the city, the expressway promised what neither mass transit nor traffic control seemed to be accomplishing: relief from congestion. In the late 1950s, the engineer Alan Voorhees pioneered the "gravity model" of transportation modeling, which used the pull of certain factors (number of jobs in an area, malls, etc.) and the distance (in travel time) to estimate how much and where intra-metropolitan travel would flow.[23] Based on this gravity model, which was subsequently widely-used and refined in other cities, Baltimore's Department of Transit and Traffic concluded in 1959 that "transit services, no matter how extensive, cannot be considered a substitute for highway improvements. Nor will they drastically reduce highway building requirements."[24] In the same year, the Baltimore Regional Council reported that conventional streets in Baltimore could accommodate about 1,000 vehicles per lane per hour under "favorable conditions." Signal equipment, one-way streets and the elimination of curbside parking helped create favorable conditions. But it did not come close to yielding the capacity required to accommodate traffic in the city. In comparison, freeways could handle 1,500-1,700 vehicles per hour per lane and could have many more lanes, accommodating up to 50,000-100,000 vehicles per day or more.[25] Studies like these whipped up support for expressways despite the tepid feelings of engineers like Barnes and Wolman.

The Baltimore city council had passed various legislation and bonds necessary for the Jones Falls Expressway in the early 1950s, but the project got a major shot in the arm after the passage of the 1956

[23] Edward Weiner, *Urban Transportation Planning in the United States: History, Policy, and Practice* (Springer Science & Business Media, 2012), 27.
[24] Booth and Morris, "Transit vs. Auto Travel in the Future," 95.
[25] Baltimore Regional Planning Council, *Freeway Plan* (Maryland State Planning Commission, May 1959), 11, MR, Pratt.

Interstate Highway Act. This act had its roots in some of the concerns of traffic congestion that arose during World War II, as well as the Cold War that emerged afterwards. On a deeper level, this act tapped a pre-WWII hope for a national system of highways. In some ways, this system was already under way. But the proposed interstate system was much larger – ultimately the largest public works program in world history – and was to be funded primarily by the federal government. Funding such a massive program was not cheap and therefore politically challenging. Before 1956, Congress had passed several other highway packages, but these had not offered enough money to entice states to build much. More expansive federal funding had failed to pass. The 1956 bill created a national highway trust, based on gasoline taxes and various excise taxes on automobile-related goods. It spread the costs around and, because it was pay-as-you-go, did not add to the debt. As it turned out, it was Baltimore's Congressman, George Fallon who played a key role in the passage of the bill, grinding away at iterations of legislation to try to get the balance of interests right so that everybody paid enough tax to fund the program, but nobody felt they were being unfairly burdened.[26]

The Jones Falls Expressway benefited from this new funding and was completed quickly, in 1962. Baltimore planners and politicians then set their eyes on another expressway that would run from east to west. However, unlike the Jones Falls Expressway, which had run along the floodplain of the Jones Falls through largely non-residential areas, an east-west expressway, whatever its particular route, would necessarily buzzsaw through multiple neighborhoods. This made the east-west expressway a source of opportunity for some planners and protest for many residents.

Cure or Cause Part I: Traffic, Blight, Slums and Expressways

Through much of the post-war decades, especially the 1940s to the 1960s, city planners and traffic engineers held the dual view that heavy traffic could cause blight and slums, but that road building, especially expressways, could mitigate or eliminate blight and slums. The relationship between heavy traffic and blight was quite old, going back to early 1900s, as discussed previously, when people argued

[26] Tom Lewis, *Divided Highways: Building the Interstate Highways, Transforming American Life* (Cornell University Press, 2013), 116–21.

that automobile noise, fumes and traffic hazards drove people out of the city and devalued property. As the city became increasingly worried about "blight" during the depression and World War II, traffic became one of the common explanations and predictors of blight (Figure 59). As Wolman's Committee on Mass Transportation put it in 1955, "it is undeniable that heavy traffic deteriorates the abutting area" and "accelerates therefore the flight to the suburbs."[27] When the Citizens Planning and Housing Association was working in the Pilot Area in the 1950s, they asked residents why people had moved away from the area and what the cause of housing deterioration was. The residents mentioned landlords who milked properties, but also "noisy, dangerous traffic," "fumes" and other environmental disamenities.[28] Likewise, in the Harlem Park urban renewal area, the city noted the decline of the neighborhood went along with "a steady increase in automobile traffic with its accompanying noise, smell and danger."[29]

The synergies of automobile traffic and housing deterioration compounded environmental health inequalities, including lead exposure. Declining property values caused landlords to disinvest in housing, exacerbating lead paint problems. Declining property values also resulted in a shift toward lower-income housing. Thus lower-income people came to be clustered along many streets with heavy residential traffic, disproportionately exposing them to lead in air pollution and the subsequent contamination of soil near roads. Heavy traffic continued to whip up this contaminated soil and dust, which made its way into the homes, mouths and lungs of nearby residents. Some of the traffic was so heavy that it literally shook the plaster and paint off the walls. And children living in these areas, which also tended to be areas with a dearth of parks and recreational opportunities, ended up playing in yards also abutting congested streets,

---

[27] Committee on Mass Transportation, *Report to the Mayor of Baltimore* (1955), Folder 2, Box 20, Series X, GBC Records, LLSC.
[28] Frances Morton (CPHA), "Shifting Neighborhoods: Their Challenge to Health, Welfare, Educational and Church Agencies," May 1, 1957, Folder 7, Box 5, Series XIII, GBC Records, LLSC.
[29] BURHA, "Harlem Park: Its People and Their Homes," 1959, Series XIII, GBC Records, LLSC.

if not in the streets themselves. They were therefore exposed to high amounts of lead in soil and air as they played.[30]

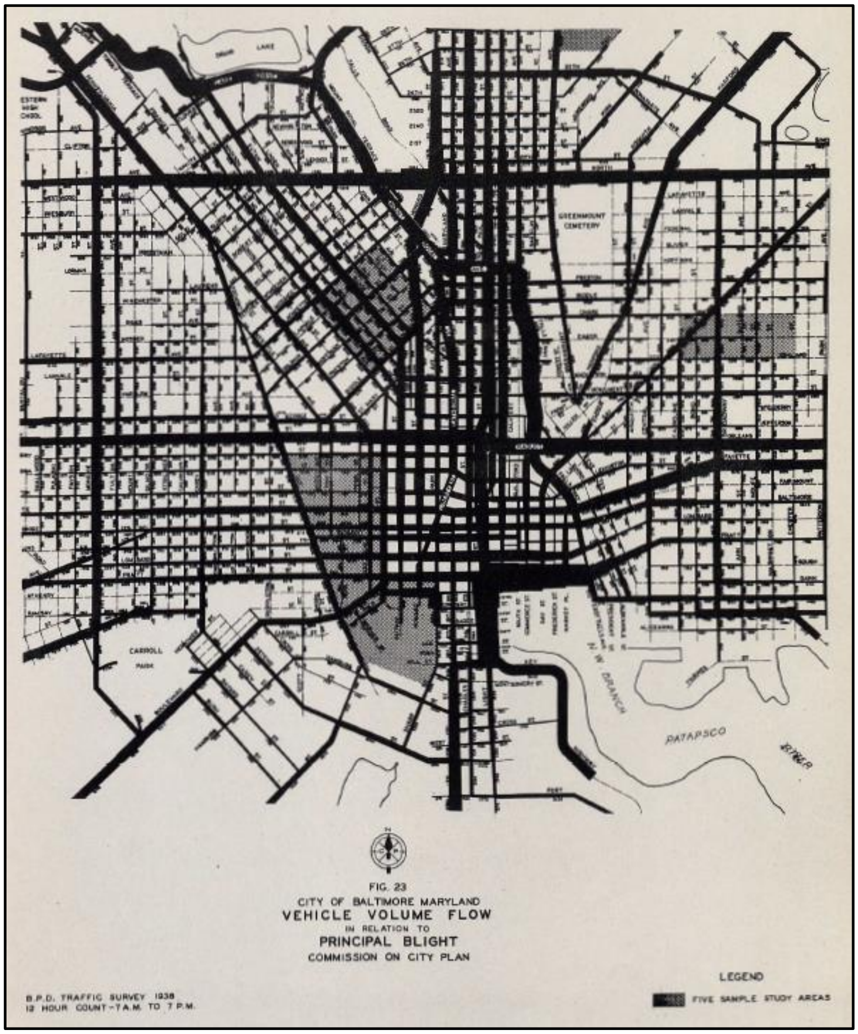


Figure 59: A map showing traffic volume, represented as varying street thickness, and blight, represented as grey areas on the map. Members of the Baltimore Commission on the City Plan, like many other planners and engineers from the 1930s on, associated heavy traffic and traffic congestion with blight. As traffic disamenities drove down property prices, it attracted low-rent housing. This magnified environmental inequality. Not only did this housing often have deteriorating lead paint, it was situated closer to sources of lead air pollution from traffic. **Source:** Commission on City Plan, *Redevelopment of Blighted Residential Areas in Baltimore; Conditions of Blight, Some Remedies and Their Relative Costs* (Baltimore, 1945).

For some experts and politicians, expressways offered a promise to deal with blight and slums. If heavy traffic in residential areas caused blight and slums, one solution, Baltimore's city engineer, Nathan

[30] As noted in the previous chapter, many residents near roads with heavy traffic complained of dust. For another example, see Interview with Nellie Roberts, Stone Hill in Hampden Collection, LLSC, in which she described having to wipe the stairs of her home down every day because it was so dusty from the traffic and nearby mill. For accounts of heavy traffic knocking paint and plaster off the walls, see Martin Millspaugh and Vivian Gurney Breckenfeld, *The Human Side of Urban Renewal: A Study of the Attitude Changes, Produced by Neighborhood Rehabilitation* (Fight-Blight, 1958), 20; Nolan to Barnes, January 25, 1954, Folder Dept. of Transit and Traffic, Commissioner Henry Barnes (2), Box 303, Series 23, BRG 9, BC Archives.

L. Smith, argued, was the construction of expressways that would provide the "initial step in their [slum areas] rehabilitation by separating through traffic from local movement and allowing both to flow with greater freedom."[31]

Far more common than Smith's idea, however, was the expressway's capacity for creative destruction. Before large-scale urban redevelopment schemes got under way, expressways provided an early hope for radically reconstructing the city. Robert Moses's 1944 committee on the east-west expressway stressed the possibilities of slum clearance. Downtown business associations (Figure 60) and the Real Estate Board favored the expressway in part for its promise to clear slums that were "a disgrace and a public health menace." The mayor and several engineering consultants in the city also argued that "an expressway through the city will clear slums, stabilize and probably increase property," according to the *Sun*, and would, in the words of the mayor, "improve the opportunity for private builders to develop communities where the advantages of suburban life may be enjoyed."[32]

[31] The city engineer was Nathan L. Smith. "Smith Calls Expressway Aid to Slums," *Sun*, January 8, 1947, 28.
[32] "Expressway Report Made," *Sun*, October 11, 1944, 11; "Appeals Made for Freeway," *Sun*, March 11, 1945, 11; "Mayor Urges Construction of Freeway," *Sun*, March 12, 1945, 18, 11. Similarly, the chief engineer for Baltimore, Nathan Smith, argued the expressway would be an aid to rehabilitating slum areas, by which he meant they would

Figure 60: An advertisement by the Downtown Committee, a merchant business association, in favor of Robert Moses's plan for an east-west expressway in Baltimore. The advertisement, as well as Moses himself, stressed expressway building as a way to clear slums. **Source:** *Sun*, March 5, 1945, 7.

Slum clearance was a fixture of the purported benefits of expressway building in Baltimore and in other cities through much of the 1950s until reactions against displacement by urban renewal and highway building cut in to the breathless celebration of what amounted to kicking people out of their homes and dismantling communities.[33] Slum clearance was often presented as a rational planning calculation (cheap land, expendable land and, although it was not often stated, politically vulnerable land) rather than an end in itself. The justification of expressway building for slum clearance did not disappear, but was joined by another justification , with echoes of Nathan L. Smith, that expressways, by reducing traffic congestion, could reduce blight. “Almost all streets of importance in the inner city area and many elsewhere suffer to a degree [from large volumes of traffic],” the city’s commission on the east-west

[33] On the benefits of expressways for slum clearance, see especially pages 98-104, but many other parts as well, of Rose and Mohl, *Interstate*. In Baltimore, the Redevelopment Commission applauded the slum clearance that would result from the extension of the Baltimore-Washington Expressway because it would offer opportunities for business. “City Expressway Change Is Hailed,” *Sun*, April 22, 1956, 39.

expressway wrote in 1960. “Expressways can provide at least a partial answer to this problem by allowing a large volume of traffic to be taken off surface streets having close proximity to residential structures.”[34]

Expressway building, and the threat of expressway building, however, was much more likely to cause “blight” than cure it. In the 1960s and 1970s the prolonged specter of an east-west expressway in Baltimore was corrosive to housing maintenance and property values. Opponents of expressway building argued that residents of houses in the path of demolition could not get repair permits and the courts did not require landlords to maintain property because “there is a ‘chance’ the road will be there within two years.” Tenants did not know their rights and did not know if landlords were selling, one citizen group stated, adding, “Meanwhile, neighborhoods run down, those that can afford it run off to the country, and the tax base runs out.”[35] These charges seem to have been born out. In 1964, the city sought to raze 450 “slum” houses that had, according to the *Sun*, been “deteriorating for years under the threat of city acquisition for future expressway construction.”[36] In 1967, according to a *Sun* reporter, Rosemont, “a middle class black community in west Baltimore was torn asunder by the 1967 highway condemnation line which took 590 dwellings (90 percent of which were classified as ‘sound’) and 68 businesses.” Although protest killed the expressway plan, the prolonged nether world of condemnation left “15 blocks” of “dilapidated houses.”[37] Like heavy traffic in neighborhoods, therefore, the threat of expressways tended to exacerbate lead paint problems. But what of the effects of expressway building on automobile pollution?

---

[34] For continuing justification, see For example, “BURHA Changing the City’s Face,” *Sun*, July 23, 1967, 89. Baltimore Planning Commission, *Study for East-West Expressway* (Baltimore: The Commission, 1960), 23, Folder 3, Box 39, Series XIII, GBC Records, LLSC. Similarly, the BURHA stated that “excessive automobile traffic through residential neighborhoods impairs the livability of neighborhoods... the gridiron pattern of earlier street layouts is unsuited for today’s high speed, high volume traffic which leads to deterioration of residential environments.” BURHA, “Community Renewal Program,” [1966], in Folder 2, Box 10, Series XII, BCDP Records, LLSC.

[35] Movement Against Destruction, “Press Release,” May 26, 1969, Folder 144, Box 1, Series 3B, MAD Records, LLSC. MAD is described in more detail below.

[36] These houses were in three square blocks, with Fremont Avenue on the west and Myrtle Avenue on the east, Franklin Street on the north and Mulberry on the south. “Slum Razing Plan Pushed,” *Sun*, June 17, 1964, 12.

[37] Mark Reutter, “Before the City Council,” (unpublished chapter), Folder 113, Box 7, Series 7A, MAD Records, LLSC.

Cure or Cause Part II: Free Flowing Traffic and Fresh Air

According to their proponents, expressways would rein in automobile pollution. Following Frenkiel and other researchers, state highway departments and a variety of experts argued that stop-and-go traffic and low vehicle speeds produced more pollution. By reducing congestion and increasing vehicle speeds, the argument went, expressways would decrease pollution.[38] By 1970, leading politicians and bureaucrats in national transportation were broadcasting this argument. John Volpe, President Nixon's Secretary of Transportation, asserted that while automobiles produced serious air pollution, highways "in many cases [have] reduced pollution. Pollution is created mainly when you travel at 10 or 12 miles an hour, or you are standing still in long traffic lines, and is much less when you are traveling on a freeway at 50 or 60 miles an hour."[39] In hearings before congress on the interstate system, Francis Turner, the Federal Highway Administrator, claimed highway improvements reduced air pollution from automobiles by 4 to 10 times. The data "clearly indicated," Turner said, that "stop-and-go traffic could well produce greater quantities of pollutants than free flow traffic." So it was "reasonable to conclude that *any highway improvement programs, designed to promote faster free flow traffic*, should reduce air pollution."[40]

---

[38] Everyone will benefit from "the elimination of annoying traffic noise and gasoline fumes that resulted from stop-and-go driving," the California highway department wrote in 1963. "California Highways…1963," *California Highways and Public Works*, November-December 1963, 7, at archive.org/details/cvol4142alifornia196263hiwacalirich. For another state agency, see "The Interstate Story," *Illinois Highway Bulletin*, September-October 1970, 34. For discussions by experts, see among others Haagen-Smit, "Smog Control"; John R. Goldsmith and Lewis H. Rogers, "Health Hazards of Automobile Exhaust," *Public Health Reports* 74, no. 6 (June 1959): 551–58; Marshall I. Goldman, *Controlling Pollution: The Economics of a Cleaner America* (Prentice-Hall, 1967), 56; Milton Pikarsky, "Chicago's Crosstown Expressway: The Team Concept in Action," in *The Engineer and the City* (Washington, D.C.: National Academy of Engineering, 1969), 76. For discussions in the media, see Hal Foust, "See Economy Boost in Area Road Projects," *Chicago Tribune*, December 9, 1956, 46; "Multiple Offensive Needed to End Smog," *Los Angeles Times*, June 2, 1963, 221; "New Anti-Smog Approach Urged," *Holland Evening Sentinel*, March 9, 1967, 7; "Stop-And-Go Auto Traffic Adds to Pollution of Air," *News-Palladium*, May 22, 1968, 36. One article from Reno found that 84% of people thought stop-and-go traffic would create more fumes than freeway traffic. "2 Routes Mark Freeway Fight," *Nevada State Journal*, November 24, 1957, 1, 14.

[39] U.S. Congress, *Federal-Aid Highway Act 1970, Hearings Before the Subcommittee on Roads of the Committee on Public Works, House of Representatives, Ninety-First Congress, Second Session, on H.R. 16788 and Related Bills*, 1970, 948. See also *Benefits of Interstate Highways*.

[40] The emphasis was Turner's, who submitted written replies along with oral testimony. U.S. Congress, *Federal-Aid Highway Act 1970*, 995. Carbon monoxide emissions show a small increase again after 60 miles per hour in some studies. Volatile organic compounds also decline with increases in speed (with a small increase around 60 miles per hour). Nitrogen oxides emissions slightly decline with speed and then increase around 20 or 30 miles per hour. Transportation Research Board (National Research Council), *Expanding Metropolitan Highways: Implications for Air Quality and Energy Use -- Special Report 245* (Washington, D.C.: National Academy Press, 1995), 50–52.

The argument that expressways would reduce air pollution was fraught with problems, however. Turner presented evidence that emissions of hydrocarbons and carbon monoxide from a vehicle decreased as speeds increased. Subsequent research has upheld these claims. But he reported there was no data on nitrogen oxide emissions by speed, despite extant studies at the time showing that nitrogen oxide increased with vehicle speeds. Turner did, however, acknowledge that in theory, nitrogen oxides should increase with vehicle speeds. Turner also made no mention other pollutants, including lead. But by 1970 there were a number of papers that had shown that lead emissions increased with vehicle speed. Lead emissions were complicated, because lead collected in exhaust systems at low speeds. During acceleration or high speeds, collected lead particles could be blown out, meaning that automobiles could exhaust more lead than was contained in the gasoline that was burned. These were usually heavier particles that settled close to roadways. Overall, the studies on lead strongly suggested that expressway driving would not reduce lead emissions and might increase them.[41]

Even more of a problem for the expressway-as-pollution-control idea was the issue of generated traffic. If interstates made driving easier and more efficient by increasing speed of travel and decreasing congestion (as well as potentially expanding access), more people would drive. Even if this increased traffic did not lead to another round of congestion, which it almost always did, there would be more vehicles emitting pollutants, which could easily offset or overwhelm any pollution reductions that resulted from less congestion or low vehicle speeds. Turner presented data showing that emissions per hour for a road declined with greater speeds even if traffic volume increased. But this data did not attempt

---

Another study found declines in emissions with speed for CO, CO_2 and hydrocarbons, but increases with nitrogen oxides. Asif Faiz, Christopher S. Weaver, and Michael P. Walsh, *Air Pollution from Motor Vehicles: Standards and Technologies for Controlling Emissions* (World Bank Publications, 1996), 40.

[41] Articles showing that, in general, lead emissions increased with speed (or acceleration) or discussed these findings before 1970 included D. A. Hirschler et al., "Particulate Lead Compounds in Exhaust Gas," *Industrial & Engineering Chemistry* 49, no. 7 (1957): 1131–1142; D. A. Hirschler AB and L. F. Gilbert MS, "Nature of Lead in Automobile Exhaust Gas," *Archives of Environmental Health: An International Journal* 8, no. 2 (February 1, 1964): 297–313; P. Mueller et al., "Concentration of Fine Particles and Lead in Car Exhaust," in *Symposium on Air-Pollution Measurement Methods* (ASTM International, 1963); Joseph M. Colucci and Charles R. Begeman, "The Automotive Contribution to Air-Borne Polynuclear Aromatic Hydrocarbons in Detroit," *Journal of the Air Pollution Control Association* 15, no. 3 (March 1, 1965): 113–22; John R. Goldsmith and Lewis H. Rogers, "Health Hazards of Automobile Exhaust," *Public Health Reports* 74, no. 6 (June 1959): 551–58; P. R. Atkins, "Lead in a Suburban Environment," *Journal of the Air Pollution Control Association* 19, no. 8 (1969): 591–594.

to estimate increases in emissions based on realistic increases in traffic volume.[42] The problems with this line of reasoning did not go unnoticed. In hearings on Clean Air Act amendments, Senator Edmund Muskie noted that there were some "elementary" studies suggesting that freeways might reduce air pollution by "eliminating stop-and-go driving." Senator Joseph Clark, of Pennsylvania, responded that it might reduce pollution for a given automobile, "but if you get 100,000 automobiles that you didn't have before" the pollution might not be any better.[43] These and other arguments against the thesis that expressways reduced pollution became increasingly prominent in the 1960s and 1970s as citizen opposition to pollution, displacement and interstates became more powerful.

Protest and Pollution

Residents had opposed expressways in Baltimore since at least the 1940s. Residents opposed many of the small "expressways" that were devised in that period, and there was considerable opposition to the east-west expressway idea. Even the Jones Falls Expressway, which was primarily planned to run through non-residential areas, drew protest. In what would become a common refrain, residents cast the expressway as a boon to suburbanites and nothing more. At one meeting in 1955, a protester, Cornelia Gibbs, claimed that the members of the Greater Baltimore Committee, one of the main groups advocating the expressway, lived "in the county and are naturally interested in getting traffic to and from the suburban areas." In the city, Gibbs argued, the expressway would just create more slums and blight.[44]

Opposition to expressways grew over the years. Years of displacement in the name of urban redevelopment had inflamed African Americans and other affected urban groups. In the meantime, a robust, well-organized Civil Rights movement had developed with both the voices and the votes to make themselves heard. Many urban business people had become jaded to, if not disgusted by, the false promise of downtown revival via traffic engineering. More than any urban projects, interstate building

---

[42] Turner's evidence was based on Rose and Krostek, "Emission Factors," U. S. Department of Health, Education, and Welfare, National Air Pollution Control Administration, June 1969 (an unpublished report) and John Edward Baerwald and Institute of Traffic Engineers, *Traffic Engineering Handbook* (Institute of Traffic Engineers, 1965).
[43] U.S. Congress, *Air Pollution, 1967: Hearings, Ninetieth Congress, First Session* (U.S. Government Printing Office, 1967), 1343.
[44] "Expressway Plan Decried," *Sun*, January 14, 1955, 19. For another charge that expressway created slums, see "Expressways and Churches" (letter to editor), *Sun*, September 1, 1958, 8.

was vulnerable to broad-based resistance. Interstates were huge projects that inevitably passed through many different types of neighborhoods and affected many different social groups in the city. In addition to the linear obliteration interstates visited on the urban fabric as they wove through the city, interstates threatened to bring traffic danger and noise to nearby residents, as well as vehicular pollution, which had been rising in importance in the previous two decades. Finally, expensive interstate building was wedded to federal funding, which made these projects prime targets of the National Environmental Policy Act, a 1969 bill that required environmental review of any federally-assisted projects.[45]

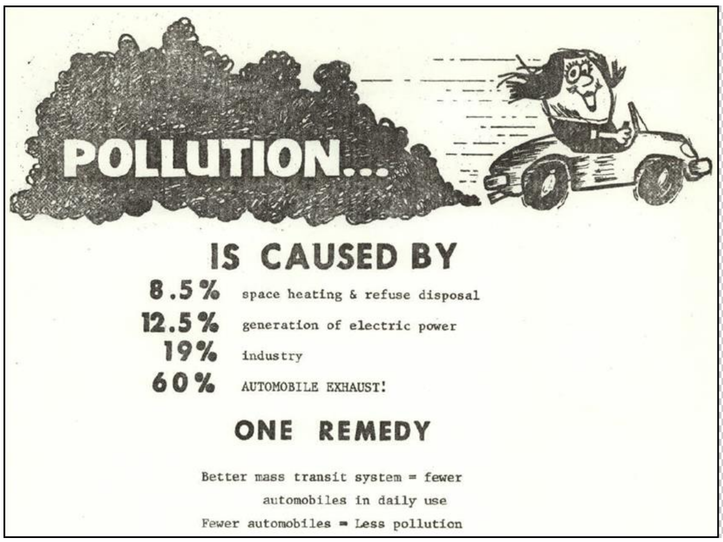
In Baltimore, opposition to expressway building coalesced into a powerful movement in the late 1960s in response to various plans that included the east-west expressway and an extension of the northern expressway (Jones Falls, I-83) through more of the city.[46] As federal funds revitalized the prospects of urban expressways and building seemed imminent, a number of existing citizen groups and residents came together across class and racial boundaries to defeat expressway plans. These groups included SCAR (Southeast Committee Against the Road) and what became the most vociferous group, MAD (Movement Against Destruction).[47]

Above all, MAD opposed the destruction of neighborhoods and the relocation of residents, but its most "violent opposition to the proposal" – the expressway plan – was "based upon the fact that the black and the poor are victimized by what is apparently a political rather than a technical decision." That victimization took the form of relocation and housing destruction, which created huge costs from displacement, loss of tax base and the creation of slums from overcrowding.[48]

---

[45] For the history of freeway revolts, see Rose and Mohl, *Interstate*.
[46] There are several good histories of this the expressway revolts in Baltimore, see Andrew M. Giguere, "'...and Never the Twain Shall meet:' Baltimore's East-West Expressway and the Construction of the 'Highway to Nowhere.'" (Ohio University, 2009); R. Gioielli, "'We Must Destroy You to Save You': Highway Construction and the City as a Modern Commons," *Radical History Review* 2011, no. 109 (December 29, 2010): 62–82.
[47] Among others, MAD included the Baltimore Tenants Union, Citizens for Fair Housing, Citizens Planning and Housing Agency, the League of Women Voters, the Maryland Lumber Company, and many churches, community action agencies, neighborhood action groups and neighborhood improvements associations. "Movement Against Destruction" membership list, Series XIII, GBC Records, LLSC.
[48] "Movement Against Destruction – Who We Are!" [1968] and "Expressway Conference Committee – Final Statement" (August 3, 1968), Series XIII, GBC Records, LLSC.

MAD also opposed expressways because they would increase air pollution and traffic noise. These objections became prominent, helped along by a cresting wave of environmental activism and legislation in 1970 that included Earth Day and the Clean Air Act. MAD and its allies were particularly concerned to highlight the increasing importance of vehicular pollution, including lead pollution. In an early meeting MAD members determined "there is a need to raise and emphasize the issue of auto air pollution, as well as that of industrial."[49] MAD formed alliances with a local environmental group, the Better Air Coalition, as well as the local chapter of the Sierra Club to build its knowledge and its case against vehicular air pollution. MAD sought to bring greater citizen participation in air pollution issues,[50] and the group celebrated the frequent jeremiads against air pollution at expressway hearings.[51]



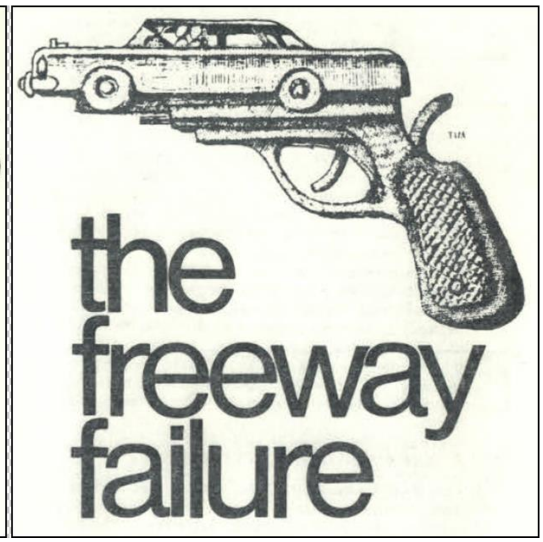


Figure 61: Graphics from a flyer (left) and a pamphlet (right) opposing the construction of expressways through Baltimore and other cities. These flyers emphasize the important role of automobiles in air pollution and the danger of that pollution. **Sources:** "Pollution" (flyer), Folder 10; and George Brown, "Freeway Failure" (Washington, DC: National Coalition on the Transportation Crisis, 1972), both in Box 2, Series I, Movement Against Destruction Records (hereafter, MAD), LLSC.

Expressway protesters developed a sophisticated understanding of the chemicals and technology involved in vehicular air pollution. Unlike most previous public crusades against smoke and noxious fumes from industry, MAD emphasized the dangers of carbon monoxide and lead. Ray Hepner, a physician at the University of Maryland, read a statement at the city council hearing in opposition to the

---

[49] MAD Minutes, January 5, 1969, Folder 5, Box 1, Series 1, MAD Records, LLSC.
[50] MAD Minutes, January 12, 1970 and February 9, 1970, January-June, both in Folder 6, Box 1, Series 1, MAD Records, LLSC.
[51] "Who Really Testified at the Hearings?" *MAD Newsletter*, August 1969, Folder 99, Box 1, Series 3, MAD Records, LLSC.

expressway in 1972. He argued that, in addition to smog, pollution from carbon monoxide and lead were serious dangers. These were not hypothetical problems, Hepner argued. Studies had already found that "children in inner cities often absorb enough [lead] to cause measurable biologic changes." No studies were needed to establish the fact that the health of the people living near expressways was in danger. The only question remaining, Hepner said, was about the concern of politicians for the "physical and mental health of their constituents and their children."[52] Another MAD report noted that lead exposure caused various problems, that there was no known role for lead in the body, and so "it can be assumed that any amount of lead in the body is a threat, and there is evidence that even small amounts cause damage especially to children, to the malnourished, to susceptible individuals, and to people who have been ordinarily exposed to greater amount s of lead anyway, in their work or home environment." Since "virtually all" of the lead pollution in air came from internal combustion engines, MAD noted, automobiles were a serious health hazard.[53] One graphic from a pamphlet distributed by various anti-expressway groups in the city featured a hybrid weapon consisting of a handgun grip and trigger with an automobile for a barrel. It was a powerful graphic, one that combined (perhaps unintentionally) the dual meanings of "lead poisoning": exposure to a toxic chemical and getting shot with a lead bullet. MAD members, however, were not purists about cars. In addition to flyers, MAD produced "Stop the Road" bumper stickers, and it urged its own members to buy unleaded gasoline. It was expressways – the subordination of city life to automobile traffic – that incensed MAD, not automobiles per se.[54]

Through the early 1970s, MAD and similar groups not only critiqued the politics of roads – which they saw as undemocratic and unjust – but also the scientific experts that government officials used to push and justify expressway building. Citizen groups critiqued scientific reports on methodological and logical grounds, cultivated citizen expertise, and drew on other government experts whose findings were

---

[52] Ray Hepner, "Medical Dangers of Expressways to Non-Users," Statement for City Council Expressway Hearings, January 27, 1972, Folder 102, Box 6, Series 6, MAD Records, LLSC.
[53] "The Internal Combustion Engine," (typewritten report), [no date], Folder 44, Box 8, Series 7B, MAD Records, LLSC.
[54] "The Polluted Air – Factsheet," (September 2, 1970), 2, Folder 71, Box 8, Series 7B, and "Stop the Road," (bumper sticker), Folder 19, Box 2, Series 3, both in MAD Records, LLSC.

useful to those opposing expressways.[55] Given the continuing argument by government agencies that expressways would ease pollution by reducing stop-and-go traffic, this was a frequent target of MAD and allied groups.[56] At a 1972 city council meeting, the Better Air Coalition, an ally of MAD, argued that, "rather than alleviating the air pollution problem, new freeway construction tends to accentuate the problem by increasing local levels of air pollution, and by encouraging further increases in traffic volume… [The] evidence clearly indicates that the air quality standards cannot be achieved without a major re-orientation of transportation strategy in Baltimore, from one based primarily on private automobiles to one based mainly on mass transportation."[57] MAD circulated reports that argued that technological pollution controls were not likely to help as well as had hoped, and that their effects were highly contextual. Anti-pollution devices designed for Los Angeles had increased pollutants in New York City's "stop-and-go" traffic, for example. And it was doubtful, MAD believed, that they would continue working in Los Angeles, given that the city's "high speed freeway" had "slowed to a crawl."[58]

Lead pollution was an important way in which MAD argued against the idea that expressways would reduce traffic pollution since lead emissions increased with traffic speed. In a memo to members, MAD provided citations that recent evidence, as of 1972, showed that carbon monoxide and hydrocarbons did not decline as much at higher speeds as had been supposed. In addition, nitrogen oxide

---

[55] For a discussion of how government expertise was undermined by conflicts within government between experts and the growing capacity of citizen expertise in the 1970s, see Brian Balogh, *Chain Reaction: Expert Debate and Public Participation in American Commercial Nuclear Power 1945-1975* (Cambridge University Press, 1991).
[56] For the continuing argument that expressways would reduce air pollution, see for example, U.S. Department of Transportation, Federal Highway Administration and Maryland Department of Transportation State Highway Administration, *Draft Environmental Statement: City Boulevard From Eutaw Street to Russell Street in Baltimore, Maryland* (December 1974), Box 12, Series VII, BCDP Records, LLSC.
[57] George Fisher of the Better Air Coalition, "Statement Regarding the Air Pollution Impact of Freeway Construction in Metropolitan Baltimore," January 27, 1972, Box 6, Folder 77, MAD Records, LLSC.
[58] "Alternatives to the Internal Combustion Engine," (typewritten report) [no date], Folder 44, Box 8, Series 7B, MAD Records, LLSC. The organization also used research from the Center for Science in the Public Interest, which publish a primer on air pollution that attacked the "myth that building expressways reduces pollution," pointing especially to increases in nitric oxide emissions with increases in speed. James Sullivan, "Highways and Air Pollution: A Citizen's Primer," (Washington, D.C.: Center for Science in the Public Interest, 1974), 39, Folder 11, Box 4, Series 5, MAD Records, LLSC. The Metropolitan Washington Coalition for Clean Air similarly attacked the D.C. Highway Department's argument that expressways would reduce air pollution, Daniel B. Fisher, "Air Pollution and Freeway Construction," Folder 28, Box 8, Series 7B; both in MAD Records, LLSC.

and lead emissions increased "greatly with increased speed." And any reductions in emissions from higher speeds would be completely overwhelmed by the increased traffic interstates would generate.[59]

MAD and other groups not only challenged government experts in the court of public opinion, they also blasted state and federal agencies with a fusillade of lawsuits drawing on the National Environmental Protection Act, the Clean Air Act and the Historic Preservation Act. Among other things, MAD challenged the Environmental Protection Agency's environmental impact statement for not including generated traffic from interstates in its estimation of air pollution impacts.[60] Although these lawsuits were not successful in court, they combined with public protest to kill east-west expressway plans in Baltimore. The government did build interstates through parts of Baltimore in the 1970s and after, primarily in the low-income neighborhoods, both white and black, in south Baltimore. Expressways crisscrossed other metropolitan areas as well, including cities where expressway protests were not successful or never occurred. As a result, many people were displaced and interstates piped huge volumes of automobiles through cities.[61]

Environmental Inequality and Environmental Regulation

The battle over the east-west expressway yielded considerable discussion about what we would now call environmental inequality and environmental justice. MAD and many others opposed to expressways saw them, and characterized them, as "gifts" to suburban commuters – gifts that caused urban residents considerable problems (Figure 62). As MAD's inaugural statement argued, "The proposed expressway proves to be of no benefit of the residents; but rather an expedient to facilitate the travel of

---

[59] Emissions control were also "now answer," according to MAD. What was necessary was a decrease in automobile use. "Memo from MAD: Some Environmental Impacts of Baltimore's Expressways," [1972], Folder 154, Box 1, Series 3, MAD Records, LLSC. Among MAD's literature was article Michael Schneiderman, Cal K. Cohn, and Glenn Paulson, "Air Pollution and Urban Freeways: Making a Record on Hazards to Health and Property," *Catholic University Law Review* 20 (1970): 5, with the following underlined: "emissions of oxides of nitrogen and lead increase with higher speeds" (page 10).

[60] MAD Minutes, November 11, 1974, Folder 10, Box 1, Series 1, MAD Records, LLSC. The EPA's study was done by Alan Voorhee's company. Among other things, the study argued that there was no evidence that lead pollution from the expressway would be serious health hazards, while acknowledging that there were not adequate epidemiological studies to state for certain that lead pollution was not a hazard. Alan M. Voorhees & Associates, *3A Highway System, Baltimore Regional Environmental Impact Study Technical Memoranda*, 1974.

[61] James Rubenstein and Robert Ferguson, "Baltimore Relocation Study," *Journal of Housing*, November 1978, 534–38; Rose and Mohl, *Interstate*.

suburbanites and to garner interstate highway funds that serve the needs of trucking and highway lobby interests."[62] At hearings, proponents were heckled with shouts of "Where do you live?"[63] Others made similar statements, dividing benefits and costs between the "city" or its residents and "suburbs" or "suburbanites."[64] MAD's private and public literature made frequent mention of suburban automobile commuters, the need for better mass transit and perhaps more radical approaches such as banning automobiles.[65] Others pointed to divisions within the city. Allan H. Marcus, a Johns Hopkins statistician and air pollution expert who assisted MAD in their campaign, argued that the "isolated bits and pieces of expressway and highways, built where community opposition is weakest, do not even make a transportation system for those lucky enough to have autos. And 30% of the households in Baltimore City do not own autos; this singularly heavily impacted population," Marcus argued, did not have access to mass transit. Marcus critiqued low estimates of air pollution from vehicles, the frequent suggestion that "smog alerts" could solve vehicle pollution problems and suggested investments in mass transit.[66]

---

[62] "Expressway Conference Committee – Final Statement" (August 3, 1968), Series XIII, GBC Records, LLSC.
[63] James Dilts, "A Brief History of Baltimore's Transportation Planning," Folder 49, Box 7, Series 7A, MAD Records, LLSC.
[64] The Baltimore League of Women Voters opposed the expressway and wondered why the city should pay the cost of transporting suburbanites to the city center. League of Women Voters, Statement for City Council Expressway Hearings, January 27, 1972, Series XIII, GBC Records, LLSC. Similarly, several merchant and street associations argued that the expressway was "clearly for the convenience of 9 to 5 suburbanite commuters," but the dangerous levels of air and noise pollution would be shouldered by the city. West Read Street Merchants Association, Tyson Street Association, Howard Read Association, Statement for City Council Expressway Hearings, January 27, 1972, Series XIII, GBC Records, LLSC.
[65] Among other places, see *MAD Newsletter*, August, October and November 1969, Folder 99, Box 1, Series 3, MAD Records, LLSC.
[66] Allan H. Marcus, "Comments on Alternative Transportation Strategies for the Baltimore Regional Air Quality Implementation Plan," February 28, 1973, Folder 5, Box 7, Series 6, MAD Records, LLSC.

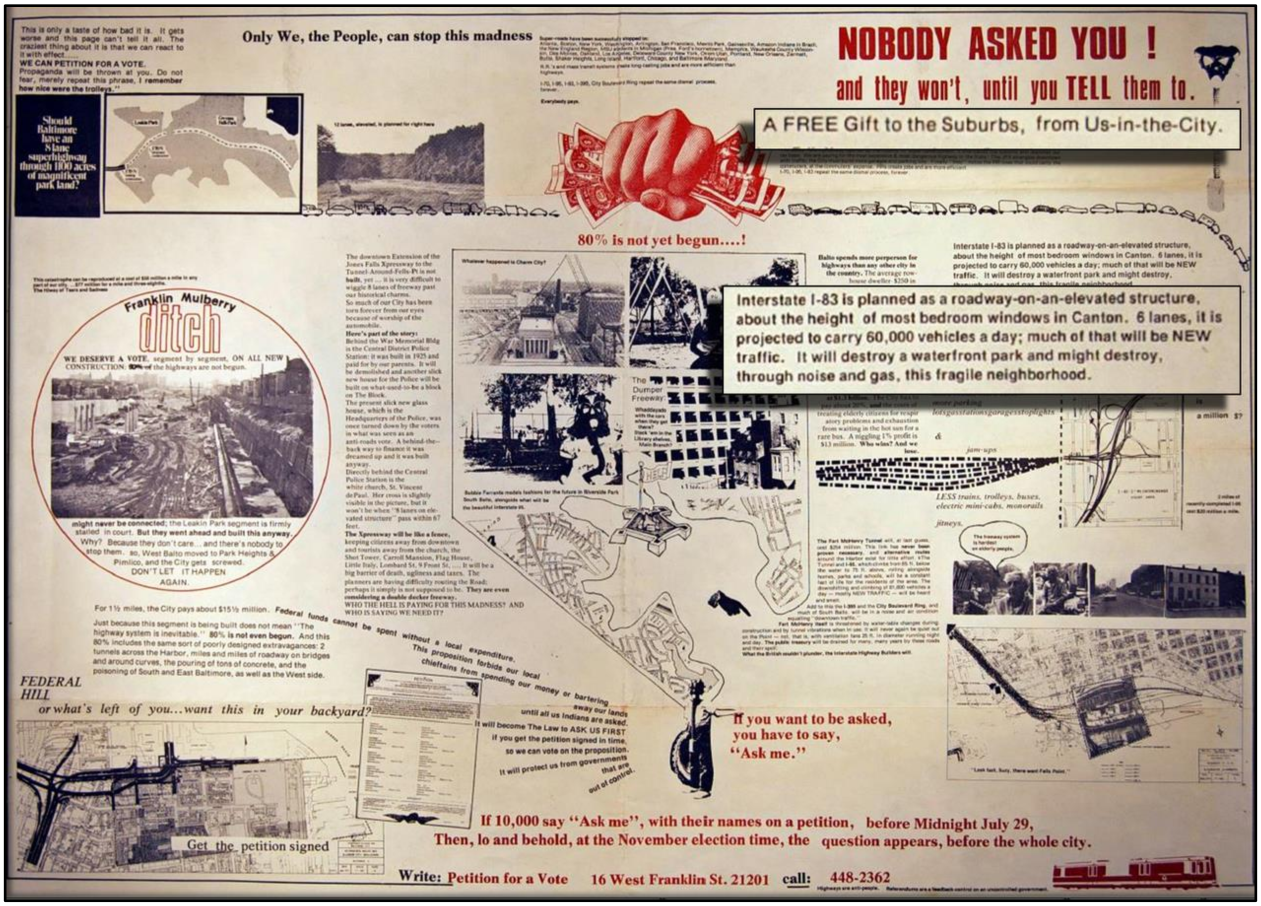


Figure 62: A flyer opposing the building of expressways through Baltimore's urban core circa 1970. The flyer shows the way MAD used powerful images and rhetoric to object to expressways on the basis of their costs to people in the city, including pollution and because they were seen as only benefiting suburbanites. At the top right, one line states "A FREE Gift to the Suburbs, from Us-in-the-City." At middle right, a paragraph states that noise and air pollution will be produced at window-height by interstates. Among other things, the flyer also features a resident wearing a gas mask (middle) and the swath of destruction created by interstate demolition (left). **Source:** "Nobody Asked You," (flyer), Folder 14, Box 2, Series I, MAD Records, LLSC.

Some limited concerns about environmental justice were even expressed by people working for the planning group, the Urban Design Concept Team, hired to develop the expressway. The team had hired Anthony Downs, a prolific and influential urban economist, to help analyze the political and economic issues with expressways. Downs's conclusion was that urban renewal and highway projects frequently entailed uncompensated costs. "Moreover," Downs wrote, "the heaviest burdens generated by such injustice tend to fall upon citizens least able to bear them because of their low incomes and generally restricted opportunities." Among other problems, "major expressways generate constant noise" and "higher levels of localized air pollution from exhaust fumes." Downs's analysis was a direct outcome of the Baltimore protests against expressways. Although Downs couched some of his language in terms of justice, he extended his concerns exclusively through the prism of property. He argued that the losses would be to property values and that compensation, which he strongly urged, would be to property owners. In the end, Downs's chief concern seems to have been about how to make large urban redevelopment plans politically acceptable, via compensation to property owners, rather concern about environmental injustice.[67]

In 1972, the EPA published its report on the environment in the inner city, which was followed by a congressional hearing on the subject. The report and hearing included considerable discussion of suburban commuting, expressways and lead hazards. James Sullivan, of the Center for Science in the Public Interest (Ralph Nader's group), presented evidence showing that areas of high carbon monoxide pollution overlapped considerably with poor areas in cities, including Baltimore. As Sullivan pointed out, carbon monoxide was a good proxy for many other pollutants, including lead (Figure 63).[68] The head of the EPA, William Rucklehaus, told congress that lead and carbon monoxide levels were highest near urban expressways.[69] Other studies showed that residents of the city center had higher blood lead levels than suburban and rural residents, and those living within 250 feet of expressways had higher blood lead levels than those living one mile away or more.[70]

---

[67] Anthony Downs, "Uncompensated Nonconstruction Costs Which Urban Highways and Urban Renewal Impose upon Residential Households," in *The Analysis of Public Output*, ed. Julies Margolis (NBER, 1970), 69–113. Downs discussed these issues more generally in Anthony Downs, *Neighborhoods and Urban Development* (Brookings Institution Press, 1981), 170.

[68] U.S. Congress, *The Inner City Environment and the Role of the Environmental Protection Agency: Hearing Before the Subcommittee on the Environment*, 1972, 25–30. Studies found that CO and lead had a correlation of about 0.72 to 0.88. These correlations were for long-term measurements, not short term, and the regression line equations were highly variable for different studies making it difficult to infer actual lead levels from the CO data on Baltimore. But it is clear that places with higher CO would also have been places with higher lead. R.M. Harrison and D.P.H. Laxen, *Lead Pollution: Causes and Control* (New York: Springer, 1981), 26–28.

[69] "Statement of Hon. William D. Rucklehaus," U.S. Congress, *The Inner City Environment*, 182.

[70] Ronald Engel, "Health Hazards of Environmental Lead" (Exhibit 9), in Ibid., 131–34.

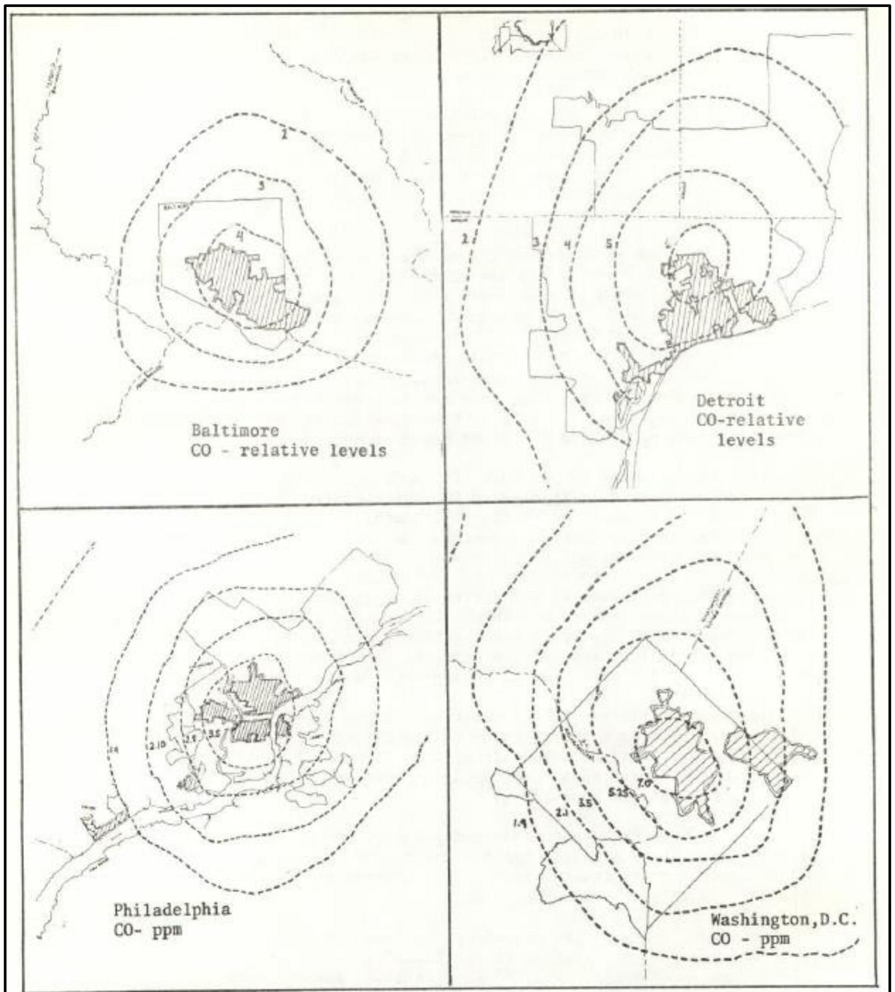


Figure 6. Carbon monoxide levels in poverty areas. Cross-hatched sectors are designated poverty areas by the Office of Economic Opportunity. Dashed lines represent pollutant concentrations either in absolute concentrations or in relative concentrations.

Figure 63: Maps of ambient carbon monoxide levels in relation to poverty in various cities. The maps showed that poor areas of cities generally suffered from the highest carbon monoxide pollution, which was overwhelmingly from automobiles. These maps can also serve as a proxy for lead air pollution, since lead and carbon monoxide levels were highly correlated. **Sources:** James Sullivan, "Highways and Air Pollution: A Citizen's Primer," (Washington, D.C.: Center for Science in the Public Interest, 1974), 39, 5-9 MAD Records, LLSC, reprinted in U.S. Congress, *The Inner City Environment and the Role of the Environmental Protection Agency: Hearing Before the Subcommittee on the Environment*, 1972, 25-30.

Concerns about environmental inequality in the city converged with a general concern about leaded gasoline that had been growing since the 1950s and accelerated in the 1960s as a result of scientific research. As early as the 1950s, the lead industry (and the scientists it funded) showed an intense interest in studying, and following studies, that attempted to ascertain the contribution of automobile pollution to atmospheric lead.[71] By this point, tetraethyl lead production was the biggest consumer of lead, with lead paint being surpassed by other kinds of paint. In the 1960s, the lead industry battled with non-industry scientists over the contribution of automobiles to lead pollution, the relationship of air lead to blood lead, and the effects of blood lead. Despite congressional hearings on leaded gasoline and increasing awareness, the lead industry was successful in keeping lead from becoming a regulated pollutant under federal legislation up and through the 1970 Clean Air Act. It also worked to counteract concerns at the local level, attending public health conferences and sending material to public health agencies, including the Baltimore City Health Department, which argued lead pollution from automobiles was not a serious public health hazard.[72]

In the early 1970s, the BCHD made no mention of leaded gasoline and despite an increasing acknowledgment of the role of automobiles in air pollution, it had little power to curb that source of pollution. Satisfied with progress on open burning and industrial emissions, the BCHD sought in 1970 to tackle the "largest contributor to pollution in urban areas – the automobile." The department initiated a program to inspect automobiles for "excessive exhaust fumes" and inform the owners of these automobiles of the problem. But this was a purely voluntary program. There was nothing illegal about operating automobiles with excessive exhaust and no way to compel owners to comply with the "notifications." And like its housing inspection programs, it was hamstrung by lack of capacity. It issued one or two dozen notices to private vehicle owners per month, and a lower number to commercial vehicles owners.[73]

---

[71] Jacob Cholak, "The Nature of Atmospheric Pollution in a Number of Industrial Communities," in *Proc. 2nd National Air Pollution Symposium*, 1952, 5–15; J. Cholak, L. J. Schafer, and T. D. Sterling, "The Lead Content of the Atmosphere," *Journal of the Air Pollution Control Association* 11, no. 6 (1961): 281–303.

[72] Markowitz and Rosner, *Lead Wars*. Don Fowler (LIA), "Lead in the Air," (typewritten release), May 26, 1965, Folder Lead Industry and Lead Industries Association 1948-1965, Box R125R2 Lead, Anna Baetjer Records, Alan Mason Chesney Medical Archives.

[73] At least initially, the BCHD saw the emission notification program as an "intermediary" step before proposed federal standards were approved and implemented. Robert Farber, Weekly Letter to the Mayor,' October 29, 1970, Folder Weekly Letters to the Mayor 1970, Box 1, Series VI, BRG 19 (Baltimore City Health Department Records), BC Archives. In the first two or three months of the program, it issued a total of 28 notices to private citizens and 23 notices to owners of commercial vehicles. BCHD, *Annual*, 1970, 74. In 1973, it sent notices to 217 and 91 owners of private and commercial vehicles, respectively. BCHD, *Annual*, 1973, 83.

Maryland took a much more aggressive approach to lead pollution from automobiles. In 1971, the state legislature passed a bill that limited the use of lead in gasoline to three grams as of 1972, and then lowered acceptable content to two grams in 1974 and 1 gram in 1976. The initial stricture was already met by 99% of vehicles operating in the state and the subsequent levels were "severely watered down" according to the bill's author, Victor Crawford, a Democrat from Montgomery County. Crawford had wanted to reduce lead content to one gram by 1973, a half gram by 1974 and zero grams by 1975. But the bill that passed was nevertheless a start on regulation. Maryland was first state to pass such legislation that progressively reduced lead content of gas.[74]

Soon after, the national government moved to regulate lead. The EPA's report and hearings on environmental inequality in the inner city helped nudge the federal government closer to action on lead by showing that many poor and minority groups were exposed to much higher levels of air lead pollution than the average person, and that these groups suffered from other sorts of exposure and malnutrition that would exacerbate the problems from lead.[75] Many experts who gave statements in the congressional hearings argued for a ban on lead in gas. In 1972, the EPA announced it would create rules to reduce lead in gasoline and in 1973 it created those rules. It had taken the national government an excruciatingly long time to formulate rules, and the rules phased out lead over a very long time. But between 1973 and 1990, leaded gasoline was finally removed from use in automobiles.

Conclusion

Automobile-based, commuter suburbanization multiplied the causes of inequality that many historians have documented in the post-war city such as racial discrimination, redlining and the imbalances between tax revenues and service costs in central cities and their surrounding suburban

---

[74] "Bill Is Enacted Restricting Use of Leaded Gas," *Sun*, April 4, 1971, 8; "State's New Pollution Laws Are Weak, But Inspire Hope," *Sun*, July 1, 1971, C20.

[75] The Center for Science in the Public Interest founded that the air pollution surrounding the poor was dangerous, sometimes exceeding federal air quality standards by "hundreds of percent." There were "rampant violations" of the Clean Air Act standards. Carbon monoxide concentrations sometimes reached 50 or even 100 ppm for "long periods." Compared to middle and upper class, there is a "consistent discriminatory pattern against the poor." U.S. Congress, *The Inner City Environment*, 24. Bertran Carnow and Virginia Carnow made a statement on airborne lead, in which they argued that poor, inner city families often lived next to expressways or other areas with high traffic use density, and that, in addition to this high level of exposure, they would be exposed to lead in dust and paint. Together, these sources could easily produce dangerous levels of lead in the body. Ibid., 282.

counties. In Baltimore and other cities in the post-war period, suburban commuters benefited from jobs in the city, reaped the relatively better environmental conditions of the suburbs, and externalized their automobile pollution onto residents in the inner city. Traffic flowed in and out of the city. But money flowed out while lead flowed in – into the city and into the bodies of children who lived there.

In addition, because noise, air pollution and hazards from vehicles were undesirable, heavy traffic and traffic congestion drove down property values. At the metropolitan level, this meant that heavy traffic in the city reduced housing values for people that lived there. This happened at the same time that African-American homeownership rates in cities greatly expanded. Thus automobiles allowed whites to buy valuable homes in the suburbs at the same time that those automobiles drove down home values in the city. Within the urban core, automobiles drove down values on houses that were close to heavily traveled or congested streets. As in other cases of housing devaluation, the result was often disinvestment in housing (contributing to lead paint hazards) and the filtration of lower-income groups into the housing along heavily traveled roads. Thus over time, the poor and African Americans (who were excluded from much of the more valuable housing) were concentrated along streets that emanated high levels of lead.

While planners argued that expressways would bring relief from traffic congestion, housing deterioration and traffic pollution, huge roads often had only limited, short-term effects on traffic congestion. And they often accelerated housing deterioration and traffic pollution. Residents who lived near expressways were subjected to high volumes of traffic and consequently high volumes of air pollution. Many studies showed that concentrations of lead in the air from exhaust and in the soil (where lead settled out of the air) were higher near expressways and heavy traffic. Children living close to these roads had higher blood lead levels. And despite the phase out of leaded gasoline in the 1970s and 1980s, soils in urban areas remained, and remain, tainted from past use of leaded gasoline. These soils continue to poison children.[76]

---

[76] Raphael J. Caprio, Harry L. Margulis, and Morris M. Joselow, "Residential Location, Ambient Air Lead Pollution And Lead Absorption In Children," *The Professional Geographer* 27, no. 1 (February 1, 1975): 37–42; H W Mielke et al., "Lead Concentrations in Inner-City Soils as a Factor in the Child Lead Problem.," *American Journal of Public Health* 73, no. 12 (December 1, 1983): 1366–69; Schwarz et al., "A Comparison of Three Empirically Based,

Spatially Explicit Predictive Models of Residential Soil Pb Concentrations in Baltimore, Maryland, USA"; Kirsten Schwarz, Richard V. Pouyat, and Ian Yesilonis, "Legacies of Lead in Charm City's Soil: Lessons from the Baltimore Ecosystem Study," *International Journal of Environmental Research and Public Health* 13, no. 2 (February 6, 2016): 209; Howard W. Mielke, Mark A. S. Laidlaw, and Chris Gonzales, "Lead (Pb) Legacy from Vehicle Traffic in Eight California Urbanized Areas: Continuing Influence of Lead Dust on Children's Health," *Science of The Total Environment* 408, no. 19 (September 1, 2010): 3965–75; Howard W. Mielke, Mark A. S. Laidlaw, and Chris R. Gonzales, "Estimation of Leaded (Pb) Gasoline's Continuing Material and Health Impacts on 90 US Urbanized Areas," *Environment International* 37, no. 1 (January 2011): 248–57.

Chapter 9 – Metropolitan Ecology and Exposure: Lead Hazards in Twentieth-Century Baltimore

At the turn of the twentieth century, the use of lead in production and its incorporation into a vast array of consumer products was already well under way. Over the next century, the applications of lead grew, changed and, in some cases, receded or were banned. But even when manufacturers, governments and buyers moved away from employing or consuming lead-related products, the hazardous legacy of those products remained in the environment. Lead was an element. Time did not change it into a less hazardous metal. The products and molecular compounds of lead could be transformed, but more often than not those transformations actually made lead more hazardous, as when lead paint deteriorated. Lead did move around in the environment, however, and it did so at different spatial and temporal scales. Lead particles emitted from automobile tail pipes fell to the ground, for example, where they were sometimes washed away, sometimes picked up by wind and spread through the air again. The movement of lead through the environment increased human exposure in some cases and decreased it in others. At all times, exposure was cumulative and there were virtually always multiple sources and routes of exposure operating, regardless of the time, place or social context.

In this chapter, I try to trace the major patterns of lead exposure in Baltimore with an eye toward seeing where there were important peaks from certain sources and important overlaps across multiple sources. In addition to surveying and grappling with the trends in lead exposure from the sources I have focused on so far - including paint, gasoline and industrial sources - in this chapter I delve into exposure from food. Food was an important source of lead exposure, but I did not focus on it earlier in part because it did not seem to have the strong spatial, metropolitan component of the others.[77]

[77] A more in-depth exploration of "supermarket redlining" and "food deserts" may reveal some spatial, metropolitan connections, however. See Elizabeth Eisenhauer, "In Poor Health: Supermarket Redlining and Urban Nutrition," *GeoJournal* 53, no. 2 (February 1, 2001): 125–33; Jarrett Thibodeaux, "A Historical Era of Food Deserts: Changes in the Correlates of Urban Supermarket Location, 1970–1990," *Social Currents* 3, no. 2 (June 1, 2016): 186–203; Julie Beaulac, Elizabeth Kristjansson, and Steven Cummins, "A Systematic Review of Food Deserts, 1966-2007," *Preventing Chronic Disease* 6, no. 3 (July 2009): A105; Manuel Franco et al., "Smoke before Food: A Tale of Baltimore City," *American Journal of Public Health* 97, no. 7 (2007): 1178–1178.

At the same time, I do not explore some sources of lead exposure discussed previously, in particular exposure to lead from burning battery casings. Despite the name it earned in the 1930s, lead exposure from this source was not just a "Depression Disease." Families continued to be poisoned in this way in Baltimore and other places beyond the 1930s, albeit not in the same numbers. The outbreak during the Great Depression was a serious health threat, and it was a significant event in the history of lead poisoning. But burning cases from lead batteries was not common enough to suggest that it was more than a sporadic contributor to lead exposure among a very small subset of the population (even the poor or African American population).

I also do not explore lead exposure through water. Water was a source of lead exposure in the city, but there is very little information on the extent of lead pipes used in the city over time, let alone concentrations of lead in water. Baltimoreans did use lead in water pipes. In 1849, James Wynne, chairman of the American Medical Association carried out a study of sanitary conditions in cities including Baltimore. In his discussion of Baltimore, he considered and rejected the idea that lead pipes would poison the population. Many other cities used lead pipes without problem, according to Wynne, and poisoning were probably the result of special circumstances.[78] In the nineteenth and early twentieth centuries, several lead manufacturers supplied the city with lead pipes, as noted in Chapter One. Four years later, the *Sun* reported several cases of fatal lead poisoning in a family drinking from a "long leaden pipe." But I could find no other reports of lead poisoning from water or pipes in the paper. The *Sun* carried occasional concerns about lead pipe (as well as reassurances that it was safe).[79] But discussion about lead pipes was sparse in the nineteenth century and even more sparse in the twentieth century until concerns about lead in general became more prominent in the 1970s. In the 1980s, the Baltimore City Health Department reported to the city council that city water had lead concentration of about 4 parts per

---

[78] James Wynne, *First Report of the Committee on Public Hygiene* (Philadelphia: T.K. and P.G. Collins, 1849), 563–65.
[79] "Local Matters," *Sun*, January 20, 1854, 1; "Effect of Lead on Water," *Sun*, December 1, 1863, 1; "Poison Aimed at Insects Getting Humans as Well," *Sun*, October 10, 1937, SH6;

billion (ppb), which is relatively low even by today's standards.[80] At the time, The EPA limit on lead in drinking water was 50 ppb. Today, the action level is 15 ppb, although some researchers have argued that 5 ppb should be a level of concern.[81] A large part of the reason for Baltimore's low lead levels in water is the low acidity of its water. Presumably this low acidity did not change over time, so it is likely that water was a minor contributor to lead levels in the city.[82]

Finally, I introduce climate as a variable that may have significantly modified lead hazards in the city over time. Recent research suggests that climate, particularly wind, can be quite important in exposing children to lead hazards via lead-contaminated, wind-blown dust and dirt. With wind, as with a number of other sources, my over-arching argument is that the 1950s were a time of exceptionally high lead hazards. Lead paint hazards probably peaked in this decade, for example. More generally, the period from 1945 to 1975 contained a density of overlapping lead hazards from various sources.

Food

Although food was one of the first sources health experts focused on in regard to child lead poisoning, it was dwarfed for much of the twentieth century by the emphasis on lead hazards from paint and gasoline. As government policies phased out lead paint and leaded gasoline, and as scientists began to study lead exposure in the general population (as opposed to people who were poisoned or at very high risk) in the 1970s, these scientists found food (including beverages other than water) to be the main source of lead exposure for children. The EPA estimated that food could account for 60% to 90% of the general population's lead intake.[83] Sources of lead in food included fertilizer made from sewage sludge, exhaust fumes falling on to gardens and crops, herbal remedies, pewter cups, leaded glass and lead glaze

[80] Susan Guarnieri (Commissioner of Health) to Anthony Ambridge (Councilman), September 9, 1985, Folder Lead Poisoning/Lead Paint, Box 855, Series 42, BRG 9, BC Archives.
[81] Alison Young, "How Much Lead in Water Poses an Imminent Threat," *USA Today*, March 17, 2016.
[82] However, the exposure could be greater under specific situations. For example, in the 1980s, the EPA found that many Maryland schools, including some in Baltimore City, had drinking fountains with lead parts, resulting in lead concentrations up to 50 ppb for some drinking water samples. Phillip Davis, "Schools Faulted on Efforts to Cut Lead Level in Water," *Sun*, November 7, 1990, 1E.
[83] Battelle Memorial Institute et al., *The Health and Environmental Impacts of Lead and an Assessment of a Need for Limitations* (EPA, 1979), iii; J. J. Chisolm and D. Barltrop, "Recognition and Management of Children with Increased Lead Absorption," *Archives of Disease in Childhood* 54, no. 4 (April 1979): 249–62.

used on ceramics.[84] In addition to atmospheric deposition, however, there were two sources of lead contamination in food that affected a very broad swath of the population: lead arsenate, an insecticide, and lead solder used in canned goods.

In the late nineteenth century, farmers, especially orchardists, began using lead arsenate as an insecticide. Maryland was both a large producer and consumer of lead arsenate. It had a large fruit industry, the products of which were often canned in Baltimore. Also in Baltimore were several producers of pesticides that made lead arsenate. Altogether, pesticide manufacturers in Maryland churned out about a million pounds of lead arsenate in 1919.[85] For the most part, the lead arsenate that Baltimoreans imbibed came from food produced outside the city, but people in the city also used lead arsenate to control pests on urban food gardens, trees, flower and other ornamental vegetation. Horticulturalists in the city, for example, blasted troublesome Japanese beetles with lead arsenate from the mid-1920s to the 1940s. During World War II, entomologists argued that it was safe for people who had treated their laws with lead arsenate to convert these lawns into "victory gardens" to help produce food on the home front.[86]

[84] Baltimoreans used lead glazed containers at least as far back as the early 1800s. Workers in the city produced lead glazes in the nineteenth and early twentieth century. In the twentieth-century, there was little regulation of leaded glazes until late in the century, but non-lead glazes replaced lead glazes over time and plastic and metal containers replaced some ceramics. The hazards from lead glazed containers depended on the age of the container, whether it was used with acidic foods and, above all, whether the glaze had been properly fired. In Baltimore, several outbreaks of lead poisoning resulted from poorly made lead glazed ceramics, resulting in the BCHD warning people of the dangers and, at times, recalling or banning certain manufacturers of lead glazed containers. One shipment of bowls made in Japan, for example, had lead chromate designs that came "right off in your fingers and into food," according to Huntington Williams in 1959. But only about twenty of these were sold in the city before the BCHD removed the remaining thousand from store shelves. Other places also recorded outbreaks of poisoning from lead glazed containers, but these outbreaks were sporadic. Scott E. Simmons and Housing and Urban Development Department, *An Investigation of the Archaeological Resources Associated with Piers 5 and 6 and the Harrison's at Pier 5 Complex (18BC62 & 18BC63) Baltimore, Maryland*, Baltimore Center for Urban Archaeology Research Series 1 (Baltimore, MD: Baltimore Center for Urban Archaeology, 1990). Huntington Williams to Richard Russo (Poison Control Service), January 30, 1959, Folder Lead Paint Cases 1951-1959, Box 3.3-3.4, Series III, GHW Papers, AMCM Archives. On other outbreaks, see Jane S. Lin-Fu, "Modern History of Lead Poisoning: A Century of Discovery and Rediscovery," in *Human Lead Exposure*, 1992, 23–43.

[85] *Fourteenth Census of the United States Taken in the Year 1920* (U.S. Government Printing Office, 1923), 639.

[86] Advertisements in the *Sun* for lead arsenate commanded "It's your duty to fight these JAPS, now!" The merging of racist and exterminatory rhetoric with metaphors about war, invasion and pests was common during World War II. "Japanese Beetle War is Explained," *Sun*, July 20, 1935, 18; "Jap Beetle Killers" (advertisement), *Sun*, August 7, 1942, 5; "Canning Promoted," *Sun*, April 18, 1943, CS19; Walter Ernest Fleming and United States Agricultural Research Service, *Integrating Control of the Japanese Beetle: A Historical Review* (U.S. Dept. of Agriculture, Agricultural Research Service, 1976), 7–8. For a comprehensive account of the metaphorical, institutional and economic connections between chemical use in warfare and in agriculture, see Edmund Russell, *War and Nature:*

Little was done locally to mitigate lead exposure from pesticides until well into the 1930s. Although there were poisonings and controversy over the use of lead arsenate and other pesticides, the U.S. government, did not set limits on lead residues from pesticides until the 1930s. Even then, the limits reflected what regulators saw as economically feasible for pesticide manufacturers and farmers rather than what was safe for ingestion.[87] In the 1930s, Maryland developed laws requiring licensing of pesticide dealers and testing of fruits and vegetables.[88] The BCHD began warning about, and testing for, pesticide spray residues on food in the early 1930s. But the BCHD found little evidence of contamination, at least by the standards of the time.[89] In the 1940s, the FDA adopted seven micrograms of lead residue per gram of food as a tolerance level.[90] But by this time, lead arsenate use was already in steep decline as a result of increasing use of DDT (Figure 64). Still, lead arsenate used continued into the 1960s in many states, including Maryland, where experts still suggested it for a number of different pests. After the 1960s, lead arsenate use declined even more, the EPA did not re-register it, and the agency fully banned the substance in 1988.[91] However, lead arsenate residues remain in soils decades after farmers and horticulturalists stop using them. They have continued to be potential source of lead exposure for residents living on areas that used to be orchards and in food that is produced in orchards that previously used lead arsenate.[92]

Fighting Humans and Insects with Chemicals from World War I to Silent Spring (Cambridge University Press, 2001).

[87] Thomas Dunlap, *DDT: Scientists, Citizens, and Public Policy* (Princeton University Press, 2014), 39–55; Frederick Rowe Davis, *Banned: A History of Pesticides and the Science of Toxicology* (Yale University Press, 2014), 4–13.

[88] "Stricter Control of Poison Urged," *Sun*, December 11, 1938, 17.

[89] BCHD, *Annual*, 1930, 71; BCHD, *Annual*, 1932, 24. The BCHD found a "negligible amount" of fruits and vegetables with excessive arsenic and lead residue in 1936: BCHD, *Annual*, 1936, 39. It seized and destroyed cabbage with spray residue in 1939: BCHD, *Annual*, 1939, 46. In other years, it recorded no cases of excessive residues: BCHD, *Annual*, 1941, 42; BCHD, *Annual*, 1943, 215. On the other hand, the BCHD recorded a number of cases of lead poisoning in workers who manufactured pesticides in the 1930s and 1940s.

[90] National Research Council, *Lead in the Human Environment: A Report* (National Academies of Science, 1980), 492.

[91] For the history of the use of lead arsenate, see Francis J. Peryea, "Historical Use of Lead Arsenate Insecticides, Resulting Soil Contamination and Implications for Soil Remediation," in *16th World Congress of Soil Science, Montpellier, France,* 1998, 20–26. For Maryland and the Baltimore area, see: "Your Dog: A Fighter to the Death," *Sun*, April 19, 1953, A7; "Caterpilloried Area is Advised," *Sun*, May 10, 1955, 36; "Leaf Bug Harms Tree," *Sun*, March 25, 1956, A21; "Spraying Garden Pests," *Sun*, April 12, 1959, SG13; "The Tent Caterpillar and Its Control," *Sun*, April 9, 1961, SG21; "Bagworm Spray," *Sun*, April 8, 1962, SG9.

[92] Ernie Hood, "The Apple Bites Back: Claiming Old Orchards for Residential Development," *Environmental Health Perspectives* 114, no. 8 (August 2006): A470–76.

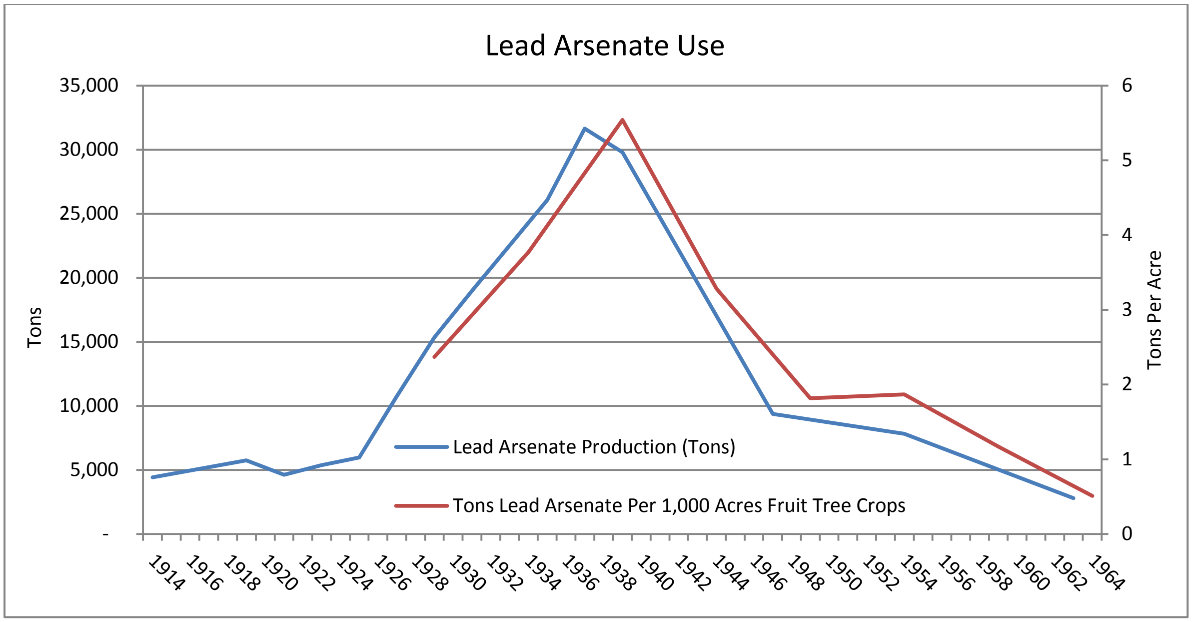


Figure 64: Production of lead arsenate in the United States in relation to acreage of fruit trees where the pesticide was primarily used. As the graph shows, lead arsenate production peaked in the 1930s before being replaced by DDT in the 1940s. Similarly, the amount of lead arsenate per acre of fruit trees, an approximation of the intensity of use, peaked at a similar time. **Sources:** *U.S. Census of Manufactures* and *U.S. Census of Agriculture* various years. **Graph:** Leif Fredrickson.

Another important source of lead in food came from lead alloys used in canned foods, especially the solder used to join and seal these cans.[93] Lead could get into canned food at just about any step in the process of growing and processing food, but solder was the most important source of lead. When in contact with the contents of the can, the lead from solder leached into the food. The longer it was in contact with food, the more acidic the food, and the more surface area of solder, the higher the lead content of the food was likely to be. Three-piece cans, the industry standard for most of the twentieth-century, used solder to seal the sides of a can and the top. More primitive soldering methods usually exposed more solder to food, both because the bead of solder would be bigger and because pieces of solder and dust from solder would fall into the food.[94] In addition, cheaper tin plating for cans often contained substantial amounts of lead that could also leach into food.

[93] As noted in Chapter Three, Johns Hopkins Hospital's first documented case of child lead poisoning in Baltimore originated in poisoning from canned food. Henry Thomas, "A Case of Generalized Lead Paralysis, With a Review of the Cases of Lead Palsy Seen in the Hospital," *Bulletin of the Johns Hopkins Hospital* 15, no. 159 (June 1904): 209–12.
[94] Battelle Memorial Institute et al., *The Health and Environmental Impacts of Lead and an Assessment of a Need for Limitations*, 6, 295, 344.

There was considerable discussion in the United States about poisoning risks from lead used in canning around the turn of the century. U.S. Department of Agriculture studies found that it was "very common" to find lumps of solder in canned goods and to find solder protruding through the joints of a can. And it found "numerous evidences of erosion of the tinned surfaces" that exposed the food to lead.[95] These tinned surfaces could have a lead content as high as 12% and the lead content of solder was around 55-60%. These findings alarmed USDA scientists who argued that there was "no question whatever among physiologists in regard to the effect of lead salts upon the human system. The continual ingestion of even minute quantities of lead into the system is followed eventually by the most serious results." USDA scientists, including the head of the Bureau of Chemistry (and later head of the Food and Drug Administration) Harvey Wiley, argued that the U.S. should follow the example of Germany, a country that limited the lead content of solder.[96] But it would take the United States another century to officially regulate lead in solder.

In the meantime, the lead content of solder *increased*. Through the early 1940s, most solder for canning was about 63% lead. Baltimore's solder guru, Frederick Schultz, for example, stated that solder made from 62-66.6% lead was a good mixture for joining cans.[97] Schultz also noted that mixtures of about 55% lead and 44% tin were "favorite alloys" for making cans (not the solder) for some foods, including condensed milk.[98] These were high lead levels, but during World War II, as a result of tin shortages, manufacturers upped the lead content of solder 98%.[99] The War Metallurgy Committee of the

---

[95] U.S. Congress, *Hearings Before the Committee on Interstate and Foreign Commerce of the House of Representatives on Food Bills H.R. 3109, 12348, 9352, 276, and 4342 for Regulating the Adulteration, Misbranding, and Imitation of Foods, Beverages, Candies, Drugs, and Condiments in the District of Columbia and The Territories, and For Regulating Interstate Traffic Therein, and for Other Purposes* (GPO, 1902), 598.

[96] Britain and France also began regulating the lead content of solder and tin used for cans. Karl Thayer Pomeroy McElroy and Willard Dell Bigelow, *Foods and Food Adulterants : Part Eighth : Canned Vegetables* (Washington, Govt. Print. Off., 1893), 1018–19, 1035–41. Of the high lead content of tin cans, Wiley said, "Such a high percentage of this dangerous metal cannot fail to excite alarm." But, he noted with apparent sarcasm, "In this country of personal liberty there is no restriction as to the percentage of lead which tins used for canned foods may contain." U.S. Congress, *Food Bills*, 598.

[97] Frederick Schultz, *Solder, Its Production and Application: With a Brief History of Tin and Lead* (Macneal Printing Company, 1908), chap. XVII. Schultz stated that solders with lower lead content could were "most excellent" for capping cans. Tin made up the balance of materials for these solders.

[98] Also salmon and peas. Ibid.

[99] Lin-Fu, "Modern History of Lead Poisoning."

National Resources Council gave its blessing, arguing that 98% lead solder was safe.[100] By the end of the 1970s, the EPA reported that solder for cans was still usually 95% to 98% lead.[101]

Until the 1970s, the FDA did not take an active role in regulating lead from canned goods.[102] In that decade, FDA's dietary intake studies had shown that Americans ingested significant amounts of lead from canned goods. Infant intake of lead from canned milk and other baby foods was particularly worrying. Although the FDA did not pass any regulations in the 1970s, its urging did result in canners reducing the use of high lead solder for infant foods or switching to glass jars.[103] Some canners of adult and infant foods had already shifted toward cans that used less solder or no solder. But many still used the classic three-piece tin can with lead solder. As late as the early 1970s, for example, not only was evaporated milk usually packaged in tin, it used a vent-hole type can, where the vent hole was sealed with solder.[104]

---

[100] There was no indication from the Committee as to how this conclusion was reached, and no person has subsequently investigated it to my knowledge. National Research Council, *Lead in the Human Environment*, 492.

[101] Battelle Memorial Institute et al., *The Health and Environmental Impacts of Lead and an Assessment of a Need for Limitations*, 108.

[102] The FDA seems to have used the tolerance limits it set for lead from pesticides as an unofficial benchmark for canned foods in the 1940s, although there is little evidence that there was much enforcement of this limit on lead in canned food. The 1958 Food Additive Amendment provided further power and specification for how the FDA would regulate food additives. Under this law, the FDA did set some limits on the lead content of several substances used in packaging, but it did not do so for solder. National Research Council, *Lead in the Human Environment*, 493.

[103] Canners reduced lead levels in infant foods by 80 to 90% between the early 1970s and late-1970s through better soldering methods, control of raw products, and switching to cans that did not use lead-solder. C Jelinek, "Occurrence and Methods of Control of Chemical Contaminants in Foods.," *Environmental Health Perspectives* 39 (June 1981): 147. In 1974, the FDA proposed a tolerance of 0.3 ppm for evaporated milk, due to its common use for infant food. This was only a proposal at the time, but by the late-1970s, most canners had replaced high-lead solder with high-tin solder for evaporated milk. The lead level in evaporated milk fell from 0.52 ppm in 1972 to 0.1 in 1978. Also, by the end of the 1970s, all infant juice manufacturers voluntarily switch from tin cans to glass jars. National Research Council, *Lead in the Human Environment*, 495. Battelle Memorial Institute et al., *The Health and Environmental Impacts of Lead and an Assessment of a Need for Limitations*, 344.

[104] Canners increasingly put beverages in glass, and later aluminum and plastic containers, after World War II. Most canned juice and canned milk, however, remained in tin cans until the 1980s. Note that "canned" juice did not and does not include juice that is frozen. Nicolo Castellino, Nicola Sannolo, and Pietro Castellino, *Inorganic Lead Exposure and Intoxications* (CRC Press, 1994), 95. By 1965, some canners had begun using two piece cans with no side-seam. In 1975 only 14% of canned food and beverages were packed in three-piece cans. Still, this amounted to 47 billion pounds of food packed in three-piece cans, a method that remained popular because it was cheap. D. L. Downing, *A Complete Course in Canning and Related Processes: Microbiology, Packaging, HACCP and Ingredients* (Elsevier, 2013), 105. By the early 1970s, canners had also started joining cans by welding or cementing rather than soldering. Battelle Memorial Institute et al., *The Health and Environmental Impacts of Lead and an Assessment of a Need for Limitations*, 7–8.

As a result of continuing pressure from the FDA, lead exposure from canned foods declined dramatically in the 1980s and 1990s. The lead content of canned foods decreased from 0.31 ppm in 1980 to 0.19 ppm in 1983. Studies of evaporated milk showed that the lead content in 1986 was 5% of the lead content in 1974. By 1987, less than five percent of canned foods were soldered. U.S. canners stopped using lead solder in 1991, and in 1995, the FDA banned the use of lead-solder in food canning – approximately 100 years after USDA chemists argued for sharp limits on lead solder used in canning.[105]

Consumption patterns for canned food and canned drinks changed over the twentieth century. Figures Figure 65Figure 66 show trends in per capita consumption for various canned fruits, vegetables and drinks. Most of these were acidic and so likely to contain relatively high levels of lead.[106] For these and virtually all canned products, consumption increased in the first half of the twentieth century, with some reductions during war times and the initial years of the Great Depression. After World War II, consumption of canned goods spiked, with some goods hitting all-time consumption highs around the late-1940s. After the 1940s and 1950s, patterns of consumption were more variable. Consumption of some goods declined, others plateaued, and others continued to increase. One of the most important trends was the continuing upward consumption of canned tomato sauces, pastes and purees, a result, in part, of the growing embrace of Italian-American food.[107] Tests often found that tomatoes had the highest lead content of any foods due to their high acidity. In general, consumption of canned vegetables (unlike

---

[105] Downing, *A Complete Course in Canning and Related Processes*, 105. P. Castellino, Sannolo, and Castellino, *Inorganic Lead Exposure and Intoxications*, 96. Michael Bolger et al., "Reductions in Dietary Lead Exposure in the United States," *Chemical Speciation & Bioavailability* 3, no. 3–4 (December 1, 1991): 31–36. Despite the phase out of lead solder, some lead poisoning experts, such as Ellen Silbergeld, argued that lead from cans remained a significant threat, especially in cans not labeled as using lead-free solder. Philip Boffey, "Environmental Hazards; After Years of Cleanup, Lead Poisoning Persists as a Threat to Health," *New York Times*, September 1988. Through the 1990s, lead solder hazards persisted in imported cans that used lead solder. These were also illegal, but occasionally slipped through. And some retailers sold off older inventories of cans with lead solder for years.

[106] In the early 1970s, a study found that of several types of canned food tested, tomatoes had the highest levels, at 0.64 micrograms per gram. Applesauce, green beans, and tomato juice had about half as much, and citrus juice had a quarter as much (0.14). "Infant juices," however, had about twice the lead content of "adult" citrus juice (0.30). Evaporated milk had 0.52 and canned concentrated formula and pureed infant food had 0.10 and 0.15 respectively. Environmental Protection Agency, *Air Quality Criteria for Lead* (GPO, 1986), 7.49.

[107] Harvey A. Levenstein, *Paradox of Plenty: A Social History of Eating in Modern America* (University of California Press, 2003), 122.

canned fruit) continued to increase through the end of the twentieth-century.[108] Canned juice consumption, especially citrus juices, skyrocketed after World War II and then plummeted almost as quickly as frozen juice started dominating the orange juice market. Canned citrus juice made a bit of a comeback after 1965, only to be beaten back again after 1980 with the increasing availability and popularity of fresh chilled orange juice. Consumption of canned milk – a category that included canned whole milk and sweetened and unsweetened condensed (or evaporated) milk – rose rapidly, peaked around 1948 and then declined rapidly. It, too, was replaced in large part by its fresh equivalent.

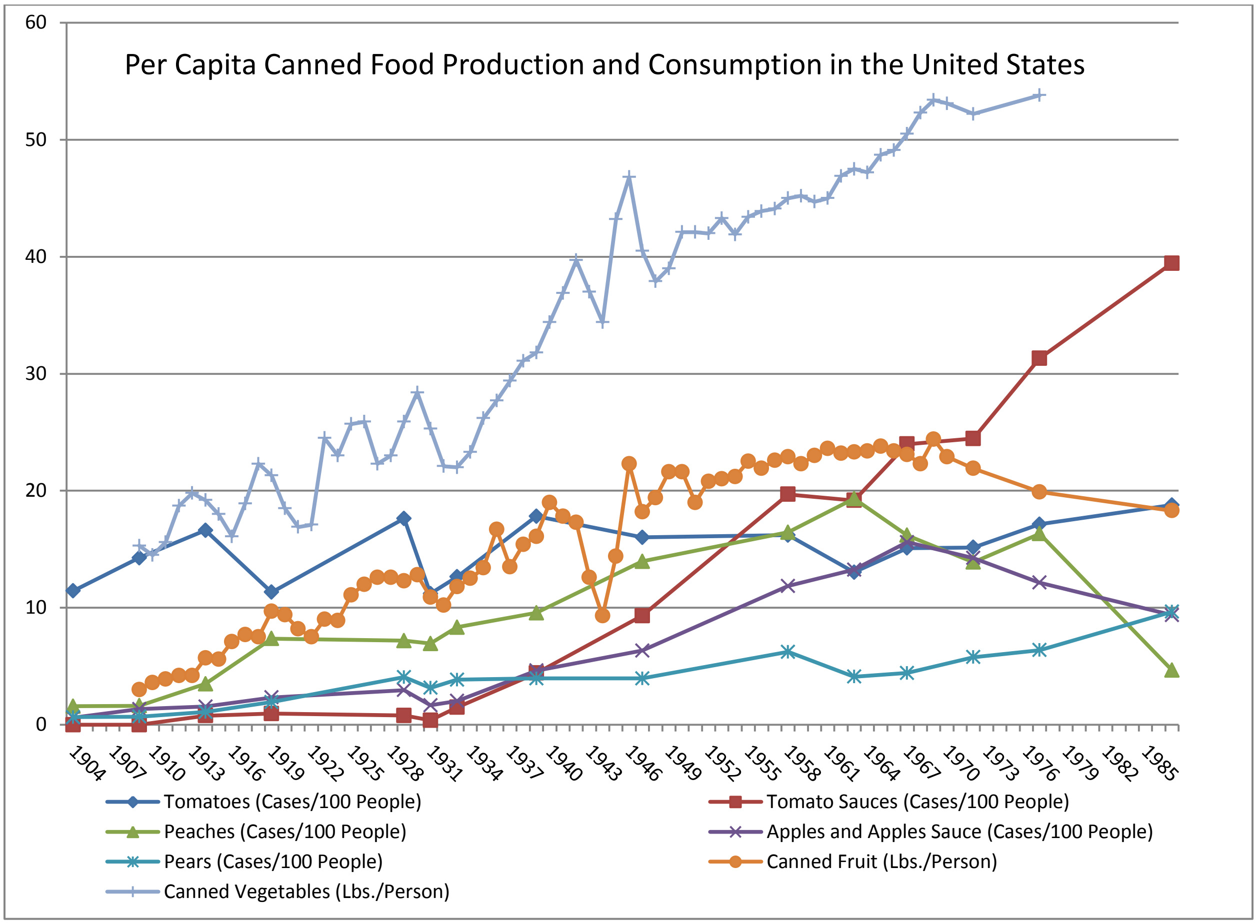


Figure 65: Per capita production (cases/100 people) of select canned fruits and vegetables and total consumption (lbs./person) of canned fruits and vegetables in the United States. The graph shows a general increase in consumption of canned fruits and vegetables, and thus the consumption of lead in these products, over the twentieth century. While the consumption of some foods, especially canned fruits, declined around 1970, some highly acidic foods, especially tomatoes, continued to be consumed in increasing numbers through the 1980s. **Sources:** Judith Jones Putnam, "Food Consumption, Prices, and Expenditures, 1967-88" (U.S. Department of Commerce, 1990); United States Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1970* (U.S. Department of Commerce, 1975).; *U.S. Census of Manufactures*, various years. **Graph:** Leif Fredrickson.

[108] Even vegetables that were not as acidic as tomatoes, such as green beans, could also have significant amounts of lead. Battelle Memorial Institute et al., *The Health and Environmental Impacts of Lead and an Assessment of a Need for Limitations*, iii.

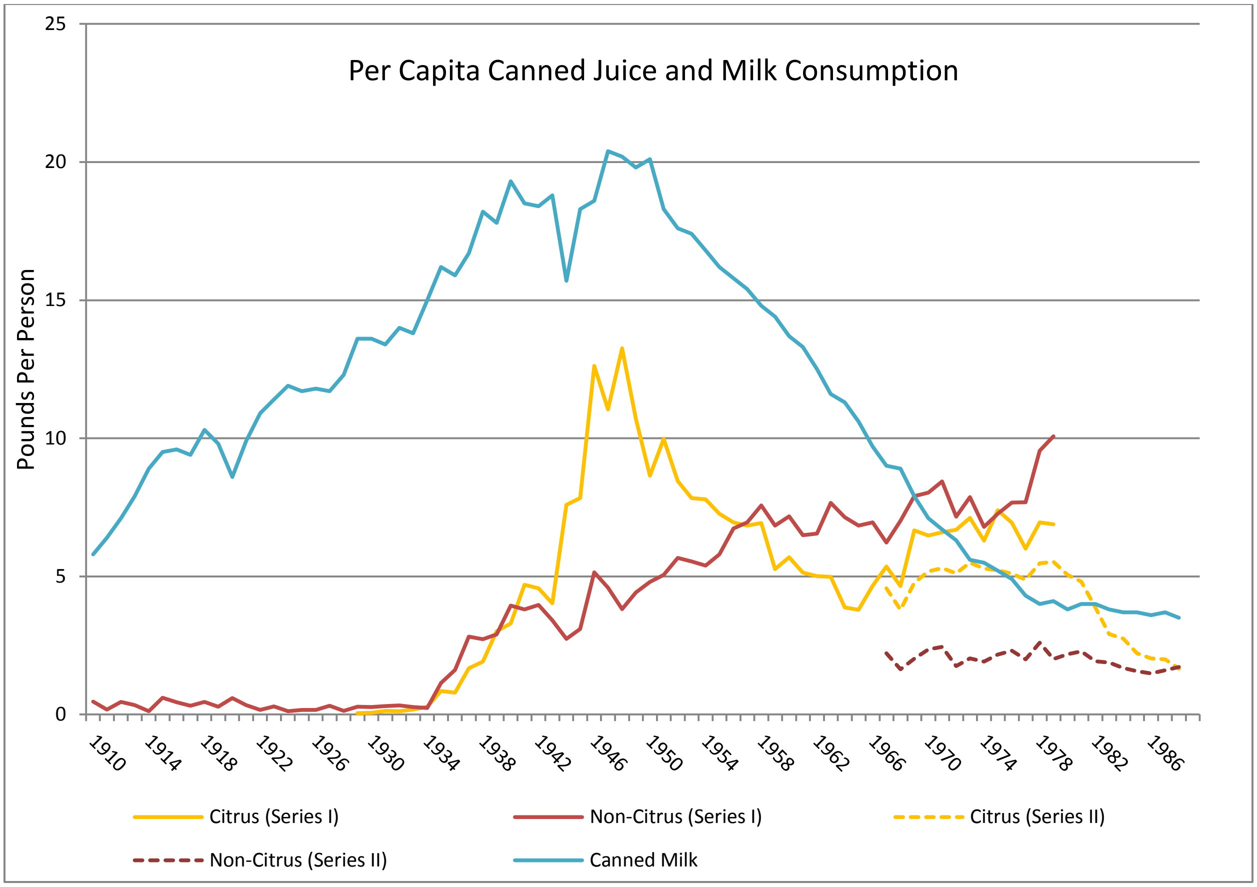


Figure 66: Per capita consumption of canned juice and canned milk. The two juice series are based on different per capita calculations and Series II does not include pineapple juice. These graphs suggest Americans consumed the highest quantities of lead from canned juice and milk in the 1940s and 1950s. **Sources:** Judith Jones Putnam, "Food Consumption, Prices, and Expenditures, 1967-88" (U.S. Department of Commerce, 1990); United States Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1970* (U.S. Department of Commerce, 1975); USDA, *Fruit Situation* and *Fruit Outlook & Situation*, various years. **Graph:** Leif Fredrickson.

Through the twentieth century, both the middle and working class used canned goods extensively. However, people also increasingly thought of canned food as cheap food and as the food of the poor. For milk, the association between canned milk and poor people was evident as early as the nineteenth century. Canned milk did not require refrigeration, which many poor people did not have, and it often contained sugar, and added caloric benefit.[109] Poor parents often fed condensed milk to their children. In 1922, one doctor who investigated rickets, a nutritional deficiency associated with feeding children too much canned milk, estimated that about 25% of the babies among the poor in the United States were raised on condensed milk.[110] While canned milk developed a strong reputation as a food of the poor, especially in

---

[109] John Burnett, *Liquid Pleasures: A Social History of Drinks in Modern Britain* (Routledge, 2012), 37.
[110] United States Congress Senate Committee on Agriculture and Forestry, *Filled Milk: Hearings Before a Subcommittee of the Committee on Agriculture and Forestry, United States Senate, Sixty-Seventh Congress, Second*

regard to infant feeding, early in the 1900s, other canned goods generally did not have that same association until the 1960s. But some sentiments and some studies before then indicated that low-income people disproportionately used canned food. When Congress considered a sales tax on canned goods in 1932, Maryland Senator Millard Tydings opposed it on the grounds that "canned foods are the foods of the poor."[111] Studies also found that low-income people, especially those in urban areas, spent more on canned fruit than wealthier people. Wealthier people were also more likely to buy frozen fruit juice than canned fruit juice.[112] Private and government food assistance programs also relied on, or directed clients to, canned foods.[113]

Lead Paint

Food was an important, even deadly, source of lead exposure throughout the twentieth century, but it rose to prominence in the 1970s and 1980s due to the reduction of lead paint, leaded gasoline and industrial emissions as sources of lead exposure. These latter sources were the dominant sources of exposure for most of the twentieth century.

Lead paint hazards changed over the twentieth century as a result of changes in paint technology, the housing market, and government policies regarding housing, lead paint use and lead paint abatement. As detailed in Chapter Two, builders and residents commonly used lead paint on both interior and exterior surfaces in the first half of the twentieth century. Although lead paint was more expensive than some alternatives, middle class and working class people used it. Very low-income housing, "slum housing," that was built as slum housing, did not usually contain lead paint. But slum housing created as a result of conversion could and did contain lead paint or the toxic residue of lead paint in dust and plaster.

Session, on H. R. 8086, to Prohibit the Shipment of Filled Milk in Interstate Or Foreign Commerce (U.S. Government Printing Office, 1922), 93.

[111] "Tydings to Fight Sales Tax on Canned Goods," *Sun*, March 11, 1932, 4.

[112] USDA, "Fruit Consumption of Households, By Region, Urbanization Group and Income, U.S., Spring of 1955," *The Fruit Situation*, January 1959, 17-23.

[113] Food banks explicitly sought out canned goods, both because they were cheap and because they were easy to store. And government programs, such as the Commodity Supplement Food Program created in 1969, distributed surplus foods, such as condensed milk and canned juice, to low-income pregnant women and young infants. J. William Levedahl and Victoria Oliveira, "Dietary Impacts of Food Assistance Programs," in, Elizabeth Frazão, *America's Eating Habits: Changes & Consequences* (U.S. Department of Agriculture, Economic Research Service, Food and Rural Economics Division, 1999), 327.

After the 1920s, changes in technology as well as consumer regulations reduced the amount of lead in paint used in homes in Baltimore and other places. In the late 1920s and early 1930s, titanium paints (produced in Baltimore among other places) began cutting in to the market for lead paint.[114] Titanium was essentially a substitute for lead, and over the next few decades, as the President's Materials Policy Commission put it, titanium from the "sands in Florida" began replacing the lead from "galena deposits in Missouri."[115] As early as 1937, the Baltimore City Health Department was urging homeowners to use titanium paints for repainting interior furniture rather than lead.[116] Titanium and lead were not necessarily used separately, however, so paints with titanium often also had lead.[117] Lead was still the main component of interior paints as late as the early 1950s and interior paints continued to contain up to 1% lead after that. The vast majority of housing built before 1950 contained lead paint.[118]

In 1951, the BCHD produced its regulation requiring that only paint "free from any lead pigment" could be used on the interiors of dwellings.[119] Although the regulation did not specify a lead content, regulators in Baltimore and elsewhere seem to have generally considered paint with 1% lead or less to not be "lead paint." The ban probably decreased the application of lead paint, but compliance was far from perfect due to lack of enforcement and lack of knowledge about lead paint.[120] In 1958, the city passed an ordinance, effective in 1959, requiring that lead paint (defined as more than 1% lead) be labeled with a warming against applying it to interior surfaces, window sills, toys, cribs, furniture and places "used for

---

[114] "DuPont Figure in New Combine: With Commercial Solvents Forms New Company – One Plant in Baltimore," *Sun*, July 10, 1931, 18.

[115] President's Commission quoted in "The Great Fugue of Our Times," *Sun*, June 28, 1952, 10. Another article went so far as to declare a coming "age of titanium." "This Metal," *Sun*, March 15, 1953, 175.

[116] "Reports 24 Cases of Lead Poisoning," *Sun*, August 9, 1937, 16.

[117] The advertisement for Glidden Paint, for example, lists three kinds of paint (for furniture, decks and porches, and walls) – all of these are described as being "self-cleaning" and containing both titanium and "pure white lead." "At Last that Good Glidden Endurance House Paint," *Sun*, April 28, 1948, 10. Keystone advertised an exterior paint for fences, screen and storm sashes, and buildings that included lead, zinc, and titanium. *Sun*, September 26, 1948, A26. In 1945, an interior decorated advertised that they used "titanium-zinc-lead" paints. *Sun*, August 29, 1945, 16.

[118] Gerald Markowitz and David Rosner, *Lead Wars: The Politics of Science and the Fate of America's Children* (Berkeley : New York: University of California Press, 2013), 60; Nancy Hicks, "Officials Differ on Best Way to Halt Lead Poisoning," *New York Times*, August 14, 1971, 21.

[119] The state of Maryland also passed a "Toxic Finishes" law in 1949 that prohibited making or selling children's playthings or furniture with lead or other poisons, but the law was quickly repealed the next year.

[120] For example, one landlord unwittingly repainted an apartment with lead paint after removing older lead paint. The new lead paint was 9% lead. "Mayor D'Alesandro Signs Lead Paint Labeling Ordinance," *Baltimore Health News*, August, 1958, 59.

care of children."[121] Labeling laws helped, but they did not end the use of lead paint either. When the BCHD surveyed paint dealers after the labeling ordinance was in effect, it found 183 of the 323 establishments surveyed were selling lead paint that was not labeled as such.[122]

Baltimore's ban on lead paint was the first in the nation. As more cities and states regulated lead paint, these regulations probably helped reduce lead paint use everywhere by causing paint manufacturers and distributors to shift away from lead paint. In 1954 New York City limited lead to 1% in interior paint, and in 1955 the American National Standards Institute suggested a limit of 1% lead.[123] In 1971, Maryland passed a law prohibiting lead-based paint on interior surfaces, porches and any "exterior surface to which children may be commonly exposed."[124] Again, these laws reduced lead paint but hardly eliminated it. Several studies in New York City revealed that some paint manufacturers were selling paint that exceeded the 1% lead allowed by city law.[125] Subsequent surveys of lead paint in housing in Baltimore showed that many houses built after 1955 contained lead paint, despite the city's 1951 ban.[126] Nationally, it was perfectly legal to continue using lead paint in housing in many places through the1960s and 1970s.

Federal laws followed and reinforced regulations enacted at the city and state level. The 1971 Lead-Based Paint Poisoning Prevention (LBPPPA) Act banned the use of paint with more than 1% lead in federally-funded projects, such as public housing developments. Subsequent legislation further lowered the allowable levels of lead paint in federal projects to 0.06%. In 1977, the Consumer Product Safety

---

[121] Ordinance No. 1504, June 9, 1958, full text in "Mayor D'Alesandro Signs Lead Paint Labeling Ordinance," *Baltimore Health News*, August 1958, 57-58. The American Medical Association had suggested lead paint labeling in 1945, and California passed a labeling ordinance that year. Colleen F. Moore, *Silent Scourge: Children, Pollution, and Why Scientists Disagree* (New York: Oxford University Press, 2003).

[122] Memo, Charles Couchman to Huntington Williams, circa March 1959, in Folder Lead Paint Poisoning Material 1931-1986, Box 3.3-3.4 Housing and Lead Paint Poisoning, Series III, GHW Papers, AMCM Archives.

[123] Moore, *Silent Scourge*.

[124] Senate Bill 814, May 17, 1971, to add Section 117A to Maryland Code, Chapter 495, Article 43, in *Laws of the State of Maryland* (Baltimore: King Brothers, Inc., 1971), in Archives of Maryland Online (hereafter AMO), http://aomol.msa.maryland.gov/html/index.html. The law was effective July 1, 1971. A 1973 revision elaborated on the penalties and liabilities for the law. House Bill 1215, May 21, 1973, in Laws of the State of Maryland (Baltimore: King Brothers, Inc., 1973), in Ibid.

[125] Nancy Hicks, "Officials Differ on Best Way to Halt Lead Poisoning," *New York Times*, August 14, 1971, 21. 1971 New York City Health Department tested 76 kinds of paint and found 8 with lead between 2 and 10%. Moore, *Silent Scourge*. In 1972, *New York Magazine* found that at least 15 paint manufacturers were found to have more than the 1% lead legally allowed. *New York Magazine*, July 31, 1972, 20.

[126] Markowitz and Rosner, *Lead Wars*; EPA, *Lead-Based Paint Abatement and Repair and Maintenance Study in Baltimore: Pre-Intervention Findings*, August 1996, 50

Commission adopted this lower standard for all interior paints (not just federal projects). The ban on interior lead paint use went into effect in 1978.[127]

Attempts to remove lead paint from housing were much more difficult than banning lead paint. It was not until the late 1940s that the BCHD used its powers under the 1941 housing ordinance to require landlords to remove flaking lead paint. For the following decades up to the present, the BCHD and other government agencies have sought to remove or abate lead from homes. For a brief time in the early 1960s the BCHD hoped that it could find all the houses with lead paint and require removal. By 1965, it had concluded this was not feasible and moved back toward a system of using child lead poisoning cases to indicate and prioritize where abatement would be enforced. Compliance was slow because of refusals to comply, legal push-back from landlords, and lack of knowledge about where lead paint was and the best way to abate it.[128]

Nevertheless, abatement did happen. Abatement almost never fully removed lead paint hazards – and in the short run it often increased hazards by creating dust – but studies in the 1990s found that homes that had been abated in the past were less hazardous than those that had not. So the cumulative number of abated homes was important. Although the BCHD recorded the number of abated homes each year, a complete list of the number does not appear to have survived. However, given the data that do exist on abatements carried out and on notices given to abate, we can make a rough estimate. From 1948, when the BCHD seems to have begun giving notices for lead paint abatement, to 1972, the BCHD gave out about 80 notices for abatement per year (for the years with data available). Numbers on houses actually abated are not available for many years. Actual abatements were lower, sometimes much lower. But I

[127] A 1973 amendment lowered the permissible lead level to 0.5% until the end of 1974, after which level was drastically reduced to 0.06% (or 600 parts per million). Simultaneously, the Federal Drug Administration banned all interior that contained more than 0.5% lead beginning in 1973. Lead-Based Paint Poisoning Act (Public Law 91-695), January 13, 1971; Amendment to the LBPPPA (Public Law 93-151), November 9, 1973; Senate Report, "Lead-Based Paint Poisoning Amendments of 1973," Report 93-130, April 27, 1973; Consumer Product Safety Commission Press Release, "CPSC Announces Final Ban on Lead-Containing Paint," September 2, 1977, at http://www.cpsc.gov/en/Recalls/1977/CPSC-Announces-Final-Ban-On-Lead-Containing-Paint. The CSPC was given the power to set regulations under Consumer Product Safety Act of 1972. Between 2008 and 2011, the acceptable level of lead in paint was further phased down .01% (100 ppm). Consumer Product Safety Improvement Act of 2008 (Public Law 110-314), August 14, 2008.

[128] Elizabeth Fee, "Public Health in Practice: An Early Confrontation with the 'Silent Epidemic' of Childhood Lead Paint Poisoning," *Journal of the History of Medicine and Allied Sciences* 45, no. 4 (October 1, 1990): 570–606.

have used the notices from this period to show how, even with this generous reading, only a small percentage of Baltimore's housing stock was abated through code enforcement. After 1972, the CDC lowered the criteria for elevated blood lead levels and the federal government funded large screening programs in Baltimore. In addition, the city got federal funding for abatement. Lead paint abatement notices increased. From 1972 to 2000, there seems to have been about 400 homes abated each year. Thus about 2,000 homes were abated from 1948 to 1972, and about 11,200 were abated from 1973 to 2000, for a total of about 13,250 homes.[129]

[129] Officially, the Dept. of Housing and Community Development took over housing code enforcement in 1965. See Fee on this.

Table 4: Housing and Lead Paint Notices and Abatements						
Year	**Lead Paint Housing Inspections**	**Total Housing Sanitation Inspections**	**Notices to Abate Lead Paint**	**Total Housing Violation Notices**	**Lead Paint Abatements**	**Total Housing Abatements**
1948	42	1,275	28	3,249		1,879
1949		1,599		4,247		2,282
1950		1,245	25	4,019		1,772
1951		1,046		1,447		1,189
1952		691		658		1,180
1953		2,622		1,329		
1954		4,214	46	2,091	46	3,023
1955		4,087		2,823		3,670
1956		4,478	45	2,310		4,668
1957			85			
1958			169			
1959			165			
1960			120		27	
1961			129			
1962			12			
1963		4,124	56	8,884		
1964		5,384		14,944		
1965		13,408	74	14,576		10,272
1966-1973	//	//	//	//	//	//
1974					425	
1975-1995	//	//	//	//	//	//
1996			235		519	
1997					353	
1998					303	

Table 4: Housing and lead paint violation notices issued by the BCHD and abatements carried out to fix housing and lead paint violations. The table shows a general increase in violations and abatements, but is also an indicator of the small number of violations and abatements compared to the hundreds of thousands of housing units in the city. **Sources:** R.H. Gardner," Lead Poisons 57 Children in City," *Sun*, October 15, 1951, 26; Elkins Dahle to Huntington Williams (memo), February 16, 1962, Folder Lead Paint Poisoning Tabulations of Lead Paint Notices, 1956-1962, Box 3.3-3.4, Series III, GHW Papers, AMCM Archives; Bureau of Building Inspection, Housing Division *Annual Report*, 1963, Folder 16, Box 24, Series X, GBC Records, LLSC; Housing Division *Annual Reports*, 1964-1965, and BCHD, *Annual*, various years, Maryland Room, Enoch Pratt Library. **Table**: Leif Fredrickson.

Although change was slow, technological change, bans and orders of abatement did reduce the amount of lead entering the Baltimore environment from paint. Tests of paint samples from Baltimore homes from the 1940s to the 1960s show a general decrease in the percentage of samples that came back positive for 1% lead paint. From 1949 to 1956, about 65% of the samples tested positives, but from 1960 to 1965, about 46% of the samples tested positive. These tests do not represent the actual prevalence of lead paint in housing. They were not random samples and they were not comprehensive samples (i.e., they were only a few samples from a house, not an attempt to see if there was any lead paint in the house).[130] But they probably indicated a relative decline in lead paint in housing over this time period.

Table 5: Paint Samples with More than 1% Lead			
Year	**# Paint Samples**	**Percent Paint Samples with More Than 1% Lead**	**# Homes Sampled**
1948	37	Not recorded	Not recorded
1949	94	72	41
1950	175	56	74
1951	268	56	113
1952	204	54	114
1953	268	69	131
1954	306	70	115
1955	228	75	77
1956	424	66	161
1957	Not recorded	Not recorded	Not recorded
1958	2200	54	Not recorded
1959	Not recorded	Not recorded	Not recorded
1960	3100	42.8	Not recorded
1961	2667	54	Not recorded
1962	1743	47.3	Not recorded
1963	1735	44.6	Not recorded
1964	1854	43.3	Not recorded

Table 5: Number of paint samples and homes analyzed in each year, with percentage of samples with 1% or more lead. Although there is variation year to year, the general trend is toward finding less lead in the paint samples. This probably reflects a general decrease in the lead paint in Baltimore homes, but the samples are not random. It could also reflect health experts testing paint more often as they became more aware of lead poisoning as a possible cause of health problems. Although the BCHD tested paint for lead for physicians as far back as the 1930s, they do not seem to have carried out tests in any great number on a regular basis until 1948. **Source:** BCHD *Annuals,* various years. **Table**: Leif Fredrickson.

Abatements also occurred for reasons other than the city ordering owners to do so. In the 1940s, 50s and 60s, there was little incentive to rental owners to carry out abatements until they got notice to do so from the city. Even when they did get notice, many did not comply. But tort cases brought by poisoned tenants against landlords increased in the 1970s. And in 1984, Baltimoreans gained the legal power to withhold rent until landlords had removed lead paint. These developments probably caused landlords to

130 The actual percentage of housing with lead paint was probably higher than these samples indicate. At the time, slum housing was still likely to have less lead paint than was housing in general. Thus samples like these that targeted slum housing would have yielded lower percentages of housing with lead paint. And the lack of comprehensive sampling would have resulted in many false-negatives. See George W. Schucker et al., “Prevention of Lead Paint Poisoning among Baltimore Children. A Hard-Sell Program.,” *Public Health Reports* 80, no. 11 (1965): 969.

remove more lead paint than they had previous to the 1970s. Unfortunately, there are no numbers on this that I am aware of.[131]

In addition to these programs specifically geared towards abatement, remodeling and demolition of the housing stock – including the large-scale destruction of housing during urban renewal and highway building projects – removed lead paint from the Baltimore environment.[132] Still, the city continued to be dominated by old, and probably lead paint-laden, housing stock through the end of the twentieth century. In 1970, about 70% of the city's housing stock was built before 1950. By 1980, this percentage had only declined to 68%.[133] By 1990 this had declined to 60%, and by 2000 to 55%. In other words, about half of the city's housing stock was still built when lead paint was widely used and there was no legal prohibition on using it. And, as stated above, some of the housing stock built between 1950 and 1980 also had some lead. Pre-1980 housing was about 93% of the housing stock. So the housing stock continued to be very dangerous (Figure 67).[134] The number of houses officially abated by government order or action was only a small fraction of these houses. In 1970, there were about 227,000 pre-1950 homes, but, only one or two thousand of these had been abated. In 2000, there were still about 165,000 pre-1950 homes, but only about 7% or 8% of these had been abated. However, many additional homes would have been abated "unofficially" as noted above.

---

[131] On torts, see "Recent Decisions," *Maryland Law Review*, 155 (1974), 34. The Maryland rent withholding law was passed in 1973, but the Baltimore City Circuit court upheld its applicability to residents of the city in 1984. "Rent-escrow decision upheld in lead-paint case," *Sun*, November 22, 1984, C5.

[132] EPA, *Lead-Based Paint Abatement and Repair and Maintenance Study in Baltimore: Pre-Intervention Findings*, August 1996, 50. Many studies show that older houses have much greater problems with lead paint hazards. See, for example, David E Jacobs et al., "The Prevalence of Lead-Based Paint Hazards in U.S. Housing.," *Environmental Health Perspectives* 110, no. 10 (October 2002): A599–606.

[133] In 1984, the Citizens Planning and Housing Association estimated that 75% of the homes in the city contained lead paint, although it is not clear how they calculated that number. Fee, "Public Health in Practice," 605. Part of the reason for the lack of reduction in pre-1950 homes between 1970 and 1980 was that the number of these homes increased from 1970 to 1980. Presumably, this was due to creating multi-unit homes from formerly single-family homes.

[134] In 1997, the BCHD estimated that about 60% of the housing in Baltimore City was built before 1950 and "may pose lead hazards." This seems to have been based on 1990 census data. BCHD, *Annual*, 1997, 7, MR, Pratt.

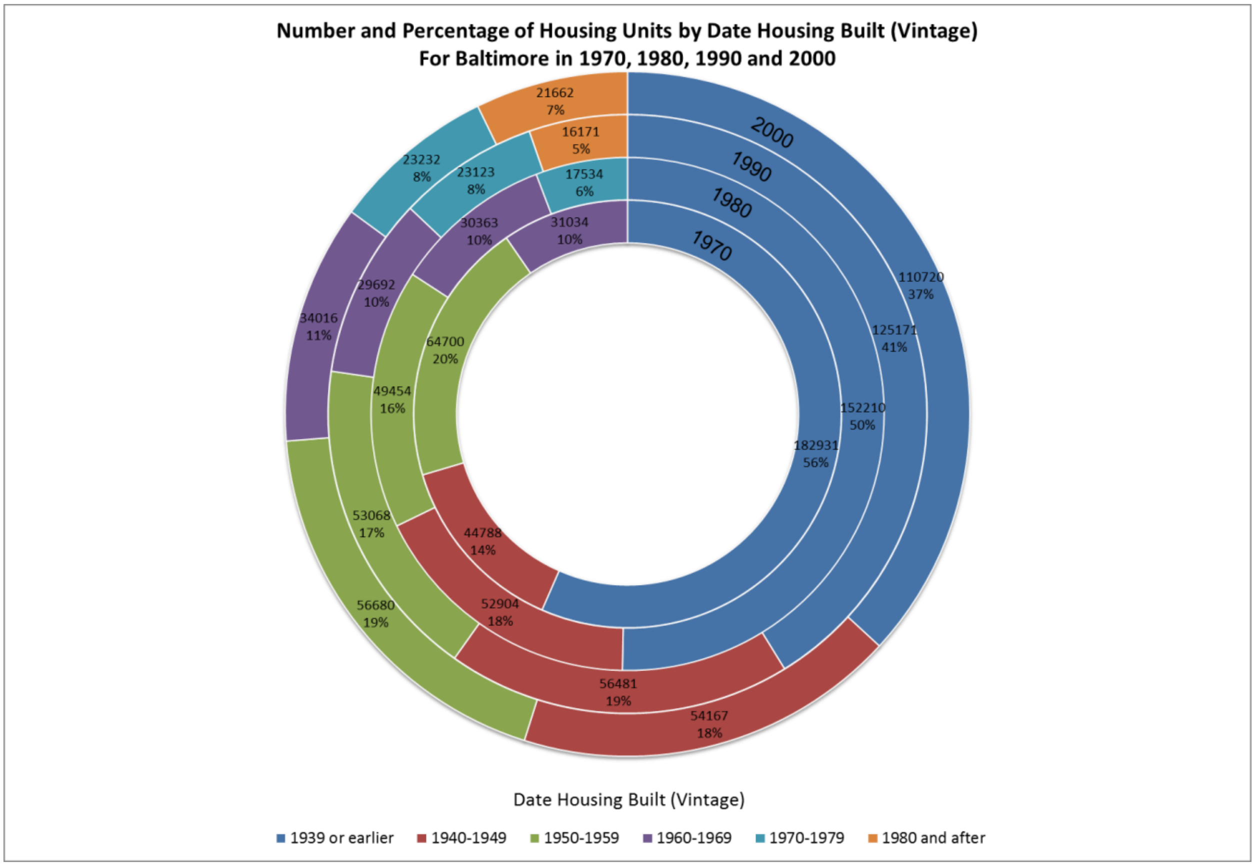


Figure 67: Number of housing units, by vintage (date built) at different points in time (1970, 1980, 1990, 2000). The graph shows that throughout the twentieth-century, Baltimore's housing stock was built in times when lead paint was widely used. A significant amount of pre-1939 housing stock was removed over time, but even in 2000 it was still the plurality of housing in the city. Housing from the 1940s showed little decrease over time, and even increased as older structures were made into multi-unit homes. Housing built between the 1950s and the end of the 1970s, when lead paint was officially banned (but still used to some extent) makes up a smaller proportion. Very little housing stock was added to Baltimore City after 1980, when lead paint was banned nation-wide. Most new housing stock built in the region after 1970 was built in Baltimore County rather than in the city. **Source:** Minnesota Population Center, *National Historical Geographic Information System: Version 2.0*. (Minneapolis, MN: University of Minnesota, 2011), www.nhgis.org**. Graph:** Leif Fredrickson.

Lead paint was an environmental hazard throughout the twentieth century but it produced the greatest hazards in the two decades following the end of World War II. Before World War II, lead paint in housing was prevalent. Systematic issues stemming from suburbanization, segregation, housing investment, housing filtration, and war-time rationing were already yielding paint deterioration, thus increasing lead hazards. But the post-World War II boom in suburbanization, combined with the other factors discussed in Chapter Four, increased lead paint hazards even more. Beginning in the 1960s, housing regulation and bans on lead paint finally started to curb lead paint hazards.

Leaded Gasoline

Figure 68 graphs estimates of pollution from leaded gasoline use in Baltimore over time. The estimates are based on vehicle registrations, fuel use per vehicle, lead content of gasoline, and the proportion of gasoline grades used in each year. I adjusted the number of vehicles in Baltimore City by a rough estimate of the suburban (out of city) commuters. In short, I took a percentage of Baltimore County's vehicles and added them to Baltimore City. I reduced the amount added over time until 1980, when reverse commuting probably canceled out commuting to the city.[135] The graph shows that lead pollution from automobiles in Baltimore City was relatively low before World War II, and then climbed rapidly. Between about 1950 and 1975, pollution was very high – more than twice the levels before World War II or after 1980. Within this period of high leaded gasoline pollution, there was a peak in 1955 and an even bigger peak in 1969. In terms of city-county comparisons, it is important to note that while lead emissions in Baltimore County increase over time, and eventually overtake emissions in the city, the area of the county is 7.5 times as large as the city. The county, therefore, was never as polluted from automobile lead as the city.[136]

---

[135] For vehicle registration sources, see Figure 54. I estimated two grams of lead per gallon for gasoline in the 1930s; see Chapter 6. The lead content of regular and premium gasoline for 1947 to 1976 is from the U.S. Bureau of Mines, *Motor Gasolines* surveys (Bartlesville, Okla.: U.S. Dept. of the Interior, Bureau of Mines, Petroleum Research Center, 1960). The lead content for these years is specific to the mid-Atlantic states. Lead content after 1977 are national data from the Ethyl Corporation, courtesy of Howard Mielke. The proportion of premium and regular gasoline for Baltimore region in the 1930s is from "Auto Trade Notes," *Sun*, January 31, 1937, SAF8. The proportion of premium and regular used from 1946 to 1974 is national data is from Alan M. Strout, "Market Trends in Mineral Fuels, 1951-1960," Fuels Symposium, American Society of Mechanical Engineers, June5-7, 1962, *ASME Papers*, 356. National-level data for premium, regular and unleaded use for 1970 to 1975 is from U.S. EPA, *Lead National Ambient Air Quality Standard: Environmental Impact Statement*, 1978, 2.12. For 1976-1983, I used sales on premium, regular and unleaded gasoline in Maryland from Ethyl Corporation, "Yearly Report of Gasoline Sales by States," *Yearly Report of Gasoline Sales by States*, 1982. Fuel use per vehicle for each year for Maryland for the years before 1949 is from Maryland State Roads Commission, *Preliminary Report of the Maryland State-Wide Highway Planning Survey by the Maryland State Roads Commission in Cooperation with the United States Department of Agriculture, Bureau of Public Roads, 1938.* (Annapolis, 1938). For years 1949 and after, I used Maryland data the Federal Highway Administration, http://www.fhwa.dot.gov/policyinformation/statistics.cfm. For the commuting percentage, I used 40% of Baltimore County vehicles from the 1930s to 1960, then reduced this linearly to 1980. For trends on commuting, see Marc V. Levine, "A Third-World City in the First World: Social Exclusion, Racial Inequality, and Sustainable Development in Baltimore," *The Social Sustainability of Cities*, 2000, 123–156.

[136] A study of carbon monoxide emissions, for example, which came primarily from automobiles, showed that while there were greater CO emissions in the suburban area and "urban fringe" around the inner city (or what the study called the "central area,"), the densities were drastically different. In 1970, there were about 10,107 kilograms per square mile produced in the inner city every day, compared to 3,725 in the "urban fringe" and 658 in the suburban

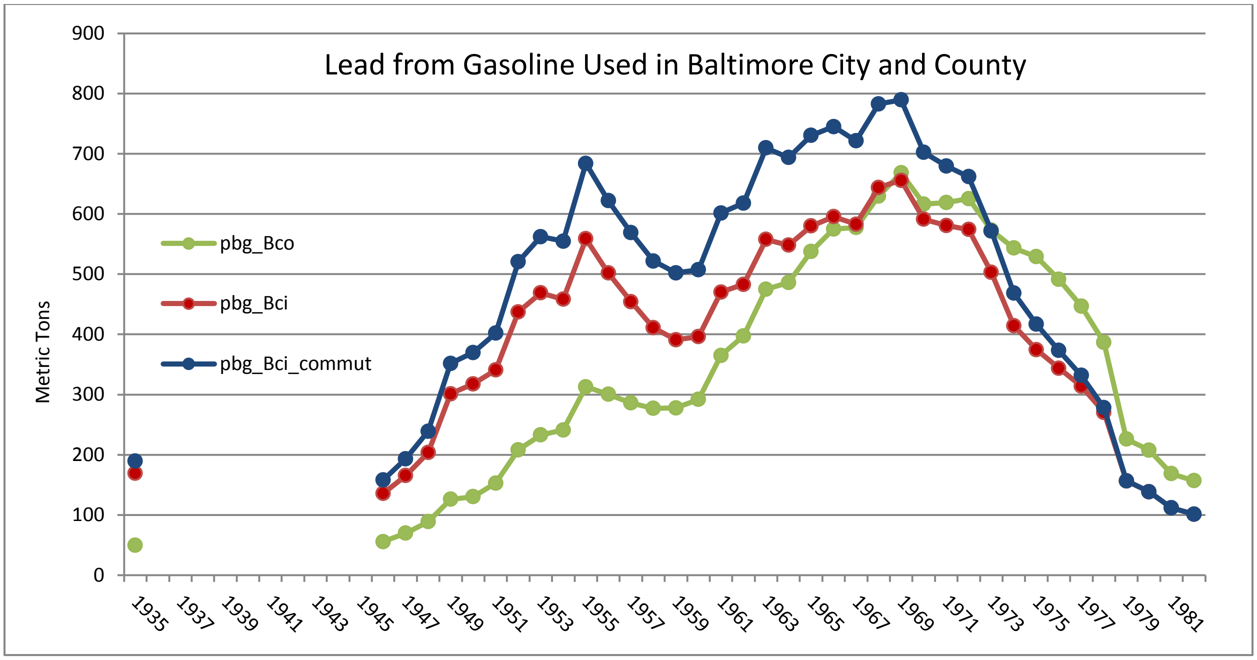


Figure 68: Metric tons of lead used in gasoline in Baltimore County (green), Baltimore City (red) and Baltimore City adjusted for commuting from the county (blue). To the left of the continuous data are estimates for 1935. The graph shows that lead pollution from automobiles in Baltimore City was relatively low before World War II, and then climbed rapidly. Between about 1950 and 1975, pollution was very high – more than twice the levels before World War II or after 1980. Within this period of high leaded gasoline pollution, there was a peak in 1955 and an even bigger peak in 1969. **Sources**: See Figure 54. **Graph**: Leif Fredrickson.

Most of this lead used in gasoline was exhausted into the air, with some of it collecting in the engine oil and exhaust components. Automobiles in Baltimore produced about two million gallons of waste oil in 1972, for example, about one percent of which was lead. Before 1964, waste oil was often reclaimed for a variety of uses. Businesses, and perhaps some residents, also used automobile waste oil to heat with, and the city spread waste oil on streets to reduce dust. When it was disposed of, it also created hazards. Thus, the lead that was not exhausted was also a source of lead exposure. In one dramatic example, a 100 foot wide waste oil pit caught fire in 1952 and "blanketed" East Baltimore in "black clouds of smoke." The same year, a ten acre oil and tar dump caught fire. Flames reached 30 feet and smoke was visible fifteen miles away. More common exposure, however, came from the everyday dripping of oil from automobiles and breezy disposal of waste oil in streets and yards.[137]

area. U.S. EPA, *National Assessment of the Urban Particulate Problem: Baltimore* (Environmental Protection Agency, Office of Air and Waste Management, Office of Air Quality Planning and Standards, 1974), 11.52.

[137] U.S. EPA, *State of Maryland Waste Oil Recovery and Reuse Program*, 1974. "Toxic-waste violations laid to recycling firm," *Sun*, August 22, 1984, 1A. "Waste Oil Burns; Area is Blanketed," *Sun*, April 19, 1952; "Two Overcome at Oil Dump Fire," *Sun*, March 22, 1954, 26. In late 1970s, the "Hooter Heater" was being advertised in

Most of the lead used in gasoline, however, was exhausted. Figure 68 does not capture the disparities in lead emissions exposure within the city discussed in Chapters Six through Eight. In addition to my discussion in those chapters, there are a few things to note with regard to changing burdens of lead emissions over time. Fine particles spread out further from the sources of pollution (traffic on streets), while coarser particles settled out of the air within a couple hundred feet of the roadway. Traffic congestion produced more coarse particles. Although there is no objective measure of congestion over this period, there is qualitative evidence that congestion was worse in the 1940s and 1950s. It remained a serious problem after the 1950s, but probably was not as severe. Also after 1960, expressway building elevated a lot of the traffic flowing into the city above street level, which distributed lead emissions further. The first peak in lead emissions in the 1950s thus probably represents a more concentrated exposure of lead along traffic routes and in the inner city, whereas the peak around 1969 represents a higher volume, but more dispersed amount of lead emissions.[138]

The combined effect of heavy traffic, large particles from congested traffic, and lead-contaminated oil produced heavily polluted streets in Baltimore. Baltimore had very high levels of lead in its streets in the 1970s. Compared to other cities, Baltimore's streets generally had more lead per pound of street debris, more lead per square foot, and more lead per curb mile. The background level of lead in soil and dust is about 10 to 50 milligrams per kilogram. Baltimore's street dirt had about 2,2000 milligrams per kilogram - many times the amount of background lead in soil and more than most other cities studies by the EPA. This high level of contamination reflected the age of the city, its industry, and traffic congestion. In addition, Baltimore's streets were cleaned less frequently than many other cities. Streets in older, low income and multi-family neighborhoods had higher levels of lead. The highest levels of lead in residential neighborhoods were found in low income, old, multi-family neighborhoods. These high lead

---

cities like Baltimore as a way to burn "dirty crankcase oil" which "probably can be obtained for nothing in most cities, where nobody knows what to do with it." "Heating with wood," *Sun*, May 20, 1979, B3. U.S.

[138] On lead particle size emissions increasing with congested driving (i.e., accelerations and decelerations), see G.L. Ter Haar et al., "Composition, Size and Control of Automotive Exhaust Particulates," *Journal of the Air Pollution Control Association* 22, no. 1 (January 1972): 43. On the dispersal of larger particles closer to roadways, see National Research Council, *Lead in the Human Environment*, 105.

levels reflected the historically high traffic flow and congestion in inner city neighborhoods, as well as neglect by the city.[139] While there are no data to track lead levels in street debris over time, it is likely that hazards from lead in material in and near streets rose and fell with vehicular lead emissions. The 1960s may have been particularly bad because parking was so bad. Heavy, unregulated parking not only increased traffic congestion, it made cleaning streets very difficult.[140]

Industrial and Waste Emissions

Automobiles were important contributors to lead air pollution in Baltimore since the introduction of tetraethyl lead in 1924. But industrial sources were probably more important to air pollution until the 1950s or perhaps the 1960s. Manufacturing in the city increased over the first half of the twentieth century. Primary metals (the smelting and refining of ferrous and nonferrous metals, including lead) were an especially important part of the Baltimore economy. Production at the Bethlehem Steel Plant in Sparrow's Point increased from 115 thousand tons in 1905 to 10,705 thousand tons in 1940. World War II increased production even more, pushing the operating capacity of the plant over 100%.[141] By this time, the Sparrow's Point plant was the largest steel mill in the world. The plant did not produce lead, but coal burning and various smelting processes released lead. Samples of sediment drilled from the sediment in Baltimore's harbor confirm the lead pollution from the Bethlehem plant, especially the burst of output around World War II.[142] Many other industries also contributed various amount of lead to the atmosphere,

---

[139] EPA, *Toxic Materials Analysis of Street Surface Contaminants*, 1973, 28, 38, 48. EPA, *Water Pollution Aspects of Street Surface Contaminants*, (November 1972), 100-142. For background levels, see Cliff Davidson and Michael Rabinowitz, "Lead in the Environment: From Sources to Human Receptors," in Herbert L. Needleman, *Human Lead Exposure* (CRC Press, 1991). The Baltimore City government claimed it aimed to provide services without "favoritism or inequality," in the mid-1950s, but the ideal was imperfect because some streets needed more cleaning than others. Urban Renewal Study Group, Report to Mayor D'Alesandro, Jr., (September 1956), 47, Folder 35A, Box 2, Series III, ACLU Collection, LLSC.

[140] David Wallace, "Parking: The Problem," Typewritten, January 4, 1958, Series XIII, GBC Records, LLSC. "City Group O.K.'s Start on Street Sweeping Plan," *Sun*, June 1, 1960, 23.

[141] Kenneth Warren, *Bethlehem Steel: Builder and Arsenal of America* (University of Pittsburgh Press, 2010), Appendix.

[142] In 1974, the EPA concluded that the "effects of the Sparrows Point industrial complex is evident in the Bear Creek and Old Road Bay areas. High mercury, cadmium, zinc and lead levels were found in these sediments." U.S. EPA, *Distribution Of Metals In Baltimore Harbor Sediments*, 1974, II-3, V-3. A later study found a spike in lead levels in harbor sediments from around 1940 to 1950, which probably reflected increased industrial output and, perhaps, harbor-filling processes of Bethlehem Steel. There was also a pattern of increased lead accumulation after 1920, and a decrease after 1970, that probably reflected the rise and fall of leaded gasoline use. Robert P. Mason,

including the secondary lead smelters. At least five secondary lead smelters were active between the 1930s and 1950s.[143] Another lead re-smelting operation, Industrial Metal Company, operated in south Baltimore until at least 1975.[144]

In addition, residential coal burning, a major contributor to particulate pollution in the early twentieth century, also released some lead. Residential burning had a disproportionate impact on urban air quality relative to industrial and utility sources because the latter sources used taller stacks that distributed pollutants further. In addition to lead, coal burning also released sulfur dioxide (SO_2), a toxic gas produced from the burning of materials containing sulfur, including coal. One estimate of sulfur dioxide concentration over time in Baltimore, based primarily on data about residential heating, shows the concentration of SO_2 climbing after 1880, peaking in 1950, and declining rapidly after 1960 (Figure 69).[145] Refuse burning also contributed to lead air pollution. Private refuse burning was not well-controlled until the 1960s, and the municipal waste agency burned most of its refuse before World War II.[146]

Eun-Hee Kim, and Jeffery Cornwell, "Metal Accumulation in Baltimore Harbor: Current and Past Inputs," *Applied Geochemistry* 19, no. 11 (2004): 1801–1825.

[143] William P. Eckel, Michael B. Rabinowitz, and Gregory D. Foster, "Investigation of Unrecognized Former Secondary Lead Smelting Sites: Confirmation by Historical Sources and Elemental Ratios in Soil," *Environmental Pollution* 117, no. 2 (2002): 273–279.

[144] EPA, *Development of an Approach to Identification of Emerging Technology and Demonstration Opportunities*, 1974, C-114; EPA, *Health and Environmental Impacts of Lead: An Assessment of a Need for Limitations*, 1979, 42. The site was located at 1508 Open Street.

[145] Lipfert's model primarily used housing density and space heating fuel as its variables, but he also included "background" sulfur dioxide concentrations for each state, which he argued was basically a measure of industrial and utility sulfur dioxide emissions. F. W. Lipfert, "Estimates of Historic Urban Air Quality Trends and Precipitation Acidity in Selected US Cities (1880-1980)" (Brookhaven National Lab, 1987).

[146] The city's other waste disposal method, ocean dumping, seems to have been less common and would have removed more lead from the city environment. In 1944, the city also started experimenting with landfills. "Sanitary Fill Will Be Tried in Baltimore," *Sun*, February 9, 1944, 20. After one poor air quality day, the *Sun* reported that there had been over a dozen fires at just one of the city dumps. Burning materials included "five-gallon cans that once had been filled with paint" and rubber cable coverings burnt to recover the steel in them. "Calm Blamed for Smokiness," *Sun*, October 19, 1944, 17.

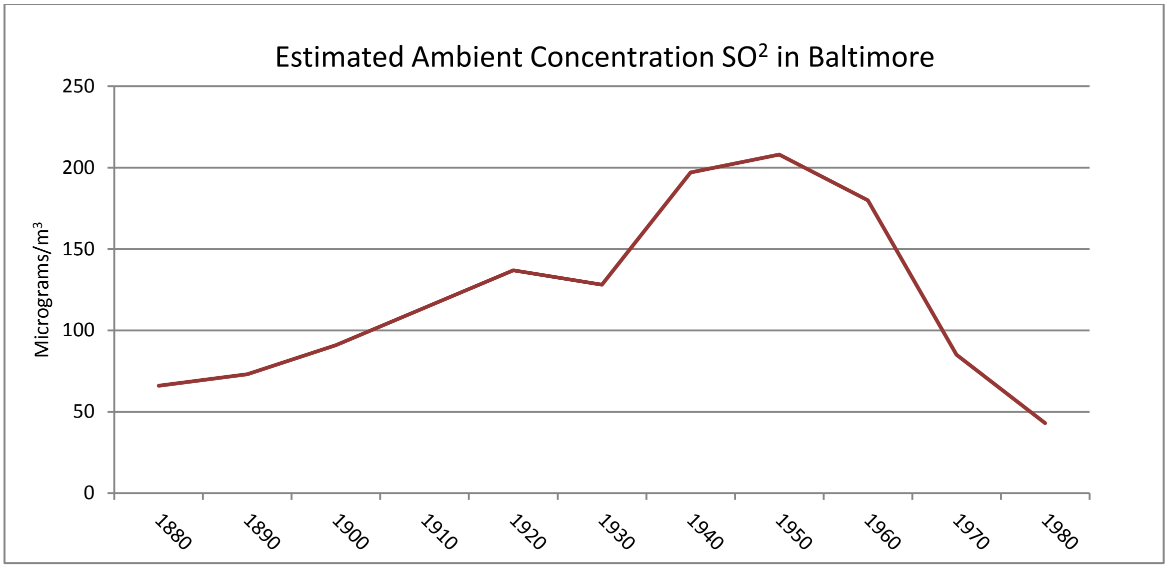


Figure 69: Estimated sulfur dioxide concentration in Baltimore City. The estimate suggests that sulfur dioxide pollution from residential and industrial/utility sources peaked around 1950. Since these sources also contributed to lead emissions, the graph gives us some sense of how much these sources contributed to air lead pollution. Sulfur dioxide concentrations, however, are not a proxy for ambient lead concentrations. **Source:** F. W. Lipfert, "Estimates of Historic Urban Air Quality Trends and Precipitation Acidity in Selected US Cities (1880-1980)" (Brookhaven National Lab, 1987). **Graph:** Leif Fredrickson.

Soon after World War II, industrial emissions began to wane. In addition to state pressure and regulations that made industrial production less polluting (discussed in Chapter Seven), Baltimore's industrial prowess began to wane. Manufacturing establishments increased in the Baltimore metropolitan area until around 1958 and then declined, helped along by an economic recession.[147] Bethlehem Steel, buoyed by the war and the post-war surge in consumption, found itself running at 60% capacity in 1958.[148] In 1962, Maryland's primary metals industry, the industry responsible for much of the lead emissions, employed fewer people than in 1960.[149] The trend toward the deindustrialization of the workforce continued through the 1960s and became even more rapid in the 1970s. In Baltimore, which

[147] In 1939, there were 1,975 establishments, in 1958 there were 2,112, in 1963 there 2,072 and in 1972 there 2,025. In 1977, the number of establishments increased again to 2,175. United States Bureau of the Census, *United States Census of Manufactures: 1958: Industry Statistics* (U.S. Government Printing Office, 1961); *1977 Census of Manufactures: Geographic Area Statistics* (U.S. Department of Commerce, Bureau of the Census, 1981).

[148] Mark Reutter, *Making Steel: Sparrows Point and the Rise and Ruin of American Industrial Might* (University of Illinois Press, 1988), 415.

[149] Maryland Department of Economic Development, "The Maryland Economy and Maryland Projections Study," 1961-1962, Folder 6, Box 51, Series I, HWC Records, LLSC.

had dominated employment for primary metals in Maryland, the sector fell by 25,000 workers between 1960 and 1970, and 40,000 between 1979 and 1984.[150]

At the same time, there was a movement of industry out of Baltimore City to the county suburbs. Thus the decline in manufacturing was even more severe for Baltimore City. In 1950, Baltimore City had 1,738 manufacturing establishments, while Baltimore County 130 and nearby Montgomery County had 79. By 1978, Baltimore City had less than half as many establishments (841) that it had in 1950. Manufacturing in Baltimore County, however, increased to 264 and Montgomery County to 203.[151] The labor force of the city employed in manufacturing fell from 34.1% in 1950 to 25.6% in 1970 and then to 15% in 1980.[152]

As regulations and decentralization to the suburbs reduced industrial emissions in the city, automobile emissions increased. In 1974, the EPA found that the plurality of emissions in the city came from automobiles (30%), followed by refuse burning, industrial sources and space heating (26%, 21% and 19% respectively). Nationally, vehicular emissions also dominated lead air pollution. On the other hand, in the Baltimore Air Quality Control Region, which included surrounding counties, industrial sources dominated (46%), followed by automobiles, space heating and refuse burning (23, 15 and 7% respectively). The relative importance of automobiles for air lead in Baltimore City, despite fewer total vehicular lead emissions in 1974 than Baltimore County, also reflected the differences in areal size between the city and county noted above.[153]

[150] Paul A. Weinstein and Baltimore Urban Observatory, *Baltimore, the Emergence of a Manpower System: A Study Prepared for the Baltimore Urban Observatory* (Dept. of Economics, University of Maryland, 1974), 14; Michael Pacione, *The City: Economic Structure and Change in the Western City* (Taylor & Francis US, 2002), 69. Between 1976 and 2011, primary metals employment in Maryland fell by over 90%. James DiLisio and James E. DiLisio, *Maryland Geography: An Introduction* (JHU Press, 2014), 184.
[151] DiLisio and DiLisio, *Maryland Geography*, 184.
[152] Kenneth D. Durr, *Behind the Backlash: White Working-Class Politics in Baltimore, 1940-1980* (University of North Carolina Press, 2003), 200.
[153] A general estimate of lead emissions in the U.S. found that vehicle emissions already accounted for about 78% of lead emissions in 1970. Even after the phase-out of leaded gasoline began in 1975, vehicular emissions accounted for about 78-81% of lead emissions through 1985. Thus the decline in lead air emissions follows the decline in leaded gasoline use closely. Jerome O. Nriagu, “The Rise and Fall of Leaded Gasoline,” *Science of the Total Environment* 92 (1990): 13–28. U.S. EPA, *National Assessment of the Urban Particulate Problem*, 13.

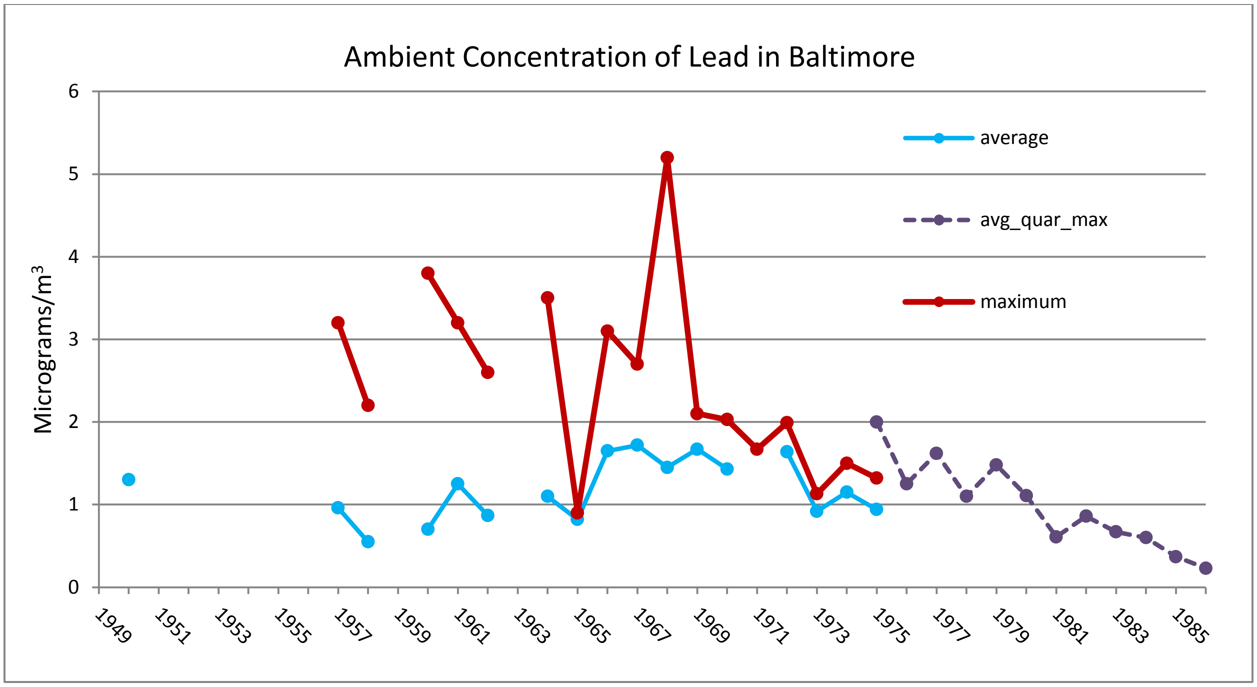


Figure 70: Concentration of lead in Baltimore air. The average and maximum values from 1957 to 1975 were collected in downtown Baltimore City. The 1949 average datum is from mobile air sampling stations in the city and is adjusted to lead levels for the downtown based Cincinnati data from Cholak (1952). The average quarterly maximum data are for the Baltimore Metropolitan area. Although the data is not continuous, it suggests high average and maximum air lead levels around 1969, when automobile lead emissions peaked. It also suggests high maximum air lead levels before 1969, at least as far back as 1957. Average lead levels were lower before 1969. This may reflect the importance of industrial emissions, which were more irregular than vehicular emissions. Overall, average lead emissions were relatively high from at least 1949 to 1975. **Sources:** Jacob Cholak, "The Nature of Atmospheric Pollution in a Number of Industrial Communities," in *Proc. 2nd National Air Pollution Symposium*, 1952, 5–15; U.S. EPA, *Air Quality Data for Non-Criteria Pollutants, 1957 through 1970* (GPO, 1977); U.S. EPA, *Air Quality Data for Non-Criteria Pollutants, 1971 through 1975* (GPO, 1978); U.S. EPA, *National Air Quality and Emissions Trends Report* (GPO, 1985). **Graph**: Leif Fredrickson.

Figure 70 shows the concentration of lead in the air of Baltimore. After 1975, air lead measurements are from the metropolitan area. Before 1975, they are from a station in downtown Baltimore.[154] Before 1975, the measurements are discontinuous, and because they are from a single station, they are probably prone to some error. In general, however, the graph suggests that between 1949 and 1975, average lead levels were very high around the time automobile lead emissions peaked (1969). The graph also suggests high maximum air lead levels before 1969, at least as far back as 1957. Average lead levels were lower before 1969. This may reflect the importance of industrial emissions, which were more irregular than vehicular emissions, producing more fluctuations in samples. Overall, the average lead concentrations in Baltimore's air were high from at least 1949 to 1975. This suggests that lead

[154] The 1949 datum is from a study by a researcher using mobile air sampling units. Compared to measurements from downtown stations, mobile air sampling returned lower air lead concentrations. Thus I have adjusted the measurement from 1949 (which was 1 microgram) by ratio of lead concentrations from mobile sampling units to downtown units in Cincinnati.

emissions from automobiles, which are only partly reflected in these trends in lead air concentration, should not be considered alone as drivers of lead exposure from air pollution in this period. In addition, the contribution of automobile emissions to lead concentration in the air depends on the particle sizes emitted from automobiles. In more congested driving, automobiles emit larger particles that fall to the ground quickly and so are not captured in tests of lead concentration in the air. Thus the emissions from automobiles during the more congested driving conditions of the 1940s and 1950s may not be accurately reflected in the (spotty) measures from these decades.

Urban Climate and Lead Exposure

Once in the urban environment, lead interacts in complex ways with that environment. One of the critical mediators of lead's movement in the environment, and the hazard it posed to people in that environment, was climate. In different ways, wind, rain and sun could amplify lead hazards. For example, many aspects of weather and the environment removed oil, corroded the paint film, and caused blistering, peeling, cracking, checking and flaking. Moisture, sun light, heat, freezing and thawing, snow and ice, abrasive windblown dust, smoke – these could all cause paint deterioration.[155] Moisture and heat were particular critical to the deterioration of lead paint. When moisture seeped under an elastic paint like white lead, and then sunlight or some other source, such as a stove, heated that moisture, the paint would blister and eventually peel.[156]

The synergistic effects of moisture and heat could happen at the micro-scale of a house, but the same was true of changing climates across regions and time.[157] In Baltimore, for example, moisture (precipitation) and heat fluctuated throughout the twentieth century, but there were periods when the city experienced both high temperatures and high precipitation. These periods would probably have produced more weathering of paint. As Figure 71 shows, from about 1949 to 1956 and from about 1973 to 1980

[155] "What is a Good Paint," *The Carter Times*, August, 1923, 3; "Painting the North Side," October, 1925, 1.
[156] Coleman, *The Principles of Paint*, 53.
[157] The South, for example, had problems with heat and humidity, while the North had problems with large temperature fluctuations. Lead Industry Association, "South or North: Pure White Lead Does a Good Job," *Lead*, 1938, 27.

rain and higher temperatures probably contributed to lead paint deterioration in these periods, but were likely not the major factors driving deterioration.[158]

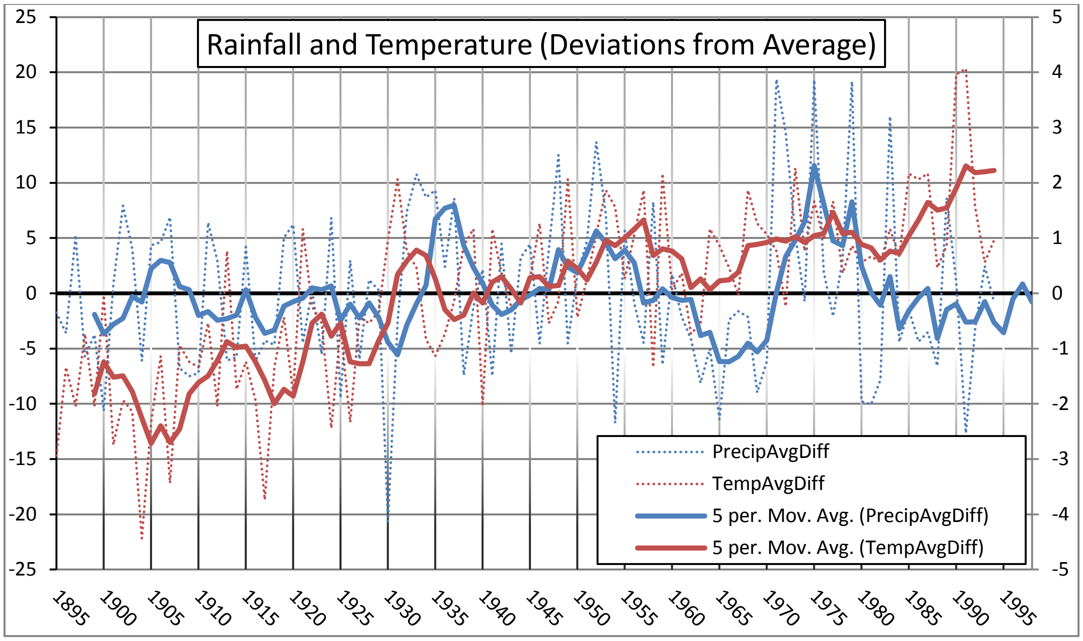


Figure 71: Annual precipitation and temperature in Baltimore in the twentieth century, with five year moving averages. The axes are deviations from average in inches (left axis) and Fahrenheit degrees (right axis). The graph shows periods when precipitation or temperature were above average, which would have contributed to the weathering of lead paint. Importantly, the period in the late-1940s to the late-1950s was a time of both above average temperature and precipitation and a time when peeling lead paint was an especially serious problem. The 1970s (and perhaps the mid-1930s) were also a time when these climatic factors probably conspired to undermine paint. **Source:** Susan Carter, et al., *Historical Statistics of the United States Millennial Edition* (Cambridge University Press, 2006). **Graph:** Leif Fredrickson.

More important for lead exposure was wind. Wind could both remove and exacerbate lead hazards. On the one hand, windless days could trap smog in the city, as it did, for example, in 1944, when wind speed dropped to one to two miles per hour for twelve hours, reducing visibility to a quarter mile.[159] On the other hand, wind could whip up lead-contaminated dust and dirt (what scientists call re-suspension or re-entrainment). Thus lead-polluted land, much of which had become polluted from lead deposition out of the air, became air pollution (again). This contaminated-dust then became a source of lead exposure when people inhaled it, or it settled on food that was eaten, or it landed on the hands of children, who put fingers in their mouths or ate with their hands.

---

[158] The period from 1949 to 1956 was the result of a "zonal regime" that affected all of the mid-Atlantic in the late 1940s and early1950s Colin Polsky et al., "The Mid-Atlantic Region and Its Climate: Past, Present, and Future," *Climate Research* 14, no. 3 (2000): 161–173.
[159] "Calm Blamed for Smokiness," *Sun*, October 19, 1944, 17.

A number of recent studies have demonstrated the importance of re-entrained soil and dust as a factor in child blood lead levels.[160] While there is not continuous or reliable enough data on blood lead levels to check against wind, we can look at child lead poisoning cases. As I discuss below in the section on trends in child lead poisoning cases, reports of child lead poisoning were influenced by factors such as changing awareness and diagnostics. However, there were relatively stable periods in which these factors did not change much and reported cases likely reflected environmental (and random) factors.

Figure 72 graphs the three of these relatively stable periods of reporting along with average summer wind speeds.[161] The graphs do suggest some relationship between wind and child lead poisoning cases. The relationship is messy, however, as would be expected from a factor like re-suspended soil that was probably not a key driver of blood lead levels until after lead paint and leaded gasoline sources became less important. Still, the current association between wind and lead exposure make descriptions like the following from the *Sun* in 1958 sound more ominous: "Showers accompanied by dust-stirring winds sent scores of people… scurrying for cover yesterday… [but] aside from blowing dust into eyes and onto sticky lollipops and ice cream cones, the wind caused little damage."[162]

[160] In addition to wind, soil particle size, temperature, and precipitation have been used as variables to produce a remarkably predictive model of child blood lead levels. Mark AS Laidlaw et al., "Seasonality and Children's Blood Lead Levels: Developing a Predictive Model Using Climatic Variables and Blood Lead Data from Indianapolis, Indiana, Syracuse, New York, and New Orleans, Louisiana (USA)," *Environmental Health Perspectives* 113, no. 6 (2005): 793. Some other studies include Mark A. S. Laidlaw et al., "Re-Suspension of Lead Contaminated Urban Soil as a Dominant Source of Atmospheric Lead in Birmingham, Chicago, Detroit and Pittsburgh, USA," *Atmospheric Environment* 49 (March 2012): 302–10; Sammy Zahran et al., "Linking Source and Effect: Re-suspended Soil Lead, Air Lead, and Children's Blood Lead Levels in Detroit, Michigan," *Environmental Science & Technology* 47, no. 6 (March 19, 2013): 2839–45; Mark A. S. Laidlaw et al., "Children's Blood Lead Seasonality in Flint, Michigan (USA), and Soil-Sourced Lead Hazard Risks," *International Journal of Environmental Research and Public Health* 13, no. 4 (March 25, 2016): 358.

[161] I use summer wind speeds this is the time when soils are drier, and so more easily mobilized by wind, and the ground is not covered in snow.

[162] "Wind, Showers, Sweep Over City," *Sun*, April 21, 1958, 19.

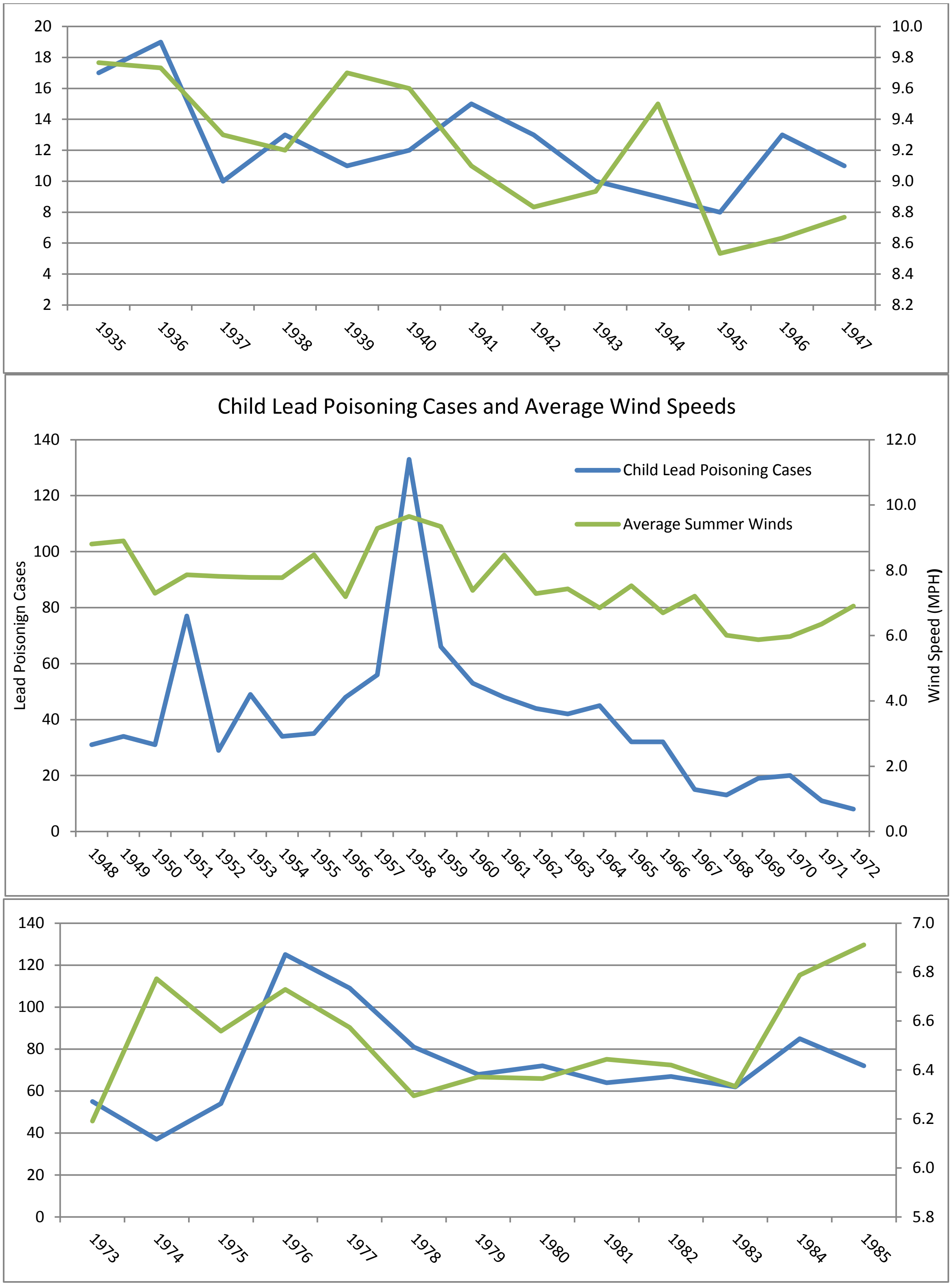


Figure 72: Reported child lead poisoning cases in Baltimore graphed with average summer wind speeds. *Note that the scales of wind speeds and child lead poisoning cases change from graph to graph in order to better compare the variation in wind speed to the "paradigm" of child lead poisoning diagnosis and reporting.* The graphs suggest that higher wind speeds may have contributed to child lead poisoning cases by re-suspending (making airborne) lead-contaminated dust and soil. **Graphs:** Leif Fredrickson.

Lead Exposure in Twentieth Century Baltimore

All sources of lead exposure contributed to cumulative exposure, but food, paint, leaded gasoline, emissions from industry (and other sources) and re-suspended soil were the most important. The severity lead hazards from these critical sources changed over the course of the twentieth century. Each had its own pattern, but there were periods with important overlapping patterns of high exposure. The period from 1945 to 1975 included many overlapping peaks of lead exposure because it was a time of high consumption of lead-related products and a period before bans, regulations and mitigations reduced or eliminated the lead used in the products. Exposure from lead arsenate was a little earlier, although the tail end of high lead arsenate use overlaps with the mid-1940s. Average summer wind speeds were high in the 1950s, but also in the 1930s. Substantial reductions in industrial emissions probably happened earlier than the 1970s as a result of regulations and the spread of industry to the suburbs. Lead paint regulations came into force at the local level before this. But unlike bans on lead in gasoline and in food, lead paint bans took a long time to have an effect for two reasons. First, while non-lead paints replaced lead paints in the market, they did not replace lead paint in housing until much later, if ever. Second, the greatest hazard in lead paint was not from its initial use, but from the deterioration of paint. So what mattered most was the continuing, widespread presence of deteriorating lead paint. And that persisted well after the Baltimore 1951 ban on lead paint.

Within the period of high exposure from 1945 to 1975, there is reason to see the 1950s as the peak period. It was a period of high industrial emissions. It was not the peak period of lead emissions from automobiles, but it included the second highest peak of lead emissions from that source. Air lead concentrations seem to have been higher in the 1960s, but the data is patchy for the 1950s and, again, the air concentration misses some of the automobile emissions that were large particle sizes. Exposure to lead in canned milk, perhaps the most important single source of lead food exposure for children, was very high in the 1950s, having peaked in the late 1940s. (Citrus juice peaked in a similar way to canned milk and was also a favorite drink to give to children). Lead paint is the hardest of these exposures to track, but exposure to lead paint probably peaked in the 1950s, at a time when lead paint was pervasive in housing and the cumulative impact of the Great Depression, World War II housing congestion, and post-war disinvestment and housing exploitation produced many housing units with deteriorating lead paint. Housing code enforcement, increased tenant legal powers, normal housing remodeling, and housing abandonment all slowly reduced lead paint hazards in the 1960s and after. Finally, lead exposure from re-suspended dust and soil may also have been highest in the 1950s. This decade had a combination of very high wind speeds and, presumably, very high contamination of dust and soil with lead. The 1930s had very high wind speeds, but leaded gasoline had only been in use for a decade or so and was not used in the high rates it was after World War II. The 1970s had much lower average wind speeds than the 1950s (note the different scales on the wind speed axis). Thus while leaded gasoline contributed to more soil contamination in the late 1960s and early 1970s, this soil was not as likely to be re-suspended. In addition to leaded gasoline, deteriorating lead paint also contributed to contaminated dust and soil. And again, this deterioration of paint was probably greatest in the 1950s. Although far from certain, there is reason to believe that the 1950s was the worst decade for lead exposure based on the trends in exposure from different sources. An examination of child lead poisoning cases and blood lead levels over time, however, tends to corroborate this interpretation.

Chapter 10 – Toxic Consequences: Lead Effects in Twentieth-Century Baltimore

Despite the incredible advances in medical science and technology, not to mention record keeping with computers, governments kept far more scrupulous records of canned tangerine juice than they did child lead poisoning cases for most of the twentieth century. Fortunately, Baltimore was an exception. Since 1932, the city kept continuous records of reported child lead poisoning cases, and since 1935 it typically recorded the blood lead levels of the lead poisoning victims. Blood lead tests are a much more useful indicator of lead absorption than diagnosed cases because they are not vulnerable to changes over time in how the diagnosis was made, and because they give us a better sense of what lead poisoning really is: a continuum of effects that start at a few micrograms/dL of blood and continue on up to death. Unfortunately, blood lead levels of children diagnosed with lead poisoning do not tell us much about the lead exposure of the rest of the population. There are studies and population screenings of blood lead levels that do give us some of this information, however, until the 1970s, these surveys were few and far between. Still, the tests that do exist are indispensable as snapshots and benchmarks that help us make sense of the complicated patterns of lead exposure and absorption over time. My argument, based on data about blood lead levels and lead poisoning cases, is that these indicators of absorption are in line with my argument in the previous chapter that lead exposure peaked around the 1950s.

In addition to their usefulness in tracking patterns of absorption and corroborating patterns of exposure, blood lead tests are critical for making inferences about the effects of lead exposure in the past. That is where I turn in this second half of this chapter – to the effects of lead on people in Baltimore and on groups within Baltimore, especially whites and African Americans. I focus on two effects. The first is the effect of lead on intelligence, and by extension the effect on earnings later in life. My conclusion is that increased lead exposure contributed significantly to decreased earnings later in life. And because blood lead levels were probably higher (on average) for African Americans than whites, this effect on earnings was disproportionate, contributing to already severe income inequality.

My second focus is an engagement with the theory that lead exposure drove crime rates over time. This theory has gained considerable momentum over the last ten years, although it is controversial. A test of this theory in a city offers an opportunity to reduce some of the problems with studying bigger aggregates of diverse people and places, as is the case with state and national level studies of the crime-lead association. I also argue that the data I use is more refined than previous studies, including other studies of cities. And I make some more general arguments about trends in lead exposure over the twentieth century that draw on the first part of this chapter and the previous chapter. My argument is that the theory suggesting that lead exposure largely explains crime rates in the twentieth century does not seem to hold up for Baltimore, and that there are several serious problems with its conceptualization for the United States in general.

Child Lead Poisoning Cases and Deaths

Although changing awareness, diagnostic criteria and diagnostic methods conditioned the diagnosis and reporting of child lead poisoning cases, trends in case-reports over time can still be useful for understanding changing lead exposure. While there were many small changes in these factors from year to year, there were some periods where these factors formed relatively stable "paradigms." Table 6 is a conceptualization of these paradigms for Baltimore City. Before 1913, there was little concern or awareness of child lead poisoning. After Blackfan's study in 1913, some pediatric specialists became concerned about child lead poisoning. In Baltimore, Edwards Park of Johns Hopkins's Harriet Lane Home for Children began tracking cases in the 1920s. In 1932, as a result of the epidemic of poisoning from batteries (and at the urging of Park), the BCHD became involved in trying to track and mitigate child lead poisoning. The period from 1935 to 1947 was characterized by diagnostic blood lead tests, moderate concern about child lead poisoning, and a lead poisoning definition that mainly included children with life threatening symptoms. Physicians considered a blood lead level (BLL) of 80 micrograms/dL or more to be elevated (or "abnormal" in the parlance of the time). The period from 1948 to 1969 was characterized by a higher level of awareness and concern about child lead poisoning. In this period, physicians also started to diagnose children with lead poisoning who had slightly less severe symptoms, including prominent cognitive impairments. This happened alongside reductions over time in the upper limit of acceptable blood lead levels for children. From 1935 to 1947, the average BLL was 239 micrograms/dL. From 1947 to 1955, it was 224 micrograms/dL. There are no data for 1956-1958, or after 1960, but in 1959, the average was 189 micrograms/dL.[163] In 1970, the surgeon general declared 40 micrograms/dL the criteria for elevated blood lead.[164] More importantly than the lowered BLL criteria (which does not appear to have had much of an effect on reported child lead poisoning cases), the city began a blood lead screening program in 1973. The period from 1973 to 1985 also saw increased awareness of the issue, and in 1975, a lower threshold was established for considering children poisoned (30 micrograms/dL of blood).

[163] These means, however, are not statistically significantly different. The standard errors are 11.9, 9.2 and 17.2, respectively. For data, see Folder Lead Poisoning in Baltimore Children 1931-1955, Box R125R2 Lead, Anna Baetjer Papers, AMCM Archives.

[164] Given that 1970-1972 was a small paradigm that did not seem to have much of an effect, I included it in the 1948-1969 paradigm when graphing child lead poisoning cases with average wind speeds in Figure 72.

Table 6: Diagnostic Paradigms of Child Lead Poisoning in Baltimore				
Paradigm	**Awareness/Concern**	**Diagnostic Symptoms**	**Blood Lead Testing**	**X-Ray**
Pre-1913	Very Little	Life threatening	No	
1913-1931	Pediatric Specialists (moderate)	Life threatening	No	Begin in this period
1932-1934	Public Health Department (high)	Life threatening	No	Yes
1935-1947	Public Health Department (moderate)	Life threatening	Yes. Elevated BLL above 80 micrograms.	Yes
1948-1969	Public Health Department (high); physicians (moderate); Public (low)	Life threatening; prominent cognitive impairment	Elevated BLL 60. Surgeon General official declares 60 in 1965, but BCHD using 60 in 1950s.	
1970-1972	Public Health Department (high); physicians (high); Public (moderate)	Prominent cognitive impairment. Less prominent cognitive or health symptoms combined with elevated BLL.		
1973-1974	Public Health Department (high); physicians (high); Public (moderate)	Prominent cognitive impairment. Less prominent cognitive or health symptoms combined with elevated BLL.	Elevated BLL 40. Blood lead screening begins.	
1975-1985	Public Health Department (high); physicians (high); Public (moderate)	Prominent cognitive impairment. Less prominent cognitive or health symptoms combined with elevated BLL.	Elevated BLL 30. Sometime in 1985, elevated BLL changed to 25. Blood lead screening.	

Table 6: Diagnostic paradigms of child lead poisoning in Baltimore. As the table shows, there was considerable variation in awareness, diagnostic symptoms and diagnostic tests, such as blood lead tests, over time in Baltimore. But there were also periods with relative stability in these factors. **Table:** Leif Fredrickson.

These paradigms help us better understand the trends in reported child lead poisoning cases in Baltimore from 1913 to the 1980s (Figure 73). The graph shows a number of fluctuations in reported child lead poisoning cases. These are sometimes the result of changes in lead exposure (battery case burnings in 1932) and sometimes the result of other changes, such as the institution of blood lead screening in 1973. Although there were changes in aspects of diagnosis and awareness within the above paradigms, there was enough stability that we can interpret trends within paradigms partly in terms of changes in exposure. The most important trend to highlight is within the paradigm from 1948 to 1969. In these years, lead poisoning cases spiked in the 1950s and then declined in the 1960s. It is hard to compare the 1960s to the 1970s given the changes in reporting caused by blood lead screening. But cases declined through 1972, despite a lower threshold for elevated blood lead levels. These patterns support my earlier conclusion that lead paint exposure was worse in the 1950s and started getting better (although hardly good) in the 1960s and 1970s.

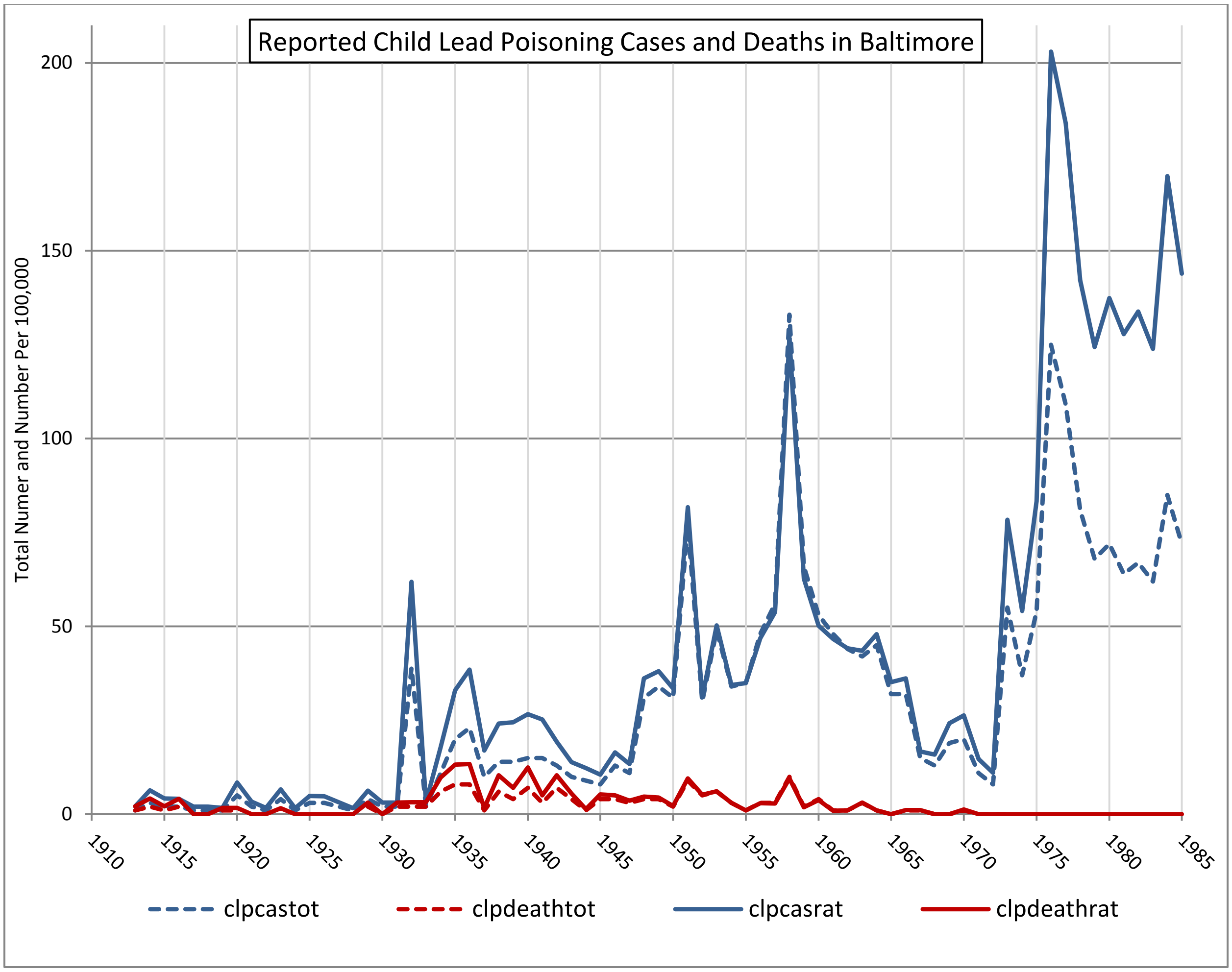


Figure 73: Reported child lead poisoning cases (clpcastot), deaths (clpdeathtot), and case rates (clpcasrat – per 100,000) and death rates (clpdeathrat – per 100,000) adjusted by the population under the age of five. The graph shows a number of fluctuations in reported child lead poisoning cases. These are sometimes the result of changes in lead exposure (battery case burnings in 1932 and housing deterioration in the 1950s) and sometimes the result of other changes, such as the institution of blood lead screening in 1973. **Sources:** See Figure 33. **Graph:** Leif Fredrickson.

Blood Lead

Today, blood lead levels (BLLs) are the standard way that public health experts track lead absorption in children. In an ideal world, we would have year to year random samples of blood lead from children to see how average blood lead levels change. But there has been no year to year sampling of BLLs in Baltimore or any other city. The only data are from children diagnosed with lead poisoning, which do not tell us about average blood lead tests, and from a sprinkling of studies that give some glimpse into changes in blood lead levels over time.

As with lead poisoning cases, comparisons across time (and place) must be treated with caution. Laboratory methods and study purposes varied, and these variations affected the results. However, the EPA has upheld the main blood lead test used from the 1930s to the early 1970s, dithizone, as reliable when measured against more accurate and sensitive tests. While the dithizone method might yield slightly different parameters for blood lead than other tests (as all blood lead testing methods do in relation to each other), the method provides a reasonably accurate record of changing blood lead levels over much of the twentieth century. This reliability is probably especially true for Baltimore because the crucial aspect of dithizone reliability was not the method, but the practitioner. Baltimore had perhaps the most experienced practitioner of the dithizone method in the world, Emmanuel Kaplan, the city's lead chemist at the health department.[165]

The purpose of blood lead testing also shaped what kind of evidence is available on blood lead changes over time. Health experts started using tests to determine the lead content of blood in the early 1930s. Until the 1960s, most of the blood lead testing was as an aid to clinical diagnosis for children suspected of lead poisoning. The main exceptions were a few studies that attempted to survey more general populations as a way of exploring laboratory methods, other diagnostics or to discern the "normal" blood lead level in the population.[166] The dearth of lead screening and surveillance was due to a

---

[165] Dithizone is a colorimetric method. Colorimetry mixed a reagent, such as dithizone (or diphenylthiocarbazone), with blood to form a chemical complex whose light patterns (measured with spectrophotometry) could reveal the content of lead. For discussions of blood lead determination methods see Carl E. Willoughby and Elwood S. Wilkins, "The Lead Content of Human Blood," *Journal of Biological Chemistry* 124, no. 3 (August 1, 1938): 639–58; *Hazardous Metals in Human Toxicology* (Elsevier, 1984), 154; Environmental Protection Agency, *Air Quality Criteria for Lead*, 9.6-9.16; Joseph L. Annest and Kathryn R. Mahaffey, *Vital and Health Statistics: Data from the National Health Survey* (U.S. Department of Health, Education, and Welfare, Public Health Service, National Center for Health Statistics, 1984), 49; Paul Mushak, *Lead and Public Health: Science, Risk and Regulation* (Elsevier, 2011), 346–50. Three blood lead determination methods, dithizone, spectrographic and polarographic, gave "closely concordant results" according to J. Cholak, K. Bambach, and others, "Measurement of Industrial Lead Exposure by Analyses of Blood and Excreta of Workmen.," *Journal of Industrial Hygiene and Toxicology* 25, no. 2 (1943): 47–54.

[166] Willoughby and Wilkins, "The Lead Content of Human Blood"; Emanuel Kaplan and John M. McDonald, "The Blood Lead Value as an Aid in the Diagnosis of Lead Poisoning," *Journal of Pharmacology and Experimental Therapy* 63 (1938): 17; J. Edmund Bradley et al., "The Incidence of Abnormal Blood Levels of Lead in a Metropolitan Pediatric Clinic: With Observation on the Value of Coproporohyrinuria as a Screening Test," *The Journal of Pediatrics* 49, no. 1 (1956): 1–6; Robert A. Kehoe, Frederick Thamann, and Jacob Cholak, "Normal Absorption and Excretion of Lead," *Journal of the American Medical Association* 104, no. 2 (January 12, 1935): 90–92; R. A. Kehoe, "Exposure to Lead," *Occupational Medicine* 3, no. 2 (February 1947): 156–71; Morton J.

combination of the expense of these programs and because many health experts did not see a need for them because they did not believe that non-symptomatic lead absorption was a serious problem. As evidence grew in the post-war period that certain populations in cities were at higher risk for lead poisoning and that lower levels of lead could cause serious health problems, the idea of screening populations became more prominent. Federal government funding for screening and national surveys began in the 1970s. Academic researchers also carried out more studies in and after the 1970s.[167] In general, blood lead level averages for people suspected of lead poisoning would be higher than averages from people screened due to risk for lead poisoning, and the averages from screening at-risk populations would be higher than studies of the general population (i.e., people not considered at-risk).[168] Comparing studies with the same purposes (diagnosis, screening and surveys) across time is more reliable in terms of trends, but even comparing studies with different purposes can be useful if we keep in mind how those studies would weight results toward higher blood lead levels.

Overall blood lead levels declined over the twentieth century (Table 7 and Table 8). Estimates of prehistoric BLLs suggest that by the twentieth century, the baseline lead absorption of people in the United States was hundreds or thousands of times greater than preindustrial people. Since there were not blood lead tests until the 1930s, we have to start there to look for more detailed changes in blood lead. In that decade, dithizone tests involving hundreds of patients not suspected of lead poisoning in Philadelphia, Germany (Table 7) and Baltimore (Table 8) produced remarkably similar BLLs close to 30 micrograms/dL. Other studies that did not use the dithizone method yielded different results and one study using dithizone with only 14 subjects yielded an average BLL of 55 micrograms for Glasgow, Scotland. The proportions of people with blood lead above 20 and 40 micrograms were also remarkably

---

Robinson, Felix E. Karpinski, and Heinrich Brieger, "The Concentration of Lead in Plasma, Whole Blood and Erythrocytes of Infants and Children," *Pediatrics* 21, no. 5 (May 1, 1958): 793–97.

[167] National blood lead surveys began in 1976, when the National Center for Health Statistics (later part of the CDC) began conducting large surveys of blood lead as part of the National Health and Nutrition Examination Survey (NHANES) studies. These were sophisticated, serial surveys that collected samples from many socioeconomic and demographic strata. NHANES II, from 1976-1980, was the first survey that included blood sampling for lead. A Hispanic NHANES followed, from 1982-1984, to collect data on the previously under-surveyed Hispanic population. More NHANES and CDC-related surveys of blood lead followed these.

[168] Mushak, *Lead and Public Health*, 346.

similar for Philadelphia and Baltimore (there was no data for the Germany study). On the other hand, Philadelphia had about four times as many people with lead levels about 60 micrograms.

There were few general survey studies of blood lead levels in the 1940s and 1950s, but studies from Philadelphia and Baltimore suggest that average BLLs either did not change much or increased a little. In Philadelphia, the median blood lead in 1956 was slightly higher than the arithmetic average in 1938.[169] The arithmetic average for 1956 would almost certainly have been even higher, given how BLLs were skewed toward some very high levels. On the other hand, the 1956 data is for children, who usually have higher average BLLs than adults. Baltimore shows an even greater change, with an average of 43 micrograms/dL in 1954.[170] These data, however, were also for children. Moreover, they were collected from a 95% African-American part of the city and black subjects often showed higher average BLLs than the white population. (The 1956 study of Philadelphia, however, included both black and white children and found no differences in BLLs between them.) Nevertheless, looking at the data from Table 8, the increase of 150% over the 1938 data is large enough to suggest increased lead absorption in addition to differences in population samples. Thus data from both of these cities suggest an increase in lead absorption from the 1930s to the 1950s, although it is not clear how large this increase in absorption was.

In the 1960s and early 1970s, researchers undertook more general studies of blood lead. These showed a continuing decline in average BLLs as well as differences between people living in different geographic areas. Many studies began using geometric, rather than arithmetic, averages in the 1960s. Geometric means, like median values, are less prone to influence by outliers and skewed distributions. For BLLs, which, as stated, are usually skewed to high blood lead levels, this means that the geometric mean of the sample will usually be lower than the arithmetic mean. But taking this in to consideration geometric means still show a pattern of declining BLLs. Studies of remote, rural, suburban and urban places from this period also show that average BLLs increased along this continuum. This is consistent with one of the key arguments of this dissertation – that urban areas bore a greater burden of lead

[169] Robinson, Karpinski, and Brieger, "The Concentration of Lead in Plasma, Whole Blood and Erythrocytes of Infants and Children."
[170] Bradley et al., "The Incidence of Abnormal Blood Levels of Lead in a Metropolitan Pediatric Clinic."

exposure than suburban areas. Similarly, studies of poor, African-American areas within urban areas, such as East St. Louis, show even higher BLLs than urban areas in general.

Table 7: Blood Lead Levels Over Time From Select Studies								
Year	**Place**	**Age**	**Mean (A)**	**Mean (G)**	**>10**	**>20**	**>40**	**>60**
Prehistoric		adult		0.016				
Prehistoric		child		0.06-0.12				
1936	Germany	adult	35.0					
1937	Philadelphia	adult	25.0		99.5%	88.4%	35.4%	10.1%
1956	Philadelphia	child		27.0[a]				
1960	Chicago	adult	20.0					
1960	Remote Mountains (CA)	adult		10.5				
1960	Central Ohio - Rural	adult	14.0					
1962	United States - Rural	adult		13.0				
1962	Philadelphia - Suburban	adult		13.0				
1962	United States - Urban	adult		19.0				
1970	Chicago - Suburban	adult	14.0					
1970	Chicago - Urban	adult	17.6					
1970	Philadelphia - Suburban	adult	17.9					
1970	Philadelphia - Urban	adult	20.1					
1971	East St. Louis	child	29.0					
1978	United States	all	13.9	12.8	77.9%	15.0%	0.4%	
1978	United States	child	16.0	14.9	87.8%	24.5%	0.5%	
1990	United States	all		2.8	8.6%			
1992	United States	child		2.7	4.4%			
2000	United States	all		1.6	3.96%	0.78%		
2000	United States	child		1.9	1.6%			

Table 7: Blood lead changes over time and place from select studies. The columns report the year and place the study applies to, the age of the population (color coded), and the arithmetic mean (A), geometric mean (G), and percentages of people who were above blood lead levels of 10, 20, 40 and 60 micrograms per deciliter. **Notes: (a)** This is a median value, not a geometric mean. **Sources**: Carl E. Willoughby and Elwood S. Wilkins, "The Lead Content of Human Blood," *Journal of Biological Chemistry* 124, no. 3 (August 1, 1938): 639–58; U.S. Department of Health, Education and Welfare, *Survey of Lead in the Atmosphere of Three Urban Communities* (U.S. Department of Health, Education, and Welfare, Public Health Service, Division of Air Pollution, 1965); Morton J. Robinson, Felix E. Karpinski, and Heinrich Brieger, "The Concentration of Lead in Plasma, Whole Blood and Erythrocytes of Infants and Children," *Pediatrics* 21, no. 5 (May 1, 1958): 793–97; Lloyd Barton Tepper and Linda S. Levin, *A Survey of Air and Population Lead Levels in Selected American Communities: Final Report* (Environmental Protection Agency, 1972); Joseph L. Annest and Kathryn R. Mahaffey, *Vital and Health Statistics: Data from the National Health Survey* (U.S. Department of Health, Education, and Welfare, Public Health Service, National Center for Health Statistics, 1984); Paul Mushak, *Lead and Public Health: Science, Risk and Regulation* (Elsevier, 2011), 349–52. **Table**: Leif Fredrickson.

In the 1970s and 1980s, blood lead levels fell even more. As noted above, a number of policies and technological changes reduced lead exposure from gasoline, paint, food and water in the 1970s and 1980s. In the 1970s, the government began including BLL surveillance in its NHANES studies. In addition to showing general declines in BLL, these broad surveys in the 1970s and 1980s showed that children had higher BLLs than adults, black children had higher BLLs than white children, lower-income children had higher BLLs than higher-income children, and children from urban areas had higher BLLs than those from rural areas.[171] By the early 1990s, average child BLLs appear to have been about 80% to 90% lower than they had been from the 1930s to the 1960s. However, the local variation in lead exposure makes it difficult to compare the NHANES national survey with earlier surveys done cities.

Blood lead tests from Baltimore can help use see trends within one city over time (Table 8). Most of these tests were not general surveys, but were screenings or compilations of data about BLLs from people who doctors believed might have lead poisoning ("suspected" in the table). So these results must be treated with caution. But doctors within the city used the same basic clinical signs as indicators of child lead poisoning and public health departments used the same basic set of risk factors to guide screening. The tests are probably comparable with each other, and different tests can be compared keeping in mind that "screening" results will likely be higher than general survey results, and "suspected" results will likely be higher than "screening" results (how much higher is harder hard to say).

As with the data from other places and national surveys, BLLs in Baltimore appear to have declined over time. As noted, the blood lead surveys of patients at hospitals and clinics in 1938 and 1954 who were *not* suspected of lead poisoning showed very high average BLLs.[172] There were no surveys or screenings in the 1960s, unfortunately, but compilations of data on suspected child lead poisoning cases in the mid-1960s suggest a decline in BLLs, at least among those with BLL over 60 micrograms/dL. Similarly, data on suspected child cases in 1970 show declines in children with BLLs above 30 and 60 micrograms/dL, and an average BLL around 27 micrograms/dL. Given that the data from 1970 were *suspected* cases, and 15 micrograms lower than the survey of children in 1954, there appears to have been a substantial decline in BLLs from the 1950s to 1970. Screening studies in and after the 1970s also show

[171] J. L. Annest et al., "Blood Lead Levels for Persons 6 Months - 74 Years of Age: United States, 1976-80," *Advance Data: From Vital and Health Statistics of the National Center for Health Statistics*, no. 79 (May 12, 1982): 1–23.

[172] Adults and children in 1940 suspected of lead poisoning, but who were ultimately *not* diagnosed with lead poisoning, show higher BLLs than the non-suspected population surveyed 1938. That is expected since "lead poisoning," while treated categorically for the purpose of diagnosis, was never a categorical disease. Thus it is likely that some of clinical signs that suggested lead poisoning and prompted a BLL tests *were* the result of elevated BLL levels, even if those patients were not diagnosed as having lead poisoning.

declines, both in comparison to data from 1970 and before, and over time through the 1980s and 1990s. Overall, there were enormous declines in the proportion of people with very high blood lead levels in Baltimore. Only 6% of children had BLLs over 20 micrograms/dL in 1997, compared to 99.7% of the children sampled in 1954. In the 1930s and 1950s, around 60% to 70% of children had BLLs above 40 micrograms/dL – by 1997, less than 1% did. Over a quarter of children from the 1954 study had BLLs over 60 micrograms/dL, but the number was virtually zero in 1997. Reductions in the highest BLL ranges (over 60 and 80 micrograms/dL) seem to have come before the 1970s, while reductions in BLLs over 40 micrograms/dL came in both the 1960s and the 1970s.

Table 8: Blood Lead Levels Over Time in Baltimore

Year	Selection	Age	Mean (A)	> 10	> 20	> 30	> 40	> 50	> 60	> 70	>80
1938	general[a]	all	31.0[e]		92.1%	72.2%	39.7%	8.7%	2.4%	1.6%	0.8%
1940	suspected[b]	child	45.0			85.3%	62.7%	34.5%	22.0%	11.3%	4.0%
1940	suspected[b]	adult	45.0			85.6%	62.2%	35.1%	15.5%	7.6%	4.8%
1954	general[c]	child	43.0[e]		99.7%	89.8%	70.9%	44.4%	25.8%	12.0%	6.3%
1965	suspected	child							11.8%		
1966	suspected	child							11.3%		
1970	suspected	child	27.1				31.6%		7.4%		1.4%
1973	screening	child	17.7				11.3%		1.6%		
1974	screening	child					12.2%				
1975	screening	child	16.7			10.6%	5.8%	1.6%			
1980	screening	child				5.8%		2.2%			0.5%
1983[d]	screening	child	15.6								
1985	screening	child				1.0%		0.2%			0.0%
1993	screening	child		33.9%							
1997	screening	child	8.0[e]	29.2%	6.0%	1.2%	0.3%	0.1%	0.0%	0.0%	0.0%
2000	screening	child		16.7%							

Table 8: Blood lead changes over time in Baltimore. The columns report the year, the population selected, the age of the population (color coded), and the arithmetic mean (A), and percentages of people who were above blood lead levels of 10 to 80 micrograms/dL. **Notes: (a)** "General" selection means the subjects were not selected because they were suspected or at risk for lead poisoning. In this case, they were adults and children from hospitals. The "suspected" populations denoted with **(b)** were not diagnosed with lead poisoning. The other "suspected" groups in this table included some children diagnosed with lead poisoning. **(c)** This "general" population was children who attended a health clinic in a poor, 95% African-American section of the city. **(d)** This is an average calculated from data from 1980 to 1985. **(e)** These means were given by the sources, presumably calculated from all the individual blood lead levels. All other means I calculated based on the midpoint for the blood lead ranges given for individuals cases. For example, if ten cases were reported as having a blood lead level between 10 and 19 micrograms/dL, I gave all these cases a value of 14.5 for the purpose of calculated averages. In most cases, ranges were reported in intervals of 10 micrograms. **Sources**: Kaplan and McDonald, "The Blood Lead Value as an Aid in the Diagnosis of Lead Poisoning"; John M. McDonald and Emanuel Kaplan, "Incidence of Lead Poisoning in the City of Baltimore," *Journal of the American Medical Association* 119, no. 11 (1942): 870–872; Bradley et al., "The Incidence of Abnormal Blood Levels of Lead in a Metropolitan Pediatric Clinic"; Jane S. Lin-Fu and others, "Undue Absorption of Lead among Children. A New Look at an Old Problem.," *New England Journal of Medicine* 286, no. 13 (1972): 702–10. BCHD, *Annual*, 1965, 1966, 1997. BCHD, *Weekly Letter to the Mayor*, March 1, 1974, Folder Health Department 1974; and BCHD, *Weekly Letter to the Mayor*, May 2, 1975, in Folder Health Department 1975, both in Box 2, Series 6, BRG 19, BC Archives. CDC, *Morbidity and Mortality Weekly Report*, September 7, 1974. [BCHD], "Baltimore City Health Department Child Lead Poisoning Prevention Program," [February 1986]; [Property Owners Association], "Child Lead Poisoning Statistics," June-July 1985, both in Folder Lead Poisoning/Lead Paint, Box 855, Series 42, BRG 9, BC Archives. Maryland Department of the Environment, "Child Blood Lead Surveillance, Baltimore City, 1993-2008," www.mde.state.md.us/assets/document/LeadCoordination/LeadGraphBCbll1993-2008.pdf. **Table**: Leif Fredrickson.

Learning and Earning

Many studies have found that elevated blood lead levels – even relatively low blood lead levels by historical standards – are associated with mental health problems and deficits in memory, learning, intelligence, attention, impulse control, motor functioning, and visual and spatial processing. Studies have also explored the neurobiological underpinnings of these psychological deficits, providing accounts of how lead molecules affect neurons, synapses, regions of the brain, and ultimately the way the brain functions.[173] Lead has thus affected the experience, quality of life and life chances of people in many ways.

In this section, I focus on the most studied psychological effect of lead – its effect on intelligence – and relate that effect to decreases in income and racial inequality in Baltimore. Psychologists have shown that intelligence is a malleable trait, affected by a multitude of factors. Intelligence is measured by IQ tests, or other cognitive tests that are correlated with IQ tests. IQ tests are correlated with life outcomes such as educational attainment and earnings. The relationships between these phenomena are complicated because many other factors are also correlated with education and earnings. Moreover, while IQ seems to "predict" education (in part), education can affect IQ. Despite these complications, studies strongly suggest that intelligence is a psychological trait, that it can be measured, and that it is important for education and income.[174] Building on research connecting blood lead levels to decrements in intelligence, researchers in the 1990s began estimating the effects of lead on intelligence and intelligence decrements on loss of earnings. The effect on earnings was seen as partly an effect of education and partly an independent effect on the job a worker got, how many hours he worked and whether he worked at all. For

[173] James K. Goodlad, David K. Marcus, and Jessica J. Fulton, "Lead and Attention-Deficit/Hyperactivity Disorder (ADHD) Symptoms: A Meta-Analysis," *Clinical Psychology Review* 33, no. 3 (April 2013): 417–25; Aaron Reuben et al., "Association of Childhood Blood Lead Levels With Cognitive Function and Socioeconomic Status at Age 38 Years and With IQ Change and Socioeconomic Mobility Between Childhood and Adulthood," *JAMA* 317, no. 12 (2017): 1244–1251; Lisa H. Mason, Jordan P. Harp, and Dong Y. Han, "Pb Neurotoxicity: Neuropsychological Effects of Lead Toxicity," *BioMed Research International* 2014 (January 2, 2014): e840547; David K. Marcus, Jessica J. Fulton, and Erin J. Clarke, "Lead and Conduct Problems: A Meta-Analysis," *Journal of Clinical Child & Adolescent Psychology* 39, no. 2 (February 26, 2010): 234–41; Richard L. Canfield, Mathew H. Gendle, and Deborah A. Cory-Slechta, "Impaired Neuropsychological Functioning in Lead-Exposed Children," *Developmental Neuropsychology* 26, no. 1 (August 1, 2004): 513–40; K. M. Cecil, "Effects of Early Low-Level Lead Exposure on Human Brain Structure, Organization and Functions," *Journal of Developmental Origins of Health and Disease* 2, no. 01 (2011): 17–24; Kim M Cecil et al., "Decreased Brain Volume in Adults with Childhood Lead Exposure," *PLoS Med* 5, no. 5 (May 27, 2008): e112; Theodore I. Lidsky and Jay S. Schneider, "Lead Neurotoxicity in Children: Basic Mechanisms and Clinical Correlates," *Brain* 126, no. 1 (January 1, 2003): 5–19; David C. Bellinger, "Neurological and Behavioral Consequences of Childhood Lead Exposure," *PLoS Med* 5, no. 5 (2008): e115; April P. Neal and Tomás R. Guilarte, "Molecular Neurobiology of Lead (Pb2+): Effects on Synaptic Function," *Molecular Neurobiology* 42, no. 3 (November 2, 2010): 151–60; Christopher J. Brubaker et al., "Altered Myelination and Axonal Integrity in Adults with Childhood Lead Exposure: A Diffusion Tensor Imaging Study," *NeuroToxicology*, 10th International Symposium on Neurobehavioral Methods and Effects in Environmental and Occupational Health, 30, no. 6 (November 2009): 867–75; Mason, Harp, and Han, "Pb Neurotoxicity."

[174] Ulric Neisser et al., "Intelligence: Knowns and Unknowns," *American Psychologist* 51, no. 2 (1996): 77–101; Richard E. Nisbett et al., "Intelligence: New Findings and Theoretical Developments.," *American Psychologist* 67, no. 2 (2012): 130.

my estimation of the effects of lead on intelligence and earnings in Baltimore, I draw on a recent re-assessment of the study of the effects of IQ on earnings by David Salkever. In addition to a number of specific issues that Salkever outlines for why his methodology is sturdy, Salkever uses survey data from 1990 of 25 to 33-year-olds. Thus his subjects were born between 1957 and 1965 during a time period well-within the scope of this dissertation. That is important, since the effects of IQ on earnings have changed over time.[175]

To maximize the reliability of my estimates, I drew on people born in the same time period that Salkever studied (1957 to 1965). I estimated average blood lead levels for white residents by linear interpolation from the 1938 study of BLLs in the general population of Baltimore to the 1978 average BLLs reported in NHANES for white children in central cities. For the BLLs of black residents, I interpolated from the 1938 study of the general population to the 1954 study of black, inner city children in Baltimore, and then to the 1978 NHANES average for black children in central cities. For the period from 1957 to 1965, this yielded a BLL range for whites of 27.2 to 23.4 and a range of 40.5 to 33.9 for black Baltimoreans.[176] To estimate the effects of BLL on IQ, I used a recent longitudinal study of the effects of lead exposure in childhood on later adult IQ scores. This study estimated a 1.61 decrement in IQ for every five micrograms/dL of blood.[177] Salkever estimated a decrease of 1.318% for ever point of IQ. These gave the following results for cohort of children born in Baltimore from 1957 to 1965: The IQ loss for whites ranged from 8.75 to 7.55 and from 13.05 to 10.91 for black Baltimoreans. The difference in IQ decrement was about three or four points. A standard deviation in IQ is 15 points. This is a small, unnoticeable difference in intelligence at the level of individuals. But summed across a large population, these decrements had significant effects. Based on Salkever's estimate, the decrease in earnings for whites ranged from 9.68% to 11.2% and for black Baltimoreans it ranged from 13.99% to 16.73%. The average

---

175 David S. Salkever, "Assessing the IQ-Earnings Link in Environmental Lead Impacts on Children: Have Hazard Effects Been Overstated?," *Environmental Research* 131 (2014): 219–230.

176 Kaplan and McDonald, "The Blood Lead Value as an Aid in the Diagnosis of Lead Poisoning"; Bradley et al., "The Incidence of Abnormal Blood Levels of Lead in a Metropolitan Pediatric Clinic"; Annest et al., "BLood Lead Levels." Kaplan and Bradley studies are listed in Table 8.

177 Reuben et al., "Association of Childhood Blood Lead Levels With Cognitive Function and Socioeconomic Status at Age 38 Years and With IQ Change and Socioeconomic Mobility Between Childhood and Adulthood."

difference between the black and white loss of earnings was 4.91%. In other words, black Baltimoreans born between 1957 and 1965 would be expected to earn about 4.91% less than whites in 1990 (all other things being equal) as a result of disproportionate lead exposure affecting intelligence.[178] Average black income in 1990 was about 50% of average white income, so this appears to be a significant, but not dominant factor in income differences. Estimated as the amount of earnings lost in 1990, the African American members of the 1957-1965 birth cohort would have made about $163 million less due the effects of lead, or about $327 million in 2017 dollars.[179] Since this is only an estimate of the loss of earnings for 25 to 33-year-olds, it is easy to imagine that the loss of earnings from lead exposure in other age groups would push the total loss close to a billion dollars (in 2017 dollars) for African Americans in 1990. Although the relationship between IQ and earnings may have been weaker going further back, these numbers still suggest that the loss amounted tens of billions of dollars over the twentieth century.[180]

The metropolitan and historical contexts of the effects of lead on earning are important. As sociologists and historians of metropolitan labor markets have shown, deindustrialization impacted people disproportionately, especially whites and African Americans. In the early and mid-twentieth century, manufacturing jobs provided relatively good, stable incomes to people with low educational attainment. These industries drew many African Americans (and whites) from rural areas to cities. African

[178] These estimates probably underestimate the disproportionate effects of lead. Salkever's estimate was a general one, including all sexes and races. But both studies of the effects of lead on cognitive development and studies of the effect of IQ on education and earnings have shown the importance of social context these effects. These studies usually show larger effects for people of low socioeconomic status and for racial minorities. Typically, researchers have argued that some combination of the presence of high stress, the lack of stimulating environments and the lack of family resources exacerbate (or fail to mitigate) the effects of lead on IQ or the effects of decrements in intelligence on education and earnings. Nisbett et al., "Intelligence"; Bernard Weiss and David C. Bellinger, "Social Ecology of Children's Vulnerability to Environmental Pollutants," *Environmental Health Perspectives* 114, no. 10 (October 1, 2006): 1479–85. So it is likely that if we had a good estimate of the differential effects of IQ on earnings by race (or class or gender) these would produce different results. For black and white comparisons, they would almost certainly magnify the income inequalities.

[179] The loss of earnings to white Baltimoreans was larger ($208 million) because there were more white children born during these years. But the difference in white and black income when the "lost" earnings were added back in was smaller. Adding the lost earnings back in, black income was about 53% of white income.

[180] Another way of getting a sense of the magnitude of the effect is to calculate lost lifetime earnings. Gould estimated the lost earnings from each loss of IQ point at $17,815 in 2006 dollars. That is $20,600 in 2017 dollars. For the 14,305 black children born in Baltimore in 1957, Gould's estimate would yield a total loss of lifetime earnings at about $3.8 billion. Elise Gould, "Childhood Lead Poisoning: Conservative Estimates of the Social and Economic Benefits of Lead Hazard Control," *Environmental Health Perspectives* 117, no. 7 (July 2009): 1162–67. However, I do not think the loss of lifetime earnings tells us as much about the reproduction of inequality as trying to estimate the loss of earnings in a particular year using Salkevar's model.

Americans, however, were discriminated against in the job market and in unions. They were excluded from some jobs and given dangerous and low paying jobs – or simply paid less. After World War II, African Americans broke down many of these labor market barriers. But just as they were doing so, these manufacturing jobs began moving to the suburbs. African Americans, however, remained concentrated in the urban core due to housing discrimination, racial intimidation, low income and the disproportionate siting of public housing in cities.[181] The job base in the city was increasingly based on services, tourism, finance, government, education and medical care. The economic base provided good paying jobs for people with high educational attainment. But for those without much education, the only available work was often low paying service sector jobs. This concentration of low-income people in the city center away from jobs, especially good jobs for people with low educational attainment – a "spatial mismatch" as sociologists have called it – has compounded racial inequality.[182] Undoubtedly, this has stemmed primarily from racial discrimination in housing, disparities in schools across races and similar factors. But lead hazards suggest an important environmental dimension. Whites moved to the suburbs with the critical assistance of automobiles, using work commuting as a life line. Industries followed this workforce out to the suburbs. Not only did this literally leave African Americans behind, but race-based, automobile-based suburbanization left tremendous lead hazards behind, as I have argued throughout this dissertation. The cognitive effects of that lead exposure, and a job market that was increasingly unforgiving of lower levels of educational attainment, put residents of the inner city at a further disadvantage.

There were many other costs of lead exposure that affected the city and affected inequality in the city. For example, the estimate made above was only the loss to *earnings*, and only the loss to earnings via *intelligence*. Other aspects of lead exposure affect learning and educational attainment separate from

---

[181] Thomas J. Sugrue, *The Origins of the Urban Crisis: Race and Inequality in Postwar Detroit*, Revised edition (Princeton: Princeton University Press, 2005); Arnold R. Hirsch, *Making the Second Ghetto: Race and Housing in Chicago, 1940-1960* (CUP Archive, 1983).
[182] John D. Kasarda, "Structural Factors Affecting the Location and Timing of Urban Underclass Growth," *Urban Geography* 11, no. 3 (May 1, 1990): 234–64; William Julius Wilson, *The Truly Disadvantaged: The Inner City, the Underclass, and Public Policy, Second Edition*, 2 edition (Chicago ; London: University Of Chicago Press, 2012), 39–41; Levine, "A Third-World City in the First World."

intelligence. And lead exposure produced myriad other costs to both individuals and the city, including hospitalizations, drug therapy costs, screening costs and loss of work time for parents. The BCHD frequently mentioned the costs of lead poisoning to the city and the taxpayer. In 1958, Baltimore's WMAR-TV host prompted Mary Lanahan, a public health nurse, by saying, "Child lead poisoning is not only tragic for the child who suffers from it but may also take a heavy toll in tax dollars." Lanahan affirmed that hospitalized children received expensive treatment and that they sometimes had to be institutionalized – with the city absorbing the cost in both cases.[183] In 1971, pediatric lead poisoning expert Julian Chisolm estimated that more than $200,000 was spent on institutionalized victims of lead poisoning – more than the cost of renovating 300 dwelling units, Chisolm noted.[184] One early study estimated the benefit-cost ratio to the taxpayer to be 4.6 to 1 for a lead poisoning prevention program in New York City in 1971. Put the other way around, lead poisoning was costing taxpayers through expenses in services and lost revenue in income taxes.[185] Hospitals stays for lead poisoned children in Baltimore, primarily paid by Medicaid, cost millions of dollars every year in the early 1980s.[186] One estimate put the cost to the state Medicaid Program from child lead poisoning at $1.45 million in 1982.[187] A full exploration of the costs of lead is beyond this dissertation, but these figures tell us that, in addition the effects on earnings that accrued over time and were not well-recognized at the time, lead poisoning had other large costs that not only concerned the victims and their families, but concerned parts of the community and government more broadly.

Crime

Economic analyses of the effects of lead exposure often include some measure of the cost to crime or juvenile delinquency from lead. That is because there is a large body of evidence suggesting that

[183] Script of Television Series: Your Family Doctor, May 23, 1958, 5:15 P.M., WMAR-TV, Folder Lead Paint Poisoning Prevention Program LPPPP 1954-1962, Box 3.3-3.4, Series III, GHW Papers, ACMA Archives.
[184] "Lead Poisoning: What is Prevention?" *Sun*, August 15, 1971, F3.
[185] John Christopher Budenholzer, "Lead Poisoning: The Costs and Benefits of a Prevention Program" (Thesis, Illinois Institute of Technology, 1971).
[186] The average cost at the time for a child lead poisoning victim's stay in a hospital was $18,000. There were over a hundred hospitalizations from 1983 to 1985. "Baltimore City Health Department Child Lead Poisoning Prevention Program," [February 1986]; in Folder Lead Poisoning/Lead Paint, Box 855, Series 42, BRG 9, BC Archives.
[187] Katie Gunther, "State Urged to Prevent Lead Poisoning," *Sun*, 1984, E1.

increased lead exposure in individuals is associated with increased likelihood of delinquency or crime. A number of retrospective studies and prospective studies have found significant, but not large, associations between early childhood lead exposure and crime/delinquency. In addition, there is biological plausibility for the link because there is evidence showing how lead can affect neuropsychological functions that would increase aggressiveness and impulsiveness, which could then lead to behaviors that society has categorizes as "delinquent" or "criminal."[188]

People have long noted the link between lead exposure and behavioral problems. In a presentation to the Baltimore Prison Congress in 1893, Abraham Jacobi, the "father of pediatrics," noted that "acute lead poisoning leads to sleeplessness, hallucinations and acts of violence, quite like those of delirium tremens produced by alcohol, which has filled by its many criminal exhibitions the annals both of hospitals and the courts of justice."[189] For most of the twentieth century, however, people simply made the connection between lead exposure and irritability, aggressiveness and impulsiveness. In the 1970s, some writers began plumbing the links between lead exposure and general crime rates.[190] But a fully-fledged empirical argument for this link only came in 2000, when the economist Rick Nevin published an article arguing that lead exposure was the main cause of the rise and fall of crime rates in the second half

---

[188] Retrospective studies examine whether people who have committed crimes were more likely to be exposed to lead in childhood. Prospective studies follow children exposed to elevated lead to see if they are more likely to arrested or end up in juvenile delinquency. David M. Fergusson, Joseph M. Boden, and L. John Horwood, "Dentine Lead Levels in Childhood and Criminal Behaviour in Late Adolescence and Early Adulthood," *Journal of Epidemiology and Community Health* 62, no. 12 (2008): 1045–1050; Marcus, Fulton, and Clarke, "Lead and Conduct Problems"; Paul B. Stretesky and Michael J. Lynch, "The Relationship between Lead and Crime," *Journal of Health and Social Behavior* 45, no. 2 (2004): 214–229; Raymund E. Narag, Jesenia Pizarro, and Carole Gibbs, "Lead Exposure and Its Implications for Criminological Theory," *Criminal Justice and Behavior* 36, no. 9 (2009): 954–973; Brian B. Boutwell et al., "The Intersection of Aggregate-Level Lead Exposure and Crime," *Environmental Research* 148 (July 2016): 79–85; Mark Patrick Taylor et al., "The Relationship between Atmospheric Lead Emissions and Aggressive Crime: An Ecological Study," *Environmental Health* 15, no. 1 (2016): 1; Jessica Wolpaw Reyes, "Environmental Policy as Social Policy? The Impact of Childhood Lead Exposure on Crime," *The B.E. Journal of Economic Analysis & Policy* 7, no. 1 (October 17, 2007): 51. Far too many studies of the lead-crime link treat crime as an objective measure of behavior rather than a measure of a diverse number of behaviors that have been categorized and subcategorized by law and culture to be considered a "crime." This leads to flawed theoretical arguments about the link between lead exposure and crime, since not all crime is aggressive, anti-social or impulsive, and there are many behaviors that are those things but are not considered crimes. Researchers on lead and crime would be well served by considering more closely and critically what "crime" is.

[189] He did not delve more into lead poisoning in this article, which was presented before the Baltimore Prison Congress. American Correctional Association, *Proceedings of the Annual Congress of Correction* (American Correctional Association, 1893), 186.

[190] For example, D. Bryce-Smith and H.A. Waldron, "Lead, and Behaviour Criminality," *The Ecologist*, v. 4, no. 10, December 1974, 367-377.

of the twentieth century. In a series of regression analyses and graphs, Nevin lagged lead exposure by 21 years on the theory that lead exposure early in life would be associated with more crime around 21 years of age – an age when people are most likely to commit crimes (the latter being a widely supported empirical finding among criminologists). Although Nevin primarily focused on exposure from leaded gasoline, at the end of his paper he argued that the rise and fall of lead paint production could explain the rise and fall of crime earlier in the century (Figure 74). He found significant effects in his regression analyses, which used the unemployment rate as a control variable. [191] Nevin and other researchers have since expanded this kind of analysis to other countries and to the states.[192]

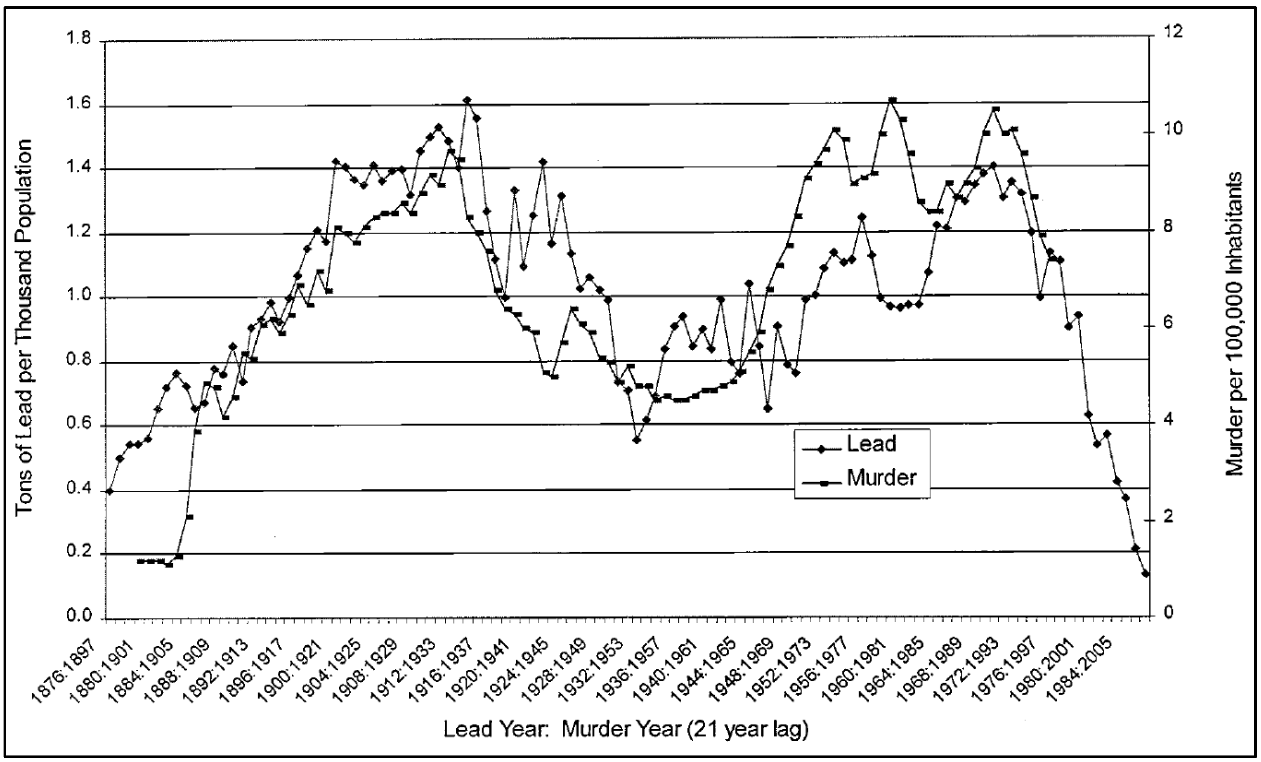


Figure 74: Lead exposure, as measured by lead paint production and leaded gasoline production per capita, lagged 21 years and graphed with the murder rate. The graph suggests a strong link between lead exposure and crime rates. **Source:** Rick Nevin, "How Lead Exposure Relates to Temporal Changes in IQ, Violent Crime, and Unwed Pregnancy," *Environmental Research* 83, no. 1 (May 2000): 1–22.

There are several critiques of these kinds of studies, which I will return to later, but one of the weaknesses of them is that they are ecological studies. Ecological studies are studies of the characteristics

[191] Rick Nevin, "How Lead Exposure Relates to Temporal Changes in IQ, Violent Crime, and Unwed Pregnancy."
[192] Rick Nevin, "Understanding International Crime Trends"; Reyes, "Environmental Policy as Social Policy?," October 17, 2007. Reyes uses the differential phase out of leaded gasoline in states as a natural experiment to see if the timing affected crime rates. She found that it does for some types of crime.

of places, rather than individuals. Nevin's studies examine lead hazards (via lead production) in the United States and crime rates in the United States. His studies do not measure lead exposure in individuals and then relate those individual exposures to criminal activity, as the retrospective and prospective studies mentioned earlier do. Because ecological studies use the characteristics of places, rather than individuals, they may fail to find relationships between variables that are lost in the agglomeration of many diverse individuals. For similar reasons, the inferences we make about individuals within a unit of ecological analysis must be treated with caution. It is possible, for example, to find relationships between variables in aggregate that do not hold for individuals within those aggregates. However, ecological studies are useful for a number of reasons, and in some cases they are the only kind of study available. That is the case when examining the historical crime trends and their relation to lead exposure. There is simply no alternative study design possible.

But there are ways of reducing some of the problems with ecological studies. One is to use smaller geographic units. For example, we can use cities rather states and nations. This will reduce some of the high variability attending ecological studies of large units such as states and nations.[193] Recently, several authors have tried to examine the historical relationship between lead exposure and crime at the city-level. Some authors have looked at exposure to lead in water and some at lead air concentrations.[194] Howard Mielke and Sammy Zahran have examined lead exposure from automobile emissions in a number of cities, and it is their study that I primarily engage with (Figure 75).[195] These researchers used aggravated assault rates for their measure, which they argued was the most plausible crime that matched with what was known about lead's effects on aggressiveness and impulse-control, and they lagged their

[193] Ecological studies of smaller units also have some drawbacks, including, in the case of lagged effects, the extent to which outmigration and in-migration mean we are not studying the same populations. But because Baltimore's migration was overwhelmingly out-migration, it is not likely that Baltimore's crime rate was affected by lead exposure or other factors that affected people outside of the city.

[194] James J. Feigenbaum and Christopher Muller, "Lead Exposure and Violent Crime in the Early Twentieth Century," *Explorations in Economic History* 62 (October 2016): 51–86; Taylor et al., "The Relationship between Atmospheric Lead Emissions and Aggressive Crime."

[195] Howard W. Mielke and Sammy Zahran, "The Urban Rise and Fall of Air Lead (Pb) and the Latent Surge and Retreat of Societal Violence," *Environment International* 43 (August 2012): 48–55.

exposure 22 years. Much like Nevin, their graphs and regressions (which included income as a control variable) showed a strong association between exposure and assault rates.

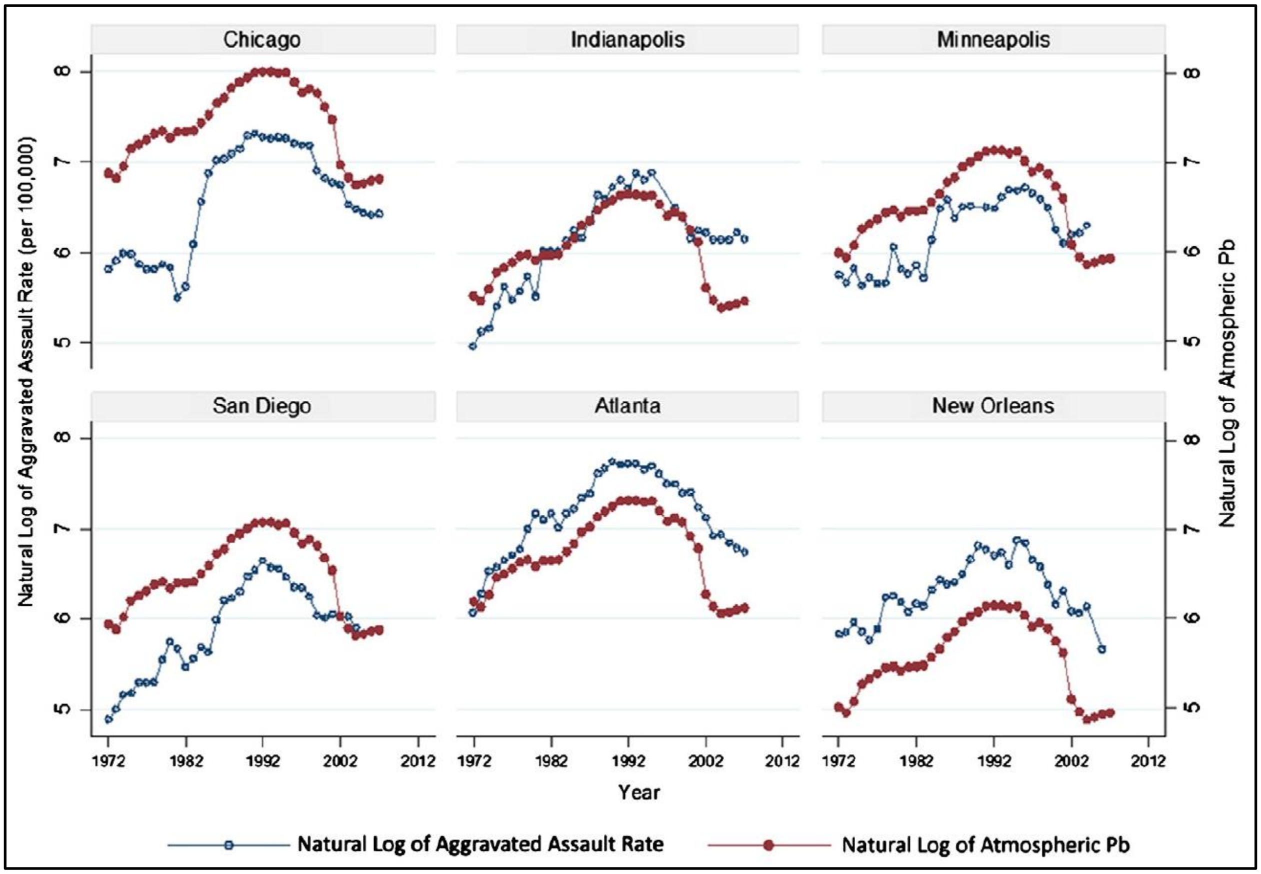


Figure 75: Lead exposure from automobile emissions, lagged 22 years, graphed with aggravated assault rates for various cities. The graphs suggest a strong link between lead exposure and crime rates. **Source:** Howard W. Mielke and Sammy Zahran, "The Urban Rise and Fall of Air Lead (Pb) and the Latent Surge and Retreat of Societal Violence," *Environment International* 43 (August 2012): 48–55.

I carried out a similar analysis for Baltimore City, using leaded gasoline exposure as the predictor, a 22 year exposure lag, and the aggravated assault rate. I used the estimation of lead emission from vehicles discussed in the previous chapter (Figure 68) based on vehicle registration in the city and adjusted for commuting.[196] My graph (Figure 76), however, suggests no positive correlation between vehicular lead emissions and aggravated assault. In fact, the correlation is negative.[197]

[196] I did reduce the "leaded gasoline used" from the previous chapter by 75% in order to estimate the amount of lead left in engine oil and engine parts, which is what Mielke and Zahran did in their study.
[197] In fact, the correlation is negative: -0.1787.

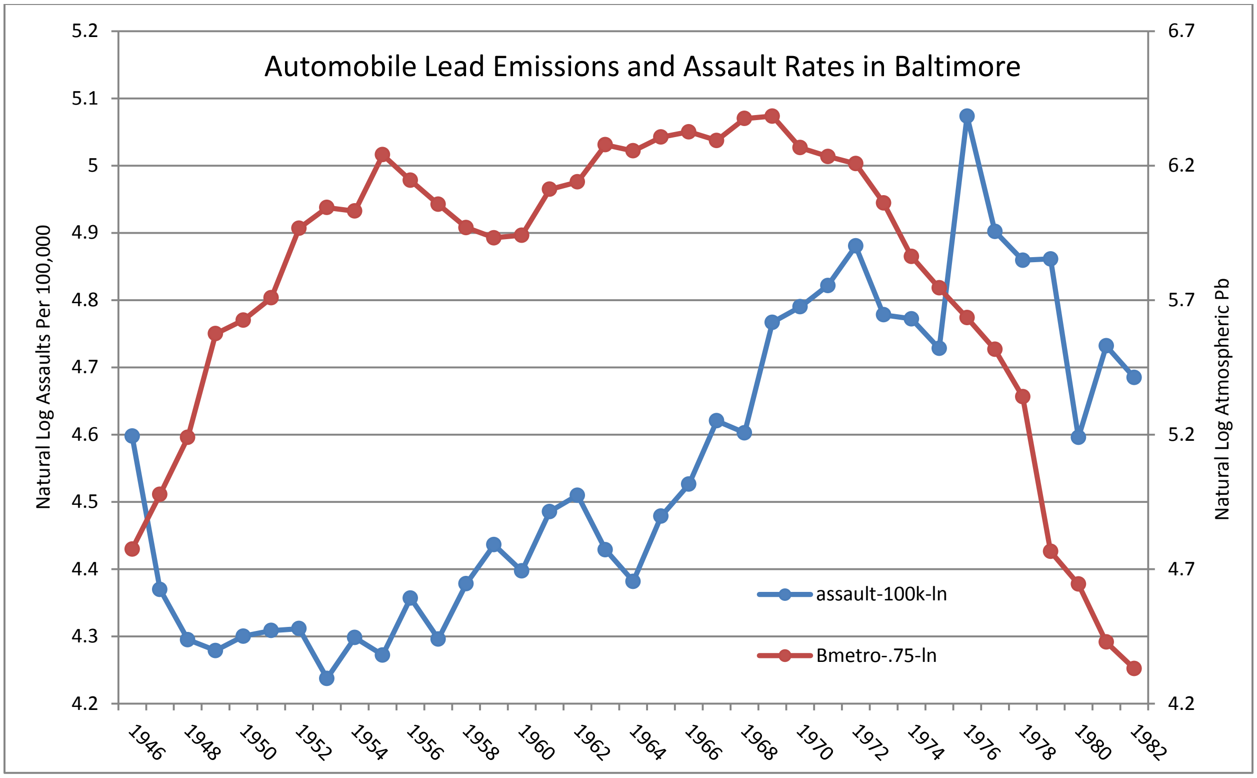


Figure 76: Estimated automobile lead emissions and assault rates in Baltimore. The graph suggests that there was no positive correlation between lead exposure from automobile emissions and assault rates. **Graph:** Leif Fredrickson**.**

The differences stem in part from a different way of estimating lead automobile emissions and my use of a slightly earlier time period. Mielke and Zahran estimated lead air pollution from vehicles in cities in the following way: The authors used 1982 data on traffic in urban areas to calculate the proportion of gasoline used in the city compared to gasoline consumption for the entire state. They then used historic state-level consumption of gasoline, along with national-level data on the lead content of regular and premium gas, and the relative amounts of regular and premium gasoline used in each year, to estimate the total lead air pollution from automobiles for each state in each year going back to 1950. Finally, they applied the estimated proportion of lead emitted from the urban areas relative to the urban area's state in 1982 to estimate the lead emissions from those urban areas in the past.[198]

One of the strengths of Mielke and Zahran's study is that it employs statistics on gasoline use, which is as close a measure of actual lead emissions that we can get without actual measures of those

[198] Although the entire methodology for calculating lead in cities is not spelled out in this paper, Howard Mielke provided me with a spreadsheet used to determine lead emissions. To the best of my knowledge, this is method they used to estimate emissions. My thanks to Howard Mielke for providing this information.

emissions. However, the estimation of gasoline use in urban areas based on one data point in 1982 is a serious weakness. There were major changes in the populations, vehicle used, and vehicle miles travelled (VMT) in cities compared to states in the period of analysis from about 1950 to the present. For example, in 1979, Baltimore City accounted for about 9.4% of the VMT in Maryland. But in 1956, the city accounted for about 36.1% of the VMT in the state.[199] The reason that the authors use a proportion from 1982, however, is that there is no city-level data on gasoline usage and there was no continuous tracking of VMT in cities versus states over time. If there were, we could use the changing proportion of VMT in cities or could use the VMT in cities with data on miles per gallon for vehicles in each year. Without that data on VMT in the city over time, however, I believe a better approach is to use vehicle registrations in the city over time.[200]

A second weakness of the study is that it used national data for the lead content of gasoline or the relative amount of premium and regular gasoline used rather than data specific to Maryland or the region. Most of the data on lead content I use is specific to the mid-Atlantic and some of the data I use for regular and premium use is specific to Maryland. The only data specific to the urban areas are their proportion of VMT relative to their state in 1982.[201]

A final important difference is that my data stretch back to 1946, whereas Mielke and Zahran's data begins in 1950. There were much lower lead emissions at that point, however. The lead content of gasoline was much lower and there were fewer vehicle registered, probably as a result of the pinch in

---

[199] Baltimore County Department of Public Works, "Study of Distribution of Gasoline Tax and Motor Vehicle Revenue Funds," June 4, 1959 and Maryland Department of Transportation, "Highway Statistics," May 1981, both in MR, Pratt. These are the only comparisons of VMT between the city and state that I have found in the period from the 1940s to 1980. It is possible a more continuous data set exists somewhere for Baltimore or other cities, in which case those data might be used to estimate lead emissions instead of the method I use here.

[200] One could also use the proportion of vehicles in the city versus the state with the total fuel used in the state. This should amount to the same numbers because fuel use per vehicle in the state is calculated from total fuel use divided by the number of vehicles in the state. I have not checked that this is the same, however.

[201] Another difference with my data and Mielke's is data on premium and regular leaded gasoline use. As noted, I use some data specific to Maryland (the years 1975-1982). In other years, I use national-level data, but my data is usually still different from Mielke's. It appears that Mielke used linear interpolation to estimate many of the years. I also did this for some years, but less frequently than Mielke. And it is unclear to me what the data sources were for the data points that Mielke used to make his interpolations.

consumerism during the war. Overall, the relationship between lead exposure from vehicular emissions and assault rates in cities seems inconclusive, in need of more study and perhaps better data.

There are other problems with the lead-crime theory. Other economists and sociologists have critiqued Nevin's studies and similar ones on several grounds. These include the lack of evidence for a cohort of people committing crimes when theory implies a cohort effect, and the lack of congruence between the relatively small effect sizes shown in prospective studies on the relationship between lead exposure and crime, and the apparently huge, dominating effect of lead exposure in essentially determining crime rates in the twentieth century.

There is also the glaring problem of Nevin's reliance on lead paint production as a proxy for lead exposure. As many current studies have shown, blood lead levels are highly correlated with deteriorating paint, and this effect on blood lead is mediated by highly bioavailable lead-contaminated dust in the household. Nevin states, "Although paint lead in older housing units poses a lingering hazard today, the health hazard must have been more acute and more widespread in the years when peeling paint was scraped away and replaced with a fresh coat of paint."[202] There is little evidence for this assertion. It is true that any lead paint was a potential hazard, and that all lead paint gave of some dust. It may even be the case that lead paint hazards did not peak in the 1950s, as I have argued, or that there was a different sort of peak in lead paint hazards that entailed more subtle, but more widespread deteriorating lead paint, such as during the Great Depression. But there is far too much evidence that lead paint hazards were at their worst years after their initial application to houses. When deterioration peaked depended on all the idiosyncratic and systematic factors I have discussed in Chapters Three and Four. I am dubious that national lead paint production can be used at all as a proxy for lead paint hazards, but at the least it would need to be lagged years or even decades from the year of production.

A final problem with these studies is the reliance on leaded gasoline emissions as a proxy for historical lead exposure. Leaded gasoline was an important source of exposure, but it is not clear that it

[202] Rick Nevin, "How Lead Exposure Relates to Temporal Changes in IQ, Violent Crime, and Unwed Pregnancy," 5.

was more important than the continuing presence of deteriorating lead paint. Even if it was, there is no question that deteriorating paint was an important source. So were the other sources of lead, such as food and contaminated soil. As I have argued, the data on lead exposure sources suggest that exposure may have been most severe in the 1950s, not the 1970s as, for example, Mielke and Zahran's study would suggest. Blood lead levels also suggest that researchers should be careful about relying solely on leaded gasoline emissions. Mielke and Zahran's data, for example, suggest that lead exposure was relatively low in the 1950s compared to the 1970s. But the blood lead data for Baltimore and Philadelphia suggest the opposite: a downward trend from the 1950s to the 1970s. To a large extent, researchers have utilized leaded gasoline data because it is more easily available, but it does not seem to be a particularly reliable indicator of blood lead levels until perhaps the late 1970s and 1980s when it was being phased out.

Conclusion

Lead exposure and absorption rose and fell over the twentieth century in ways that we will never be able to precisely pinpoint. While uncertainties abound, there is much that the data can tell us, both in the negative sense of discounting some hypotheses, and in the positive sense of suggesting some broad periods when lead exposure and absorption was certainly high.

Another certainty is that the levels of lead exposure had significant effects on people in Baltimore and other cities. In some cases, these effects were acutely felt as life threatening and unmistakably life altering poisonings. But lead also had certain effects through its more widespread, and more subtle, effects on large populations. The blood lead levels of the past make it clear that virtually nobody – no body, no brain – was untouched by the effects of lead, even if those effects could never be detected in an individual. At the level of population, those effects could be detected, as researchers in the 1970s and after increasingly found through large, epidemiological studies. Those studies showed that even very low levels of lead – below 10 micrograms/dL and then below 5 micrograms/dL – produced identifiable deficits in intelligence, among other psychological measures. No one fully escaped lead.

But the burdens of lead exposure were uneven. Although leaded gasoline pollution wafted into the nostrils and onto the food of nearly everybody in the city, it did so in greater volumes for people that lived in the inner city, people who had lower incomes and people who were black. Similarly disproportionate burdens held for lead paint in housing. Lead-tainted soils, primarily contaminated by vehicular pollution and lead paint, would also have disproportionately burdened the poor, the inner city residents, and black Baltimoreans.

Nor was it just that the effects on individuals within a group were unequally shared. The social, indeed metropolitan, context modified how individual effects played out. Better schooling helped mitigate learning disabilities from lead exposure. And good paying jobs, regardless of educational attainment, helped assure that those with cognitive deficits affecting education did not have to scrape by on low wages and no benefits. In Baltimore, deindustrialization and the exclusion of the poor and African Americans from equal education further compounded the effects of lead.

The cumulative effect of these consequences, however, happened over a long period of time. Decades. In the meantime, life in the suburbs and inner city carried on. Unequal childhood environments, particularly the toxic aspects of those environments, rarely came up in discussions in the late-twentieth century about the "urban underclass" and "ghetto poverty." Yet those effects were there – significant, if perhaps subtle. And almost totally invisible.

Epilogue – The Age of Alchemy: The Hidden Legacies of Lead in the Monumental City

Si monumentum requiris, circumspice – "If you seek a monument, look around you."

That was how Henry Shepherd signed off his letter to the *Sun* in 1924, in which he pleaded that the city not get rid of the old shot tower in downtown Baltimore. As a young man, Shepherd had been seriously wounded. While hospitalized, he would limp to the window "to gaze upon the Tower and the Washington Monument, then standing in simple grandeur unobscured by the skyscraping structures of our own day."[203] Those skyscrapers, filled with office workers and customers, had brought more and more people downtown. Increasingly, those people arrived and departed the city center by automobile. As these commuters converged on the city center, automobile congestion increased, reaching painful levels in the 1920s. As a result, residents and city planners sought to ease the congestion by rearranging streets and widening them to create more capacity and more efficient traffic flow. The shot tower was in the way of that plan. And so people called for its removal.

But not Shepherd. Many people saw the shot tower as "awfully in the way," Shepherd admitted. But, he said, the "same objection has been strenuously urged against St. Paul's Cathedral, London, with its superb art and glorious historic memories."[204] Famously, St. Paul's Cathedral contained a stone plaque with the inscription "*Si monumentum requiris, circumspice.*" The plaque was placed over the resting place of Christopher Wren, the cathedral's architect. The point of the inscription was that Wren's true legacy surrounded the reader and, perhaps, that the built world is full of monuments and legacies if we would just see them as such. For Shepherd, the shot tower was a monumental object, even if it had not been built to be monumental, and it deserved preservation. Shepherd was not alone. The city spared the shot tower, and it remains there to this day.

The shot tower represents Baltimore's legacy of lead manufacturing, stretching back to the early nineteenth century. It also signifies the city's consumption of lead. In the same year that Shepherd wrote

[203] Henry Shepherd, "The Shot Tower," *Sun*, August 20, 1924, 8.
[204] Ibid.

his letter, 1924, Baltimoreans began taking the hills with tetraethyl lead in their automobile tanks. Surrounded by streets, and sitting within 100 feet of the beginning of the Jones Falls Expressway, the shot tower stands less as a testament to the restraint of Baltimoreans in refashioning their urban landscape than a testament to how much the automobile came to utterly dominate the city in the twentieth century. For most of the century, the automobiles that rumbled past the tower and accelerated out to the suburbs via the expressways ran on leaded gasoline.

If the shot tower is in some sense a monument to the production and consumption of lead in the city, where is the monument to the *effects* of lead? Can we – could we ever – look around and see it?

Parents of lead poisoned children could see it. They could see it when their child's body erupted in convulsions and then was quieted by death. They could hear it when their child vomited for days on end from stomach colic. They could even hold it when their daughter's legs stopped working, and they had to carry her. Other parents saw it in children who never learned to speak more than a few words or who were so emotionally disturbed that they attacked family members. And some parents saw it in their children who were unable to keep up in school. Others thought maybe they saw it – was their son's struggles with learning due to bits of lead paint in the house, or was it something else? – but were not sure.

These were private understandings of the effects of lead, however. There is no public object that serves as a monument to the effects of lead, not even in the broadest sense of the word monument, as some sort of marker or signifier of lead's effects.

The hidden effects of lead are especially troubling given their contribution to inequality across race, class and space. But the obscuration of the past inequalities is not unique to the story of lead exposure in Baltimore. A number of historians have documented the production and reproduction of inequality, particularly racial inequality, in twentieth-century American metropolis.[205] They have detailed

[205] Thomas J. Sugrue, *The Origins of the Urban Crisis: Race and Inequality in Postwar Detroit*, Revised edition (Princeton: Princeton University Press, 2005); Robert O. Self, *American Babylon: Race and the Struggle for Postwar Oakland: Race and the Struggle for Postwar Oakland* (Princeton University Press, 2005); Matthew D. Lassiter, *The Silent Majority: Suburban Politics in the Sunbelt South: Suburban Politics in the Sunbelt South*

the cruel conjunctures in which urban African Americans made gains in civil rights and economic and political participation, only to be left holding the bag as whites left for the suburbs, taking tax revenues and jobs with them. African Americans were excluded from the long-term wealth gains obtained by suburban homebuyers and left in cities with high service costs and low paying service jobs. Social inequality festered. But Americans have not tended to think about the urban inequality that persisted through the end of the twentieth century as something that was rooted in the mid-twentieth century American Golden Age. Looking skin deep, they have blamed it on the character of the victims of structural inequality.

Environmental historians have also told stories of cities and obscured connections. In one version, the urban core spread its tentacles – usually railroads – out into the forests, farmlands, and prairies of its surrounding region in order to bring back profit. For better or worse, the core and periphery became increasingly interlocked in a system of production, consumption and capital accumulation. But while these places became increasingly interwoven, the long supply chains and the abstractions necessitated by sophisticated capital financing obscured their relations. To the capitalist, pigs were boiled down to their numerical bones, until they were nothing more than digits on a statement. A clear cut forest, meanwhile, was nothing to the financier – such environmental destruction made no appearance on his balance sheet. To the consumer, goods came in packages telling him the price, but not the cost of making that good. Throughout the system, costs were externalized and the natural value of resources was used up. But there was no accountant keeping track.[206]

If we kept track of the putative Golden Age of American, we would see, as Thomas Sugrue has argued, that it was only golden for some Americans. From the perspective of a history of lead exposure

---

(Princeton University Press, 2013); Kevin M. Kruse, *White Flight: Atlanta and the Making of Modern Conservatism* (Princeton University Press, 2013); Ira Katznelson, *When Affirmative Action Was White: An Untold History of Racial Inequality in Twentieth-Century America* (W. W. Norton & Company, 2006).

206 William Cronon, *Nature's Metropolis: Chicago and the Great West* (W. W. Norton, 1991); Kathleen A. Brosnan, *Uniting Mountain & Plain: Cities, Law, and Environmental Change Along the Front Range* (UNM Press, 2002); Gray A. Brechin, *Imperial San Francisco: Urban Power, Earthly Ruin* (University of California Press, 2001); Richard White, *Railroaded: The Transcontinentals and the Making of Modern America* (W. W. Norton & Company, 2011); Joel Tarr, *The Search for the Ultimate Sink: Urban Pollution in Historical Perspective* (University of Akron Press, 1996).

and environmental inequality, the Golden Age was literally an Age of Lead. These were not parallel ages, however, they were deeply intertwined, just as the forests of Wisconsin and the prairies of Nebraska were intertwined with Chicago capitalists in the nineteenth century. The decades after World War II were an Age of Alchemy. Suburban owners of inner city housing externalized the cost of deteriorating lead paint onto their tenants, and in so doing, they turned lead into gold.

Suburban commuters, meanwhile, used their tetraethyl-laced fuel to expand into the suburbs while still holding on to their jobs in the city. It was an incredible boon to be able take advantage of the low-mortgage rates on new homes in the suburbs while keeping one's job in the city. Only the automobile allowed that. But in taking advantage of this opportunity, suburban commuters externalized the lead pollution from their automobiles onto residents of the inner city.

These environmental inequities existed before and after the Golden Age of the post-World War II period. Even before the automobile, the ability of some people to move away from the environmental harms of the urban core had created disparities in lead exposure from industry. The expansion of gas and electrical utilities also facilitated to suburban expansion, at the same time widening the energy and environmental health inequalities between the urban poor and the rest of the metropolitan population. As automobiles became more available, thanks in part to lead-acid batteries and leaded gasoline, suburban expansion increased even more. The affluent zoomed away from the dust, noise and pollution of – *automobiles*, among other things. As traffic congestion increased in the inner city, more people moved to the suburbs to get away from it. But they kept their jobs downtown, further adding to the congestion. They also dropped their lead-acid batteries off at their local service station, who then sold the batteries to junk yards in the inner city, who broke them apart and gave away the wood casings to their impoverished neighbors.

The lead poisoning epidemic that arose out of the ashes of lead-saturated battery casings catalyzed the Baltimore City Health Department to become permanently involved in trying to mitigate child lead poisoning. But there were strong limits on what it could accomplish, given the deep intertwining of lead exposure with industrial development, housing markets and transportation systems. It was enough that, as the health department occasionally recognized, it did not have departmental jurisdiction over facets of urban life that deeply affected public health. Even more, industry, housing and transportation were embedded in a metropolitan system that the city itself had little control over. Despite years of experience with child lead poisoning – far more than any other city – the Baltimore City Health Department often appeared helpless in the 1950s in the face of skyrocketing child lead poisoning cases. The department was simply no match for the scale of race-based suburbanization and slumlord management that yanked the value out of so many homes in the inner city. Over the next two decades, housing abandonment became an increasing problem in the city. It was exacerbated by the impending threats to neighborhoods from expressway building. In the 1970s and 1980s, vacant houses dotted the landscape like the stumps in the vast clear cuts of Wisconsin.

Historian of metropolitan America have typically told a story in which white suburbanites "hoard resources." But the story of metropolitan development and lead in Baltimore looks much more interactive than the phrase "hoarding" implies. It looks more like the story told in Cronon's *Nature's Metropolis*, where the development of core and periphery are inseparable. The post-World War II metropolis was highly segregated, and yet many of those suburbanites drove through the neighborhoods of the inner city on a daily basis to get to their downtown jobs. There was great disinvestment in the inner city, and yet many suburban slumlords made great profits from their investments in the inner city.

The contrast with Cronon's work is that the flow of benefits and harms was inverted. In the case of Chicago, economic benefits flowed into the core while environmental harms accumulated on the periphery. In Baltimore, suburbanites on the periphery reaped rental profits and wages from the city and left behind environmental problems. Suburban externalities were spatially, as opposed to economically, "internalized" in the metropolis. Lead flowed into the city and into the bodies of children who lived there. Lead is still there, in its molecular form and in the social inequality in the metropolis. To get it out, you need history.

Sources

Libraries, Archives and Collections

Alan Mason Chesney Medical Archives, Johns Hopkins Medical Institutions Archives and Libraries (AMCM)
George Huntington Williams Papers (GHW)
Edwards Park Collection (EP)
Anna Baetjer Papers

Baltimore City Archives (BC)
BRG 9 (Mayor's Office)
BRG 19 (Baltimore City Health Department Records)
BRG 48 (Department of Housing and Community Development)
BTR22 (Baltimore City Planning Records)

Baltimore City Block Books, Baltimore City Superior Court, mdlandrec.net

Enoch Pratt, Central Library (Pratt)
Maryland Room (MR)
Views of African American Life, Maryland Collection

Johns Hopkins Medical Records, Phipps Building, Johns Hopkins Hospital (JHMR)

Langsdale Library Special Collections, University of Baltimore (LLSC)
American Civil Liberties Union of Maryland Records (ACLU)
Baltimore City Department of Planning Records (BCDP)
Baltimore Neighborhoods, Inc. Records (BNI)
Baltimore Urban Renewal and Housing Authority Records (BURHA)
Citizens Planning and Housing Association Records (CPHA)
Citizens Housing Council of Baltimore Records (CHCB)
East Baltimore Oral History Project
Greater Baltimore Committee (GBC)
Health and Welfare Council Records (HWC)
Movement Against Destruction (MAD)
Pullen Collection
Stone Hill in Hampden Collection

Maryland Historical Society (MHS)
Mount Vernon District Improvement Association Collection
Sherlock Swann Papers

Milton S. Eisenhower Library, Special Collections, Johns Hopkins University (MESC)
Map and Atlas Collection, jscholarship.library.jhu.edu/handle/1774.2/32585 (MA)
Abel Wolman Papers (AW)

National Service Center for Environmental Publications, https://www.epa.gov/nscep

New York Public Library Digital Collections
The Miriam and Ira D. Wallach Division of Art, Prints and Photographs: Photography Collection

ProQuest Digital Sanborn Maps, 1876-1970, http://sanborn.umi.com

Transportation Library, Northwestern University

U.S. Census Enumeration Districts Records, Ancestry.com,

U.S. Social Security Applications and Index Claims, Ancestry.com

Data Sources

Department of Energy. "Average Historical Annual Gasoline Pump Price, 1929-2015." Accessed September 21, 2016. http://energy.gov/eere/vehicles/downloads/fact-915-march-7-2016-average-historical-annual-gasoline-pump-price-1929.

Federal Highway Administration, Publications and Statistics, https://www.fhwa.dot.gov/resources/pubstats/

"Mapping Inequality," *American Panorama*, ed. Robert K. Nelson and Edward L. Ayers, accessed October 14, 2016, dsl.richmond.edu/panorama/redlining.

Minnesota Population Center, *National Historical Geographic Information System: Version 2.0.* (Minneapolis, MN: University of Minnesota, 2011), www.nhgis.org

Segregation Data, National Bureau of Economic Research, www.nber.org/data/segregation.html.

United States Geological Services, Minerals Information, Lead Statistical Compendium, minerals.usgs.gov/minerals/pubs/commodity/lead/stat/index.html

Newspapers and Magazines

Anaconda Standard (Newspapers.com)
Baltimore Afro-American (ProQuest)
Baltimore News-Post (clippings in archives)
Baltimore Sun (ProQuest)
Baltimore Evening News (clippings in archives)
Baltimore American (clippings in archives)
Berkeley Daily Gazette (Google News Archive)
Chicago Daily Tribune (ProQuest)
Cincinnati Enquirer (Newspapers.com)
Collier's (Google Books)
Courier-News (Newspapers.com)
Crisis (Google Books)
Ecologist (reader.exacteditions.com/magazines/308/issues?mid=18513)
Eugene Register-Guard (Google News Archive)
Holland Evening Sentinel (Newspapers.com)
Kentucky New Era (Newspapers.com)
Lewiston Daily Sun (Google News Archive)
Los Angeles Times (ProQuest)
Nevada State Journal (Google News Archive)
New York Times (ProQuest)
News-Palladium (Newspapers.com)
Newsweek

Oakland Tribune (Newspapers.com)
Owosso Argus Press (Google News Archive)
San Jose Evening News (Google News Archive)
Southeast Missourian (Google News Archive)
Spartanburg Herald (Google News Archive)
Spokane Daily Chronicle (Google News Archive)
St. Louis Dispatch (Newspapers.com)
Toledo Blade (Google News Archive)
Tuscaloosa News (Google News Archive)
Washington Post (ProQuest)
Wall Street Journal (ProQuest)

Trade Journals

American Gas Engineering Journal (Google Books)
American Paint and Oil Dealer (Google Books)
American Printer and Lithographer (Google Books)
American School Board Journal (Google Books)
Automobile Facts and Figures
Carter Times (Google Books)
Chemical and Metallurgical Engineering (Google Books)
Chemical Engineering Catalog Sixth Annual Edition (Google Books)
Gas Age (Google Books)
Gas Industry (Google Books)
Gas Record (Google Books)
Electrical Review (Google Books)
Electrical World (Google Books)
Engineering News Record (Google Books)
Horseless Age (Google Books)
International Stereotypers and Electrotypers Journal (Google Books)
Journal of Electricity, Power and Gas (Google Books)
Lamp (Google Books)
Lead (University of Minnesota Library)
Master Painter (Google Books)
Metal Finishing (Google Books)
Metal Industry (Google Books)
Modern Painter (Google Books)
Moody's Manual of Investments (Google Books)
*Oil and Gas Journal (*University of Virginia Library)
Paint, Oil and Drug Review (Google Books)
Painters Magazine (Google Books)
*Petroleum World (*Google Books)
Waste Trade Journal (Google Books)

Health, Medical and Environmental Science Journals

American Journal of Diseases of Children
American Journal of the Medical Sciences
American Journal of Nursing
American Journal of Public Health
American Medico-Surgical Bulletin
NeuroToxicology
Archives of Disease in Childhood

Archives of Environmental Health
Atmospheric Environment
Australian Medical Gazette
BioMed Research International
Boston Medical and Surgical Journal
Brain
British Medical Journal
Bulletin of the American Geographical Society
Bulletin of the Johns Hopkins Hospital (Alan Mason Chesney Medical Archives)
Bulletin of the American Meteorological Society
Canadian Medical Association Journal
Chemical Speciation & Bioavailability
Clinical Psychology Review
Developmental Neuropsychology
Engineering and Science
Environmental Health
Environmental Health Perspectives
Environment International
Environmental Pollution
Environmental Research
Environmental Science & Technology
Geoforum
Industrial & Engineering Chemistry
International Journal of Environmental Research and Public Health
International Journal of Occupational and Environmental Health
Journal of Biological Chemistry
Journal of Clinical Child & Adolescent Psychology
Journal of Developmental Origins of Health and Disease
Journal of Epidemiology and Community Health
Journal of Health and Social Behavior
Journal of Industrial Hygiene and Toxicology
Journal of Pediatrics
Journal of the Air Pollution Control Association
Journal of the American Medical Association
Journal of Industrial Hygiene
Journal of Pharmacology and Experimental Therapy
Journal of Public Health Management and Practice
Journal of the National Medical Association
Medical News
Medical Record
Midland Medical Journal
NeuroToxicology
New England Journal of Medicine
Occupational Medicine
Pediatrics
PLoS Med
Preventing Chronic Disease
Public Health Reports
Science of the Total Environment
Transactions of the Association of American Physicians

Published Government Documents

Baltimore and Maryland

J. Edward Aldred and Ernest Illmer, *Industrial Survey of Baltimore: Report of the Industries Located within the Baltimore Metropolitan District* (Baltimore, 1915)

Baltimore City Health Department, *Baltimore Health News*, various years (Maryland Room, Enoch Pratt Library)

Baltimore Commission on City Plan, *Redevelopment of Blighted Residential Areas in Baltimore Conditions of Blight, Some Remedies and Their Relative Costs*

Baltimore City Health Department, *Annuals*, various years (Maryland Room, Enoch Pratt Library)

Baltimore Chamber of Commerce *Annual Report*, various years

Baltimore City, *Ordinances and Resolutions of the Mayor and City Council of Baltimore*, various years

Baltimore Department of Transit and Traffic, *Annual Report*, various years

Baltimore City Housing Division *Annual Reports*, various years

Baltimore Planning Commission, *Study for East-West Expressway* (Baltimore: The Commission, 1960)

Baltimore Regional Planning Council, *Freeway Plan* (Maryland State Planning Commission, May 1959)

Baltimore Housing Authority, *Baltimore's Housing Situation in Charts* (1954)

Baltimore Redevelopment Commission. "Redevelopment Project No. 1-A." Baltimore, May 1950.

Baltimore Urban Renewal and Housing Authority. *A Demonstration of Rehabilitation, Harlem Park, Baltimore, Maryland*. Baltimore Urban Renewal and Housing Authority, 1965.

———. *Ten Years of Relocation Experience in Baltimore, Maryland*, 1961.

Baltimore Committee on Mass Transportation, *Report to the Mayor of Baltimore* (1955)

Richard T. Ely, *Supplementary Report on Taxation in Maryland* (Maryland Tax Commission, 1888)

House of Delegates of the General Assembly of the State of Maryland, *Report of the Grand Inquest of the State of Maryland into the Background, Causes and Possible Ending of the Current Strike in the Baltimore Transit Company* (Baltimore, 1956)

Journal of the Proceedings of the First Branch City Council, various years

Kelker, De Leuw and Company, *Report and Recommendations on the Routing of Street Railway Lines and Methods for the Improvement of Traffic Conditions in the City of Baltimore to the Traffic Survey Commission of Baltimore* (Baltimore: Waverly Press, 1926)

Laws of the State of Maryland, various years

Maryland Bureau of Industrial Statistics, *Annual Reports*, various years

Maryland Commission on Interracial Problems and Relations, *An American City in Transition; the Baltimore Community Self-Survey of Inter-Group Relations* (Baltimore, 1955)

Maryland Commission to Study and Report on the Transportation System Operated by the Baltimore Transit Company, *Report of Majority and Separate Report of Commissioner Herbert Levy*

Maryland State Roads Commission, *Preliminary Report of the Maryland State-Wide Highway Planning Survey by the Maryland State Roads Commission in Cooperation with the United States Department of Agriculture, Bureau of Public Roads, 1938.* (Annapolis, 1938)

Maryland State Accident Commission, and Maryland Court of Appeals. *Reports of Cases under the Workmen's Compensation Act Decided by the State Industrial Accident Commission and the Court of Appeals of Maryland*. George W. King Printing Co., 1916.

Maryland State Highway Administration. "Modern Transportation Milestones in Maryland, 1900-1960." Accessed September 14, 2016. http://sha.md.gov/OPPEN/II-MODT.pdf.

Maryland State Planning Department. *The Counties of Maryland and Baltimore City: Their Origin, Growth, and Development, 1634-1963*, 1963William Oswald Weyforth and United States Employment Service Maryland Division, *Manpower Problems and Policies in the Baltimore Labor Market Area during World War II* (U.S. Dept. of Labor, U.S. Employment Service for Maryland, 1946)

Mayor's Message to Members of the City Council, various years

Report of the City Officers and Departments Made of the City Council, various years

Smith, Wilbur. “Baltimore Metropolitan Area Transportation Study,” 1964.
George Drayton Strayer, *Report of the Survey of the Public School System of Baltimore, Maryland, Volume I*, 81.

Other State and Local

California Highway Department, *California Highways and Public Works*
Ohio State Board of Health, *Annual Report*
Illinois Highway Department, *Illinois Highway Bulletin*
Indiana State Board of Health *Bulletin*

Federal

Annest, J. L., K. R. Mahaffey, D. H. Cox, and J. Roberts. “Blood Lead Levels for Persons 6 Months - 74 Years of Age: United States, 1976-80.” *Advance Data: From Vital and Health Statistics of the National Center for Health Statistics*, no. 79 (May 12, 1982): 1–23.
Annest, Joseph L. and Kathryn R. Mahaffey, *Vital and Health Statistics: Data from the National Health Survey* (U.S. Department of Health, Education, and Welfare, Public Health Service, National Center for Health Statistics, 1984).
C.E. Lesher, *Coal in 1915 – Part B: Distribution and Consumption*, United States Geological Survey, Mineral Resources of the United States (Washington: GPO, 1916), 493
Lloyd Barton Tepper and Linda S. Levin, *A Survey of Air and Population Lead Levels in Selected American Communities: Final Report* (Environmental Protection Agency, 1972).
Battelle Memorial Institute et al., *The Health and Environmental Impacts of Lead and an Assessment of a Need for Limitations* (U.S. Environmental Protection Agency, 1979)
Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1970* (U.S. Department of Commerce, 1975)
Bureau of the Census, *U.S. Census of Housing,* various years and publications
Bureau of the Census, *U.S. Census of Population,* various years and publications
Bureau of the Census, *Statistical Abstracts,* various years
Bureau of Mines, *Motor Gasolines*, various years
Bureau of Mines, *Mining Industry of the United States of America* (U.S. Government Printing Office, 1922), 39.
Centers for Disease Control, *Morbidity and Mortality Weekly Report,* various years
Commission on Civil Rights, *1961 Commission on Civil Rights Report: Housing* (GPO, 1961), 68, 74.
Commission on Civil Rights, *Hearing before the United States Commission on Civil Rights. Hearing Held in Baltimore, Maryland, August 17-19, 1970* (GPO, 1971)
Commission on Urban Problems, *Building the American City: Report of the National Commission on Urban Problems to the Congress and to the President of the United States* (GPO, 1968)
Congress, *Hearings Before the Committee on Interstate and Foreign Commerce of the House of Representatives on Food Bills H.R. 3109, 12348, 9352, 276, and 4342 for Regulating the Adulteration, Misbranding, and Imitation of Foods, Beverages, Candies, Drugs, and Condiments in the District of Columbia and The Territories, and For Regulating Interstate Traffic Therein, and for Other Purposes* (GPO, 1902)
Congress, *Air Pollution, 1967: Hearings, Ninetieth Congress, First Session* (U.S. Government Printing Office, 1967)
Congress, *The Inner City Environment and the Role of the Environmental Protection Agency: Hearing before the Subcommittee on the Environment*, 1972
Congress, *Federal-Aid Highway Act 1970, Hearings Before the Subcommittee on Roads of the Committee on Public Works, House of Representatives, Ninety-First Congress, Second Session, on H.R. 16788 and Related Bills*, 1970
Congress, *National Defense Migration: Part 15, Baltimore Hearings*

Congress, Senate Committee on Agriculture and Forestry, *Filled Milk: Hearings Before a Subcommittee of the Committee on Agriculture and Forestry, United States Senate, Sixty-Seventh Congress, Second Session, on H. R. 8086, to Prohibit the Shipment of Filled Milk in Interstate Or Foreign Commerce* (U.S. Government Printing Office, 1922)

Congress, "Housing Act of 1949," HR 4009, 81st Cong., *Congressional Record* (June 23, 1949), Appendix A4128

Congress Senate Committee on Agriculture and Forestry. *Filled Milk: Hearings Before a Subcommittee of the Committee on Agriculture and Forestry, United States Senate, Sixty-Seventh Congress, Second Session, on H. R. 8086, to Prohibit the Shipment of Filled Milk in Interstate Or Foreign Commerce*. U.S. Government Printing Office, 1922

Department of Agriculture, *U.S. Census of Agriculture,* various years and publications

Department of Agriculture, *Integrating Control of the Japanese Beetle: A Historical Review* (Agricultural Research Service, 1976)

Department of Agriculture, *Fruit Situation*

Department of Agriculture, *Fruit Outlook & Situation*

Department of Agriculture, "Fruit Consumption of Households, By Region, Urbanization Group and Income, U.S., Spring of 1955," *The Fruit Situation*, January 1959

Department of Commerce, *U.S. Census of Manufactures,* various years and publications

Department of Commerce, *Local Government Finances in City Areas 1953*

Department of Commerce, *Compendium of City Government Finances*, 1951

Department of Commerce and Labor, "Housing Conditions in Baltimore," *Monthly Labor Review*

Department of Health, Education and Welfare, *Survey of Lead in the Atmosphere of Three Urban Communities* (U.S. Department of Health, Education, and Welfare, Public Health Service, Division of Air Pollution, 1965)

Department of Housing and Urban Development, *Abandoned Housing Research: A Compendium* (GPO, 1973)

Environmental Protection Agency, *Air Quality Data for Non-Criteria Pollutants, 1957 through 1970* (GPO, 1977)

Environmental Protection Agency, *Air Quality Data for Non-Criteria Pollutants, 1971 through 1975* (GPO, 1978)

Environmental Protection Agency, *National Air Quality and Emissions Trends Report* (GPO, 1985)

Environmental Protection Agency, *Lead National Ambient Air Quality Standard: Environmental Impact Statement*, 1978,

Environmental Protection Agency, *National Assessment of the Urban Particulate Problem: Baltimore* (Environmental Protection Agency, Office of Air and Waste Management, Office of Air Quality Planning and Standards, 1974)

Environmental Protection Agency, *Development of an Approach to Identification of Emerging Technology and Demonstration Opportunities*, 1974

Environmental Protection Agency, *Toxic Materials Analysis of Street Surface Contaminants*, 1973

Environmental Protection Agency, *Water Pollution Aspects of Street Surface Contaminants*, (November 1972)

Environmental Protection Agency, *Distribution of Metals in Baltimore Harbor Sediments*, 1974

Environmental Protection Agency, *State of Maryland Waste Oil Recovery and Reuse Program*, 1974

Environmental Protection Agency, "Supplementary Guidelines for Lead Implementation Plans: Updated Projections for Motor Vehicle Lead Emissions" (Office of Mobile Sources, 1978)

Environmental Protection Agency, *Air Quality Criteria for Lead* (GPO, 1986)

Environmental Protection Agency, *Air Quality Criteria for Lead* (U.S. Environmental Protection Agency, 1977)

Environmental Protection Agency, *Lead-Based Paint Abatement and Repair and Maintenance Study in Baltimore: Pre-Intervention Findings*, August 1996

Environmental Protection Agency, *Examination of Issues Related to Two-Car Regional Emission Control Strategies*. Ann Arbor, Mich.: Environmental Protection Agency, 1973.
Environmental Protection Agency, “Supplementary Guidelines for Lead Implementation Plans: Updated Projections for Motor Vehicle Lead Emissions.” Office of Mobile Sources, 1978.
Federal Highway Administration, *Benefits of Interstate Highways*. U.S. Government Printing Office, 1970.
Federal Highway Administration, “Highway Statistics: Summary to 1995” (Washington: GPO, 1997)
Federal Highway Administration, *Bus Use of Highways: State of the Art*, National Cooperative Highway Research Program Report 143 (Washington, D.C., 1973)
Federal Highway Administration, *Evaluation of a Bus Transit System in a Selected Urban Area: Final Report*. Bureau of Public Roads, Federal Highway Administration, 1969.
Federal Home Loan Bank Board, *Waverly: A Study in Neighborhood Conservation* (Federal home loan bank board, 1940)
Federal Housing Authority, *FHA Homes in Standard Metropolitan Areas 1950 – South Atlantic Division* (GPO, 1952).
Elizabeth Frazão, *America’s Eating Habits: Changes & Consequences* (U.S. Department of Agriculture, Economic Research Service, Food and Rural Economics Division, 1999)
Geological Survey, *Mineral Resources of the United States*, various years
Geological Survey, *Mineral Yearbooks*, various years
Geological Survey, *Flow Studies for Recycling Metal Commodities in the United States* (U.S. Dept. of the Interior, U.S. Geological Survey, 2004), F-1.
International Trade Commission. *Synthetic Organic Chemicals : United States Production and Sales*. GPO, 1925.
International Trade Commission. *Synthetic Organic Chemicals : United States Production and Sales*. GPO, 1926.
Official Register of the United States, Containing a List of Officers and Employees in the Civil, Military and Naval Service (Washington: GPO, 1881)
Karl Thayer Pomeroy McElroy and Willard Dell Bigelow, *Foods and Food Adulterants : Part Eighth : Canned Vegetables* (Washington, Govt. Print. Off., 1893)
Putnam, Judith Jones. “Food Consumption, Prices, and Expenditures, 1967-88.” U.S. Department of Commerce, 1990.
Anna Rochester, *Infant Mortality: Results of a Field Study in Baltimore, Md., Based on Births in One Year* (DC: United States Children’s Bureau, 1923), 43–44.
Task Force on Environmental Problems of the Inner City, *“Our Urban Environment and Our Most Endangered People;” A Report to the Administrator of the Environmental Protection Agency* (U.S. Government Printing Office, 1972
Tyler, Paul McIntosh. “Trends in White-Pigment Consumption.” U.S. Dept. of the Interior, Bureau of Mines, 1936.
Alan M. Voorhees & Associates, *3A Highway System, Baltimore Regional Environmental Impact Study Technical Memoranda*, 1974
Weather Bureau, *Climatological Data: Maryland and Baltimore Section*, annuals, various years
Carroll Davidson Wright, *The Slums of Baltimore, Chicago, New York, and Philadelphia* (US Government Printing Office, 1894)

Published Primary Sources

American Transit Association. “Transit Facts.” Chicago: Public Administration Clearing House, 1955.
American Correctional Association. *Proceedings of the Annual Congress of Correction*. American Correctional Association, 1893.
Aub, Joseph C., Lawrence Turner Fairhall, A. S. Minot, and Paul Reznikoff. *Lead Poisoning*. Williams & Wilkins Company, 1926.
Andrews, John Bertram. *Lead Poisoning in New York*, 1912.

Baerwald, John Edward, and Institute of Traffic Engineers. *Traffic Engineering Handbook*. Institute of Traffic Engineers, 1965.
Baltimore Directory, various years
Barnes, Henry A. *The Man with the Red and Green Eyes: The Autobiography of Henry A. Barnes, Traffic Commissioner, New York City*. Dutton, 1965.
Barney, Mary. *A Biographical Memoir of the Late Commodore Joshua Barney: From Autographical Notes and Journals in Possession of His Family, and Other Authentic Sources*. Gray and Bowen, 1832.
Bolles, Albert. *Industrial History of the United States, from the Earliest Settlements to the Present Time*. H. Bill publishing Company, 1879.
Brogden, Margaret. *Handbook of Organization and Method in Hospital Social Service*. Norman, Remington Company, 1922.
Brown, George Stewart. "Municipal Ownership of Public Utilities." *The North American Review* 182, no. 594 (1906): 701–8.
Brown, George Thomas. *The Gas Light Company of Baltimore: A Study of Natural Monopoly*. Johns Hopkins Press, 1936.
Chauncey Depew, *One Hundred Years of American Commerce* (D.O. Haynes & Company, 1895)
Clark, Victor Selden. *History of Manufactures in the United States*. Carnegie Institution of Washington, 1916.
Chute, Charles Lionel. *Child Labor Laws in All States*. National Child Labor Committee, 1912.
Consolidated Gas, Electric Light, and Power Company of Baltimore. *American Gas Centenary, 1816-1916*. The Company, 1916.
Edwards, William A. *Diseases of Children, Medical and Surgical: Supplement to Keating's Cyclopaedia of the Diseases of Children*. Lippincott, 1901.
Ely, Richard T. "Municipal Ownership of Natural Monopolies." *The North American Review* 172, no. 532 (1901): 445–55.
———. *An Introduction to Political Economy*. Hunt & Eaton, 1889.
———. *Natural Monopolies and Local Taxation*. Robinson & Stephenson, Manufacturing Printers, 1889.
———. *Problems of To-Day: A Discussion of Protective Tariffs, Taxation, and Monopolies*. T. Y. Crowell, 1888.
———. *The Strength and Weakness of Socialism*. Chautauqua Press, 1899.
Eldridge, John. *The Gas Fitter's Guide*. J. Eldridge, 1891.
Encyclopedia Britannica Films. *Baltimore Plan*, 1953. http://archive.org/details/baltimore_plan.
Ethyl Corporation. "Yearly Report of Gasoline Sales by States." *Yearly Report of Gasoline Sales by States*, 1982.
Frederick Schultz, *Solder: Its Production and Application with a Brief History of Tin and Lead* (MacNeal Printing Company, 1908
Gas Making. Scranton: International Textbook Co., 1906.
Hamilton, Alice. "Lead Poisoning in American Industry." *The Journal of Industrial Hygiene*, May 1919, 8.
———. *Lead Poisoning in Potteries, Tile Works, and Porcelain Enameled Sanitary Ware Factories*. U.S. Government Printing Office, 1912.
———. *Lead Poisoning in the Smelting and Refining of Lead*. U.S. Department of Labor, Bureau of Labor Statistics, 1914.
———. *Women in the Lead Industries*. U.S. Government Printing Office, 1919.
Hamilton, Alice, and Royal Meeker. *Industrial Poisons Used in the Rubber Industry*. U.S. Government Printing Office, 1915.
Hamilton, Alice, and Charles Henry Verrill. *Hygiene of the Printing Trades*. U.S. Government Printing Office, 1917.
Hawkins, W. Ashbie. "A Year of Segregation in Baltimore." *Crisis* 3 (1911): 27–30.

Henry Disston & Sons, Inc. *The File; Its History, Making and Uses: A Description of the Development of the File from the Earliest Times to the Present Day; a Brief Statement of the Modern Methods of File Making; a Description of the Great Variety of Files and the Numerous Uses to Which the Tool Is Adapted*. Henry Disston & sons, inc., 1921.

Hoffman, Frederick Ludwig. *The Statistical Experience Data of the Johns Hopkins Hospital: Baltimore, Md., 1892-1911*. Johns Hopkins Press, 1913.

Howard, George Washington. *The Monumental City: Its Past History and Present Resources*. J. D. Ehlers, 1873.

Howard, William. *Public Health Administration and the Natural History of Disease in Baltimore, Maryland 1797-1920*. Carnegie Institution of Washington, 1924.

Howe, Frederic C. "The Case for Municipal Ownership." *Proceedings of the American Political Science Association* 2 (1905): 89–104.

Kelly, Albanis Ashmun. *The Expert House Painter: A Reliable Guide for the Experienced House Painter and Manual of Instruction for the Less Expert Workman ... Formulas Given for Various Paint Mixtures, Tests for Ascertaining Purity and Value of Materials, How to Choose and Combine Proper Colors in Their True Scientific Relations, Etc*. David McKay Company, 1920.

Keating, John Marie. *Cyclopædia of the Diseases of Children: Medical and Surgical*. Lippincott, 1890.

Kemp, Janet E. *Housing Conditions in Baltimore: Report of a Special Committee of the Association for the Improvement of the Condition of the Poor and the Charity Organization Society*. Arno Press, 1974.

King, Thomson. *Consolidated of Baltimore, 1816-1950: A History of Consolidated Gas Electric Light and Power Company of Baltimore*. The Company, 1950.

Kober, George Martin, and William Clinton Hanson. *Diseases of Occupation and Vocational Hygiene*. P. Blakiston's Son & Company, 1916

Lead Industries Association. *Useful Information about Lead*. Lead Industries Association, 1931.

National Consumers League. *Child Labor Legislation*, 1905.

Notes for a History of Lead: And an Inquiry into the Development of the Manufacture of White Lead and Lead Oxides. D. Van Nostrand, 1888.

Oliver, Sir Thomas. *Lead Poisoning in Its Acute and Chronic Forms*. Pentland, 1891.

Planches, Louis Jean Charles Marie Tanquerel Des. *Lead Diseases*. Daniel Bixby and Company, 1848.

Polk's Baltimore City Directory, various years

Putzel, Leopold. *A Treatise on Common Forms of Functional Nervous Diseases*. W. Wood & Company, 1880.

Real Estate Board of Baltimore. *A Survey of Housing Conditions, Baltimore, Maryland*. Baltimore: Industrial Bureau, Board of Trade, 1921.

The Encyclopedia of Founding and Dictionary of Foundry Terms Used in the Practice of Moulding. Wiley, 1894.

Thompson, Gustave Whyte. *Painting Defects: Their Causes and Prevention; an Address*. Gustave Thompson, 1915.

Thompson, William P. "The Lead Industry." In *1795-1895: One Hundred Years of American Commerce ... a History of American Commerce by One Hundred Americans, with a Chronological Table of the Important Events of American Commerce and Invention Within the Past One Hundred Years*, 433–41. D. O. Haynes & Company, 1895.

Vail, Charles Henry. *Modern Socialism*. Commonwealth Company, 1897.

Wells, William H., and John Taylor. *Manual of the Diseases of Children*. Blakiston's Son & Company, 1901.

Wood's Baltimore City Directory, various years

Bibliography*1977 Census of Manufactures: Geographic Area Statistics*. U.S. Department of Commerce, Bureau of the Census, 1981.
A. H. Rose, R. Smith, W. F. Mcmichael, and R. E. Kruse. “Comparison of Auto Exhaust Emissions in Two Major Cities.” *Journal of the Air Pollution Control Association* 15, no. 8 (August 1, 1965): 362–66. doi:10.1080/00022470.1965.10468393.
Aaron Glazer. “Fade to Gas: The Conversion of Baltimore’s Mass Transit System from Streetcars to Diesel-Powered Buses.” *Maryland Historical Magazine* 97 (Fall 2002): 337–57.
Adler, Sy. “The Transformation of the Pacific Electric Railway: Bradford Snell, Roger Rabbit, and the Politics of Transportation in Los Angeles.” *Urban Affairs Quarterly* 27, no. 1 (September 1, 1991): 51–86. doi:10.1177/004208169102700104.
Alan M. Voorhees & Associates. *3A Highway System, Baltimore Regional Environmental Impact Study Technical Memoranda*, 1974.
Aldred, J. Edward, and Ernest Illmer. *Industrial Survey of Baltimore: Report of the Industries Located within the Baltimore Metropolitan District*. Baltimore, 1915.
American Transit Association. “Transit Facts.” Chicago: Public Administration Clearing House, 1955.
Ammon, Francesca Russello. *Bulldozer: Demolition and Clearance of the Postwar Landscape*. Yale University Press, 2016.
Amsterdam, Daniel. *Roaring Metropolis: Businessmen’s Campaign for a Civic Welfare State*. University of Pennsylvania Press, 2016.
Anderson, Alan D. *The Origin and Resolution of an Urban Crisis: Baltimore, 1890-1930*. Johns Hopkins University Press, 1977.
Anderson, Curtis Darrel, and Judy Anderson. *Electric and Hybrid Cars: A History*. McFarland, 2005.
Anderson, Martin. *The Federal Bulldozer: A Critical Analysis of Urban Renewal, 1949-1962*. MIT Press, 1965.
Andrews, John Bertram. *Lead Poisoning in New York*, 1912.
Annest, J. L., K. R. Mahaffey, D. H. Cox, and J. Roberts. “Blood Lead Levels for Persons 6 Months - 74 Years of Age: United States, 1976-80.” *Advance Data: From Vital and Health Statistics of the National Center for Health Statistics*, no. 79 (May 12, 1982): 1–23.
Annest, Joseph L., and Kathryn R. Mahaffey. *Vital and Health Statistics: Data from the National Health Survey*. U.S. Department of Health, Education, and Welfare, Public Health Service, National Center for Health Statistics, 1984.
Appleby, Joyce. *The Relentless Revolution: A History of Capitalism*. W. W. Norton & Company, 2011.
Argersinger, Jo Ann E. *Toward a New Deal in Baltimore: People and Government in the Great Depression*. University of North Carolina Press, 2011.
Arnold, Joseph L. “Baltimore Southern Culture and A Northern Economy.” *Snowbelt Cities, Metropolitan Politics in the Northeast and Midwest since World War II*, 1990, 23–39.
———. “Suburban Growth and Municipal Annexation in Baltimore, 1745-1918.” *Maryland Historical Magazine* 73, no. 2 (1978): 109–128.
———. “The Neighborhood and City Hall The Origin of Neighborhood Associations in Baltimore, 1880-1911.” *Journal of Urban History* 6, no. 1 (November 1, 1979): 3–30.
Association, American Correctional. *Proceedings of the Annual Congress of Correction*. American Correctional Association, 1893.
Association, Lead Industries. *Useful Information about Lead*. Lead Industries Association, 1931.
Atkins, P. R. “Lead in a Suburban Environment.” *Journal of the Air Pollution Control Association* 19, no. 8 (1969): 591–594.
Aub, Joseph C., Lawrence Turner Fairhall, A. S. Minot, and Paul Reznikoff. *Lead Poisoning*. Williams & Wilkins Company, 1926.
Automobile Facts and Figures. Automobile Manufacturers Association, 1955.
Baerwald, John Edward, and Institute of Traffic Engineers. *Traffic Engineering Handbook*. Institute of Traffic Engineers, 1965.

Balogh, Brian. *A Government Out of Sight: The Mystery of National Authority in Nineteenth-Century America*. Cambridge University Press, 2009.
———. *Chain Reaction: Expert Debate and Public Participation in American Commercial Nuclear Power 1945-1975*. Cambridge University Press, 1991.
"Baltimore City Department of Planning Records," n.d. Baltimore City Department of Planning Records. Langsdale Special Collections, University of Baltimore.
Baltimore (Md.). Laws, etc. *Ordinances and Resolutions of the Mayor and City Council of Baltimore.* Baltimore: Re-printed by John Cox, City Printer., 1877. http://archive.org/details/ordinancesres12balt.
———. *Ordinances and Resolutions of the Mayor and City Council of Baltimore.* Baltimore: Wm. J.C. Dulany Company, City Printers., 1904. http://archive.org/details/ordinances04balt.
Baltimore Planning Commission. *Study for East-West Expressway*. Baltimore: The Commission, 1960.
Baltimore Redevelopment Commission. "Redevelopment Project No. 1-A." Baltimore, May 1950.
Baltimore Urban Renewal and Housing Authority. *A Demonstration of Rehabilitation, Harlem Park, Baltimore, Maryland*. Baltimore Urban Renewal and Housing Agency, 1965.
———. *Ten Years of Relocation Experience in Baltimore, Maryland*, 1961.
Barnes, Henry A. *The Man with the Red and Green Eyes: The Autobiography of Henry A. Barnes, Traffic Commissioner, New York City*. Dutton, 1965.
Barney, Mary. *A Biographical Memoir of the Late Commodore Joshua Barney: From Autographical Notes and Journals in Possession of His Family, and Other Authentic Sources*. Gray and Bowen, 1832.
Battelle Memorial Institute, Battelle Columbus Laboratories, United States, Environmental Protection Agency, and Office of Toxic Substances. *The Health and Environmental Impacts of Lead and an Assessment of a Need for Limitations*. Washington; Springfield, VA: U.S. Environmental Protection Agency ; Available through the National Technical Information Service, 1979.
Beaulac, Julie, Elizabeth Kristjansson, and Steven Cummins. "A Systematic Review of Food Deserts, 1966-2007." *Preventing Chronic Disease* 6, no. 3 (July 2009): A105.
Beauregard, Robert A. "Federal Policy and Postwar Urban Decline: A Case of Government Complicity?" *Housing Policy Debate* 12, no. 1 (2001): 129–151.
Belfoure, Charles, and Mary Ellen Hayward. *The Baltimore Rowhouse*. Chronicle Books, 2012.
Bellinger, David C. "Neurological and Behavioral Consequences of Childhood Lead Exposure." *PLoS Med* 5, no. 5 (2008): e115.
———. "Very Low Lead Exposures and Children's Neurodevelopment." *Current Opinion in Pediatrics* 20, no. 2 (2008): 172–177.
Benefits of Interstate Highways. U.S. Government Printing Office, 1970.
Berk, Gerald. *Louis D. Brandeis and the Making of Regulated Competition, 1900-1932*. Cambridge University Press, 2009.
Biehler, Dawn Day. *Pests in the City: Flies, Bedbugs, Cockroaches, and Rats*. University of Washington Press, 2013.
Biles, Roger. *The Human Tradition in Urban America*. Rowman & Littlefield, 2002.
Bishop, John Leander, Edwin Troxell Freedley, and Edward Young. *A History of American Manufactures from 1608 to 1860...: Comprising Annals of the Industry of the United States in Machinery, Manufactures and Useful Arts, with a Notice of the Important Inventions, Tariffs, and the Results of Each Decennial Census*. E. Young, 1864.
Blackfan, Kenneth D. "Lead Poisoning in Children with Especial Reference to Lead As a Cause of Convulsions." *The American Journal of the Medical Sciences* 153, no. 6 (1917): 877–887.
Blackhawk, Ned. *Violence over the Land: Indians and Empires in the Early American West*. Harvard University Press, 2009.
Bloom, Nicholas Dagen. *Merchant of Illusion: James Rouse, America's Salesman of the Businessman's Utopia*. Ohio State University Press, 2004.

Bloom, Robert, and Marshall Newman. "Rent Control." *Annual Survey of Massachusetts Law* 1974, no. 1 (January 1, 1974). http://lawdigitalcommons.bc.edu/asml/vol1974/iss1/22.

Bloomfield, J. J., and H. S. Isbell. "The Problem of Automobile Exhaust Gas in Streets and Repair Shops of Large Cities." *Public Health Reports (1896-1970)* 43, no. 13 (1928): 750–65. doi:10.2307/4578765.

Board, United States Federal Home Loan Bank. *Waverly: A Study in Neighborhood Conservation*. Federal home loan bank board, 1940.

Boddy, Martin, and Fred Gray. "Filtering Theory, Housing Policy and the Legitimation of Inequality." *Policy & Politics* 7, no. 1 (January 1, 1979): 39–54. doi:10.1332/030557379783246335.

Bolger, P. Michael, Clark D. Carrington, Stephen G. Capar, and Michael A. Adams. "Reductions in Dietary Lead Exposure in the United States." *Chemical Speciation & Bioavailability* 3, no. 3–4 (December 1, 1991): 31–36. doi:10.1080/09542299.1991.11083151.

Bolles, Albert. *Industrial History of the United States, from the Earliest Settlements to the Present Time*. H. Bill publishing Company, 1879.

Boone, Christopher G. "An Assessment and Explanation of Environmental Inequity in Baltimore." *Urban Geography* 23, no. 6 (2002): 581–595.

Booth, James, and Robert Morris. "Transit vs. Auto Travel in the Future." *Journal of the American Institute of Planners* 25, no. 2 (May 1959): 90–95. doi:10.1080/01944365908978311.

Bottles, Scott L. *Los Angeles and the Automobile: The Making of the Modern City*. University of California Press, 1987.

Bourne, I. Blanche. "Epidemic Lead Poisoning in Children from Storage Battery Casings." *Journal of the National Medical Association* 36, no. 6 (November 1944): 187–93.

Boutwell, Brian B., Erik J. Nelson, Brett Emo, Michael G. Vaughn, Mario Schootman, Richard Rosenfeld, and Roger Lewis. "The Intersection of Aggregate-Level Lead Exposure and Crime." *Environmental Research* 148 (July 2016): 79–85. doi:10.1016/j.envres.2016.03.023.

Bowles, Samuel, Richard Edwards, and Frank Roosevelt. *Understanding Capitalism: Competition, Command, and Change*. Oxford University Press, 2005.

Bracht, Neil F. *Social Work in Health Care: A Guide to Professional Practice*. Psychology Press, 1978.

Bradley, J. Edmund, Albert E. Powell, William Niermann, Kathleen R. McGrady, and Emanuel Kaplan. "The Incidence of Abnormal Blood Levels of Lead in a Metropolitan Pediatric Clinic: With Observation on the Value of Coproporohyrinuria as a Screening Test." *The Journal of Pediatrics* 49, no. 1 (1956): 1–6.

Brandt, Allan M. *No Magic Bullet: A Social History of Venereal Disease in the United States Since 1880*. Oxford University Press, 1987.

Brechin, Gray A. *Imperial San Francisco: Urban Power, Earthly Ruin*. University of California Press, 2001.

Brogden, Margaret. *Handbook of Organization and Method in Hospital Social Service*. Norman, Remington Company, 1922.

Brosnan, Kathleen A. *Uniting Mountain & Plain: Cities, Law, and Environmental Change Along the Front Range*. UNM Press, 2002.

Brown, George Stewart. "Municipal Ownership of Public Utilities." *The North American Review* 182, no. 594 (1906): 701–8.

Brown, George Thomas. *The Gas Light Company of Baltimore: A Study of Natural Monopoly*. Johns Hopkins Press, 1936.

Brubaker, Christopher J., Vincent J. Schmithorst, Erin N. Haynes, Kim N. Dietrich, John C. Egelhoff, Diana M. Lindquist, Bruce P. Lanphear, and Kim M. Cecil. "Altered Myelination and Axonal Integrity in Adults with Childhood Lead Exposure: A Diffusion Tensor Imaging Study." *NeuroToxicology*, 10th International Symposium on Neurobehavioral Methods and Effects in Environmental and Occupational Health, 30, no. 6 (November 2009): 867–75. doi:10.1016/j.neuro.2009.07.007.

Brugger, Robert J. *Maryland, A Middle Temperament: 1634-1980*. JHU Press, 1996.

Bryant, Bunyan I., and Paul Mohai. *Race and the Incidence of Environmental Hazards: A Time for Discourse*. Westview Press, 1992.

Budenholzer, John Christopher. "Lead Poisoning: The Costs and Benefits of a Prevention Program." Thesis, Illinois Institute of Technology, 1971.

Bullard, Robert. *Toxic Wastes and Race at Twenty, 1987-2007: A Report Prepared for the United Church of Christ Justice & Witness Ministries*. United Church of Christ, 2007.

Bullard, Robert D. *Dumping in Dixie: Race, Class, and Environmental Quality*. Westview Press, 2008.

Bullard, Robert, Glenn S. Johnson, and Angel O. Torres. *Sprawl City: Race, Politics, and Planning in Atlanta*. Island Press, 2000.

Burchell, Robert, Anthony Downs, Barbara McCann, and Sahan Mukherji. *Sprawl Costs: Economic Impacts of Unchecked Development*. Island Press, 2005.

Burnett, Proffessor John, and John Burnett. *Liquid Pleasures: A Social History of Drinks in Modern Britain*. Routledge, 2012.

Burnham, John C. "Unraveling the Mystery of Why There Was No Childhood Lead Poisoning." *Journal of the History of Medicine and Allied Sciences* 60, no. 4 (2005): 445–77.

Burns, Nancy. *The Formation of American Local Governments: Private Values in Public Institutions*. Oxford University Press, 1994.

Cameron, Catherine M., Paul Kelton, and Alan C. Swedlund. *Beyond Germs: Native Depopulation in North America*. University of Arizona Press, 2015.

Canfield, Richard L., Mathew H. Gendle, and Deborah A. Cory-Slechta. "Impaired Neuropsychological Functioning in Lead-Exposed Children." *Developmental Neuropsychology* 26, no. 1 (August 1, 2004): 513–40. doi:10.1207/s15326942dn2601_8.

Caprio, Raphael J., Harry L. Margulis, and Morris M. Joselow. "Residential Location, Ambient Air Lead Pollution And Lead Absorption In Children." *The Professional Geographer* 27, no. 1 (February 1, 1975): 37–42. doi:10.1111/j.0033-0124.1975.00037.x.

Carpenter, Daniel P. *The Forging of Bureaucratic Autonomy: Reputations, Networks, and Policy Innovation in Executive Agencies, 1862-1928*. Princeton University Press, 2001.

"Carroll Museums: Making History Yours." Accessed June 2, 2016. http://www.carrollmuseums.org/history/towerhistory.html.

Carter, Susan B. *Historical Statistics of the United States: Population*. Cambridge University Press, 2006.

Casper, Scott E., Jeffrey D. Groves, Stephen W. Nissenbaum, and Michael Winship. *A History of the Book in America: Volume 3: The Industrial Book, 1840-1880*. Univ of North Carolina Press, 2009.

Castellino, Nicolo, Nicola Sannolo, and Pietro Castellino. *Inorganic Lead Exposure and Intoxications*. CRC Press, 1994.

Cebul, Brent. "Developmental State: Business, Poverty, and Economic Empowerment from the New Deal to the New Democrats." Dissertation, University of Virginia, 2014.

Cecil, K. M. "Effects of Early Low-Level Lead Exposure on Human Brain Structure, Organization and Functions." *Journal of Developmental Origins of Health and Disease* 2, no. 01 (2011): 17–24.

Cecil, Kim M, Christopher J Brubaker, Caleb M Adler, Kim N Dietrich, Mekibib Altaye, John C Egelhoff, Stephanie Wessel, et al. "Decreased Brain Volume in Adults with Childhood Lead Exposure." *PLoS Med* 5, no. 5 (May 27, 2008): e112. doi:10.1371/journal.pmed.0050112.

Census, United States Bureau of the. *United States Census of Manufactures: 1958: Industry Statistics*. U.S. Government Printing Office, 1961.

Chandler, Alfred D. *Scale and Scope: The Dynamics of Industrial Capitalism*. Harvard University Press, 2009.

Chapin, Henry. "Lead Paralysis In Children." *The Medical Record* 25, no. 20 (May 17, 1884): 546–47.

Chatterjee, Lata. "Real Estate Investment and Deterioration of Housing in Baltimore." Dissertation, Johns Hopkins University, 1973.

Chisolm, J. J., and D. Barltrop. "Recognition and Management of Children with Increased Lead Absorption." *Archives of Disease in Childhood* 54, no. 4 (April 1979): 249–62.

Cholak, J., K. Bambach, and others. "Measurement of Industrial Lead Exposure by Analyses of Blood and Excreta of Workmen." *Journal of Industrial Hygiene and Toxicology* 25, no. 2 (1943): 47–54.

Cholak, J., L. J. Schafer, and T. D. Sterling. "The Lead Content of the Atmosphere." *Journal of the Air Pollution Control Association* 11, no. 6 (1961): 281–303.

Cholak, Jacob. "The Nature of Atmospheric Pollution in a Number of Industrial Communities." In *Proc. 2nd National Air Pollution Symposium*, 5–15, 1952.

Chute, Charles Lionel. *Child Labor Laws in All States*. National Child Labor Committee, 1912.

City of Baltimore. *Ordinances and Resolutions of the Mayor and City Council of Baltimore*. Baltimore: King Bros., Inc. City Printers., 1927. http://archive.org/details/ordinances27balt.

———. *Ordinances and Resolutions of the Mayor and City Council of Baltimore*. Baltimore: King Bros. Inc., City Printers., 1939. http://archive.org/details/ordinances39balt.

———. *Ordinances and Resolutions of the Mayor and City Council of Baltimore*. Baltimore: King Bros. Inc., City Printers., 1942. http://archive.org/details/ordinances42balt.

Clark, Victor Selden. *History of Manufactures in the United States*. Carnegie Institution of Washington, 1916.

CNN, Sara Ganim and Linh Tran. "How Flint, Michigan's Tap Water Became Toxic - CNN.com." *CNN*. Accessed January 26, 2016. http://www.cnn.com/2016/01/11/health/toxic-tap-water-flint-michigan/index.html.

Cole, Luke W., and Sheila R. Foster. *From the Ground Up: Environmental Racism and the Rise of the Environmental Justice Movement*. NYU Press, 2001.

Coleman, Roy Edwin. *The Principles of Paint: A Treatise on the Principles of Paint*. Arco Company, 1915.

Collins, Robert M. *More: The Politics of Economic Growth in Postwar America*. Oxford University Press, USA, 2000.

Collins, William J., and Robert A. Margo. "Race and Home Ownership from the End of the Civil War to the Present." *The American Economic Review* 101, no. 3 (2011): 355–359.

———. "Race, Home Ownership, and Family Structure in Twentieth-Century America." *What Has Happened to the Quality of Life in the Advanced Industrialized Nations*, 2004, 187–213.

Collins, William J., and Katharine L. Shester. "Slum Clearance and Urban Renewal in the United States." *American Economic Journal: Applied Economics* 5, no. 1 (2013): 239–73.

Colten, Craig E. "Chicago's Waste Lands: Refuse Disposal and Urban Growth, 1840-1990." *Journal of Historical Geography* 20, no. 2 (1994): 124–142.

Colucci, Joseph M., and Charles R. Begeman. "The Automotive Contribution to Air-Borne Polynuclear Aromatic Hydrocarbons in Detroit." *Journal of the Air Pollution Control Association* 15, no. 3 (March 1, 1965): 113–22. doi:10.1080/00022470.1965.10468342.

Commission on City Plan. *Redevelopment of Blighted Residential Areas in Baltimore; Conditions of Blight, Some Remedies and Their Relative Costs*. Baltimore, 1945.

Commission on Interracial Problems and Relations. *An American City in Transition: The Baltimore Community Self-Survey of Inter-Group Relations*. Baltimore, 1955.

Committee on Mass Transportation. *Report to the Mayor of Baltimore*. Baltimore, Md.: Committee on Mass Transportation, 1955.

Connolly, Cynthia. "Late-Nineteenth and Early-Twentieth Century Pediatrics: The Development of a Specialty." University of Pennsylvania, School of Nursing, n.d. http://www.nursing.upenn.edu/nhhc/Welcome%20Page%20Content/Late%20Nineteenth%20and%20Early%20Century%20Pediatrics.pdf.

Connolly, N. D. B. *A World More Concrete: Real Estate and the Remaking of Jim Crow South Florida*. University of Chicago Press, 2014.

Consolidated Gas, Electric Light, and Power Company of Baltimore. *American Gas Centenary, 1816-1916*. The Company, 1916.

Corn, Joseph J. *User Unfriendly: Consumer Struggles with Personal Technologies, from Clocks and Sewing Machines to Cars and Computers*. JHU Press, 2011.

Cronon, William. *Nature's Metropolis: Chicago and the Great West*. W. W. Norton, 1991.

Crooks, James B. *Politics & Progress: The Rise of Urban Progressivism in Baltimore, 1895 to 1911*. Louisiana State University Press, 1968.

Crosby, Alfred W. *Ecological Imperialism: The Biological Expansion of Europe, 900-1900*. 2nd ed. Cambridge University Press, 2004.

D. A. Hirschler AB, BSME, and L. F. Gilbert MS. "Nature of Lead in Automobile Exhaust Gas." *Archives of Environmental Health: An International Journal* 8, no. 2 (February 1, 1964): 297–313. doi:10.1080/00039896.1964.10663670.

Dahl, Robert Alan. *Who Governs?: Democracy and Power in an American City*. Yale University Press, 2005.

Davis, Frederick Rowe. *Banned: A History of Pesticides and the Science of Toxicology*. Yale University Press, 2014.

Department of Energy. "Average Historical Annual Gasoline Pump Price, 1929-2015." Accessed September 21, 2016. http://energy.gov/eere/vehicles/downloads/fact-915-march-7-2016-average-historical-annual-gasoline-pump-price-1929.

DiLisio, James, and James E. DiLisio. *Maryland Geography: An Introduction*. JHU Press, 2014.

Dilts, James D. *The Great Road: The Building of the Baltimore and Ohio, the Nation's First Railroad, 1828-1853*. Stanford University Press, 1996.

Dilworth, Richardson. *The Urban Origins of Suburban Autonomy*. Harvard University Press, 2005.

"Display Ad: Save on Paint." *Afro-American (1893-1988)*. May 27, 1939.

Domhoff, G. William. *Who Really Rules?: New Haven and Community Power Reexamined*. Transaction Publishers, 1978.

Downing, D. L. *A Complete Course in Canning and Related Processes: Microbiology, Packaging, HACCP and Ingredients*. Elsevier, 2013.

Downs, Anthony. *Neighborhoods and Urban Development*. Brookings Institution Press, 1981.

———. "Uncompensated Nonconstruction Costs Which Urban Highways and Urban Renewal Impose upon Residential Households." In *The Analysis of Public Output*, edited by Julies Margolis, 69–113. NBER, 1970. http://www.nber.org/chapters/c3351.pdf.

Dreier, Peter, John Mollenkopf, and Todd Swanstrom. *Place Matters: Metropolitics for the Twenty-First Century*. University Press of Kansas, 2014.

Dunlap, Thomas. *DDT: Scientists, Citizens, and Public Policy*. Princeton University Press, 2014.

Durr, Kenneth D. *Behind the Backlash: White Working-Class Politics in Baltimore, 1940-1980*. University of North Carolina Press, 2003.

Eadie, Mervyn J. *The Flowering of a Waratah: A History of Australian Neurology and of the Australian Association of Neurologists*. John Libbey Eurotext, 2000.

Eckel, William P., Michael B. Rabinowitz, and Gregory D. Foster. "Investigation of Unrecognized Former Secondary Lead Smelting Sites: Confirmation by Historical Sources and Elemental Ratios in Soil." *Environmental Pollution* 117, no. 2 (2002): 273–279.

Edwards, William A. *Diseases of Children, Medical and Surgical: Supplement to Keating's Cyclopaedia of the Diseases of Children*. Lippincott, 1901.

Eisenhauer, Elizabeth. "In Poor Health: Supermarket Redlining and Urban Nutrition." *GeoJournal* 53, no. 2 (February 1, 2001): 125–33. doi:10.1023/A:1015772503007.

Eldridge, John. *The Gas Fitter's Guide*. J. Eldridge, 1891.

Ely, Richard T. "Municipal Ownership of Natural Monopolies." *The North American Review* 172, no. 532 (1901): 445–55.

———. *Supplementary Report on Taxation in Maryland*. Maryland Tax Commission, 1888.

Ely, Richard Theodore. *An Introduction to Political Economy*. Hunt & Eaton, 1889.

———. *Natural Monopolies and Local Taxation*. Robinson & Stephenson, Manufacturing Printers, 1889.

———. *Problems of To-Day: A Discussion of Protective Tariffs, Taxation, and Monopolies*. T. Y. Crowell, 1888.
———. *The Strength and Weakness of Socialism*. Chautauqua Press, 1899.
Encyclopedia Britannica Films. *Baltimore Plan*, 1953. http://archive.org/details/baltimore_plan.
English, Peter C. *Old Paint : A Medical History of Childhood Lead-Paint Poisoning in the United States to 1980*. New Brunswick, NJ: Rutgers University Press, 2001.
Environmental Protection Agency. *Air Quality Criteria for Lead*. U.S. Environmental Protection Agency, 1977.
———. *Air Quality Criteria for Lead*. GPO, 1986.
———. *Examination of Issues Related to Two-Car Regional Emission Control Strategies*. Ann Arbor, Mich.: EPA, 1973.
———. "Supplementary Guidelines for Lead Implementation Plans: Updated Projections for Motor Vehicle Lead Emissions." Office of Mobile Sources, 1978.
Erickson, Ansley T. *Making the Unequal Metropolis: School Desegregation and Its Limits*. University of Chicago Press, 2016.
Ermer, Virginia B. "Street-Level Bureaucrats in Baltimore: The Case of Housing Code Enforcement." Dissertation, Johns Hopkins University, 1972.
Ethyl Corporation. "Yearly Report of Gasoline Sales by States." *Yearly Report of Gasoline Sales by States*, 1982.
Faiz, Asif, Christopher S. Weaver, and Michael P. Walsh. *Air Pollution from Motor Vehicles: Standards and Technologies for Controlling Emissions*. World Bank Publications, 1996.
Fassig, Oliver L. "Report on the Climate and Weather of Baltimore and Vicinity." *Bulletin of the American Geographical Society* 37, no. 5 (1905): 316.
Federal Highway Administration. *Bus Use of Highways: State of the Art*. National Cooperative Highway Research Program Report 143. Washington, D.C., 1973.
———. *Evaluation of a Bus Transit System in a Selected Urban Area: Final Report*. Bureau of Public Roads, Federal Highway Administration, 1969.
———. "Highway Statistics: Summary to 1995." Washington: GPO, 1997.
Fee, Elizabeth. "Public Health in Practice: An Early Confrontation with the 'Silent Epidemic' of Childhood Lead Paint Poisoning." *Journal of the History of Medicine and Allied Sciences* 45, no. 4 (October 1, 1990): 570–606.
Feigenbaum, James J., and Christopher Muller. "Lead Exposure and Violent Crime in the Early Twentieth Century." *Explorations in Economic History* 62 (October 2016): 51–86. doi:10.1016/j.eeh.2016.03.002.
Fergusson, David M., Joseph M. Boden, and L. John Horwood. "Dentine Lead Levels in Childhood and Criminal Behaviour in Late Adolescence and Early Adulthood." *Journal of Epidemiology and Community Health* 62, no. 12 (2008): 1045–1050.
Fetter, Daniel K. "The Home Front: Rent Control and the Rapid Wartime Increase in Home Ownership." Working Paper. National Bureau of Economic Research, October 2013. http://www.nber.org/papers/w19604.
Fleming, Walter Ernest, and United States Agricultural Research Service. *Integrating Control of the Japanese Beetle: A Historical Review*. U.S. Dept. of Agriculture, Agricultural Research Service, 1976.
Flink, James J. *The Automobile Age*. MIT Press, 1990.
Flores, Dan. "Bison Ecology and Bison Diplomacy: The Southern Plains from 1800 to 1850." *The Journal of American History*, 1991, 465–485.
Fogelson, Robert M. *Bourgeois Nightmares: Suburbia, 1870-1930*. Yale University Press, 2007.
Forestry, United States Congress Senate Committee on Agriculture and. *Filled Milk: Hearings Before a Subcommittee of the Committee on Agriculture and Forestry, United States Senate, Sixty-Seventh Congress, Second Session, on H. R. 8086, to Prohibit the Shipment of Filled Milk in Interstate Or Foreign Commerce*. U.S. Government Printing Office, 1922.

Fourteenth Census of the United States Taken in the Year 1920 ... U.S. Government Printing Office, 1923.

Franco, Manuel, Arijit Nandi, Thomas Glass, and Ana Diez-Roux. "Smoke before Food: A Tale of Baltimore City." *American Journal of Public Health* 97, no. 7 (2007): 1178–1178.

Frazão, Elizabeth. *America's Eating Habits: Changes & Consequences*. U.S. Department of Agriculture, Economic Research Service, Food and Rural Economics Division, 1999.

Freund, David M. P. *Colored Property: State Policy and White Racial Politics in Suburban America*. University of Chicago Press, 2010.

Friedman, Lawrence M. *American Law in the Twentieth Century*. Yale University Press, 2008.

Fullilove, Mindy. *Root Shock: How Tearing Up City Neighborhoods Hurts America, and What We Can Do About It*. Random House Publishing Group, 2009.

Galster, George. "How Neighborhoods Affect Health, Well-Being, and Young People's Futures." Policy Research Brief. Macarthur Foundation, March 2014. https://www.macfound.org/media/files/HHM_-_Neighborhoods_Affect_Health_Well-being_Young_Peoples_Futures.pdf.

Galster, George C. "The Mechanism (S) of Neighbourhood Effects: Theory, Evidence, and Policy Implications." In *Neighbourhood Effects Research: New Perspectives*, 23–56. Springer, 2012. http://link.springer.com/chapter/10.1007/978-94-007-2309-2_2.

Gans, Herbert J. *The Urban Villagers: Group and Class in the Life of Italian-Americans*. Collier-Macmillan, 1962.

Gas Making. Scranton: International Textbook Co., 1906.

Gibson, J. L. "A Plea for Painted Railings and Painted Walls of Rooms as the Source of Lead Poisoning amongst Queensland Children." *Australian Medical Gazette* 23 (1904): 149–53.

Giguere, Andrew M. "'...and Never the Twain Shall meet:' Baltimore's East-West Expressway and the Construction of the 'Highway to Nowhere.'" Ohio University, 2009. https://etd.ohiolink.edu/ap/10?0::NO:10:P10_ETD_SUBID:61145.

Gioielli, R. "'We Must Destroy You to Save You': Highway Construction and the City as a Modern Commons." *Radical History Review* 2011, no. 109 (December 29, 2010): 62–82. doi:10.1215/01636545-2010-015.

Gioielli, Robert. "The City and American Environmentalism." *Journal of Urban History* 41, no. 3 (2015): 526–533.

Glenn, Wm. "Chrome Yellow Considered as a Poison." *Science* 13, no. 326 (1889): 347–49.

Gnesin, G. G. "Metals and Alloys of Bronze Age: From Middle to Modern Times. II. Gold, Silver, Tin, Lead, Mercury, and Their Alloys." *Powder Metallurgy and Metal Ceramics* 53, no. 11–12 (March 1, 2015): 722–32. doi:10.1007/s11106-015-9667-x.

Goldin, Claudia, and Robert A. Margo. "The Great Compression: The Wage Structure in the United States at Mid- Century." *The Quarterly Journal of Economics*, 1992.

Goldman, Marshall I. *Controlling Pollution: The Economics of a Cleaner America*. Prentice-Hall, 1967.

Goldsmith, John R., and Lewis H. Rogers. "Health Hazards of Automobile Exhaust." *Public Health Reports* 74, no. 6 (June 1959): 551–58.

Goodlad, James K., David K. Marcus, and Jessica J. Fulton. "Lead and Attention-Deficit/Hyperactivity Disorder (ADHD) Symptoms: A Meta-Analysis." *Clinical Psychology Review* 33, no. 3 (April 2013): 417–25. doi:10.1016/j.cpr.2013.01.009.

Gordon, Robert B., and Patrick M. Malone. *The Texture of Industry: An Archaeological View of the Industrialization of North America*. Oxford University Press, 1997.

Gould, Elise. "Childhood Lead Poisoning: Conservative Estimates of the Social and Economic Benefits of Lead Hazard Control." *Environmental Health Perspectives* 117, no. 7 (July 2009): 1162–67. doi:10.1289/ehp.0800408.

Grigsby, William G., Morton S. Baratz, and Duncan Maclennan. "The Dynamics of Neighborhood Change and Decline." Research Report Series. Department of City and Regional Planning, University of Pennsylvania, 1983.

Haagen-Smit, Arie J. “Smog Control.” *Engineering and Science* 26, no. 2 (1962): 9–14.
Hall, Clayton. *Baltimore: Its History and Its People*. Lewis Historical Publishing Company, 1912.
Hamalainen, Pekka. *The Comanche Empire*. New Haven: Yale University Press, 2009.
Hamilton, Alice. “Lead Poisoning in American Industry.” *The Journal of Industrial Hygiene,* May 1919, 8.
———. *Lead Poisoning in Potteries, Tile Works, and Porcelain Enameled Sanitary Ware Factories*. U.S. Government Printing Office, 1912.
———. *Lead Poisoning in the Smelting and Refining of Lead*. U.S. Department of Labor, Bureau of Labor Statistics, 1914.
———. *Women in the Lead Industries*. U.S. Government Printing Office, 1919.
Hamilton, Alice, and Royal Meeker. *Industrial Poisons Used in the Rubber Industry*. U.S. Government Printing Office, 1915.
Hamilton, Alice, and Charles Henry Verrill. *Hygiene of the Printing Trades*. U.S. Government Printing Office, 1917.
Hamilton, Shane. *Trucking Country: The Road to America’s Wal-Mart Economy*. Princeton University Press, 2008.
Harris, Richard. “‘Ragged Urchins Play on Marquetry Floors’: The Discourse of Filtering Is Reconstructed, 1920s–1950s.” *Housing Policy Debate* 22, no. 3 (June 1, 2012): 463–82. doi:10.1080/10511482.2012.680481.
———. “The Rise of Filtering Down The American Housing Market Transformed, 1915-1929.” *Social Science History* 37, no. 4 (2013): 515–49.
Harrison, Mark. *Disease and the Modern World: 1500 to the Present Day*. John Wiley & Sons, 2013.
Harrison, R.M., and D.P.H. Laxen. *Lead Pollution: Causes and Control*. New York: Springer, 1981.
Harvey, A. McGehee. *Adventures in Medical Research: A Century of Discovery at Johns Hopkins*. Baltimore: Johns Hopkins University Press, 1976.
Harvey, D., L. Chaterjee, M. Wolman, and J. Newman. “The Housing Market and Code Enforcement in Baltimore.” *Baltimore Urban Observatory,* 1972.
Harvey, David. “Class-Monopoly Rent, Finance Capital and the Urban Revolution.” *Regional Studies* 8, no. 3–4 (November 1, 1974): 239–55. doi:10.1080/09595237400185251.
———. *Social Justice and the City*. University of Georgia Press, 2010.
Harwood, Herbert H. *Baltimore Streetcars: The Postwar Years*. JHU Press, 2003.
Havran, T. “Eminent Domain and the Police Power.” *Notre Dame Law Review* 5, no. 7 (April 1, 1930): 380.
Hawkins, W. Ashbie. “A Year of Segregation in Baltimore.” *Crisis* 3 (1911): 27–30.
Hawley, Ellis Wayne. *The New Deal and the Problem of Monopoly*. Princeton University Press, 2015.
Hays, Samuel P. *Conservation and the Gospel of Efficiency: The Progressive Conservation Movement, 1890-1920*. Atheneum, 1969.
———. *The Response to Industrialism, 1885-1914*. University of Chicago Press, 2014.
Hays, Samuel P., and Barbara D. Hays. *Beauty, Health, and Permanence: Environmental Politics in the United States, 1955-1985*. Cambridge University Press, 1989.
Hayward, Mary Ellen. *Baltimore’s Alley Houses: Homes for Working People Since the 1780s*. Johns Hopkins University Press, 2008.
Hayward, Mary Ellen, and Charles Belfoure. *The Baltimore Rowhouse*. Princeton Architectural Press, 2001.
Hayward, Mary Ellen, and Frank R. Shivers Jr. *The Architecture of Baltimore: An Illustrated History*. JHU Press, 2004.
Hazardous Metals in Human Toxicology. Elsevier, 1984.
Heidorn, K. C. “A Chronology of Important Events in the History of Air Pollution Meteorology to 1970.” *Bulletin of the American Meteorological Society* 59, no. 12 (1978): 1589–1597.
Helper, Rose. *Racial Policies and Practices of Real Estate Brokers*. U of Minnesota Press, 1969.

Henry Disston & Sons, Inc. *The File; Its History, Making and Uses: A Description of the Development of the File from the Earliest Times to the Present Day; a Brief Statement of the Modern Methods of File Making; a Description of the Great Variety of Files and the Numerous Uses to Which the Tool Is Adapted*. Henry Disston & sons, inc., 1921.

Highsmith, Andrew R. *Demolition Means Progress: Flint, Michigan, and the Fate of the American Metropolis*. University of Chicago Press, 2015.

———. "Demolition Means Progress Urban Renewal, Local Politics, and State-Sanctioned Ghetto Formation in Flint, Michigan." *Journal of Urban History* 35, no. 3 (March 1, 2009): 348–68.

Hille, Stanley J., and Theodore K. Martin. "Consumer Preference in Transportation." *Highway Research Record*, no. 197 (1967). https://trid.trb.org/view.aspx?id=93100.

Hillier, Amy E. "Redlining and the Home Owners' Loan Corporation." *Journal of Urban History* 29, no. 4 (2003): 394–420.

Hinton, Elizabeth. *From the War on Poverty to the War on Crime*. Harvard University Press, 2016.

Hirsch, Arnold R. *Making the Second Ghetto: Race and Housing in Chicago, 1940-1960*. CUP Archive, 1983.

Hirschler, D. A., L. F. Gilbert, F. W. Lamb, and L. M. Niebylski. "Particulate Lead Compounds in Exhaust Gas." *Industrial & Engineering Chemistry* 49, no. 7 (1957): 1131–1142.

Hirt, P.W. *A Conspiracy of Optimism: Management of the National Forests since World War Two*. Lincoln: University of Nebraska Press, 1996.

Hobbs, Frank, and Nicole Stoops. "Demographic Trends in the Twentieth Century. Census 2000 Special Reports.," 2002.

Hoet, Perinne. "Speciation of Lead in Occupational Exposure and Clinical Health Aspects." In *Handbook of Elemental Speciation II-Species in the Environment, Food, Medicine and Occupational Health*, 252–276, 2005.

Hoffman, Alexander von. "Coordinator's Introduction to the Forum." *Journal of Urban History* 40, no. 4 (July 1, 2014): 631–33. doi:10.1177/0096144214524347.

———. "The Lost History of Urban Renewal." *Journal of Urbanism: International Research on Placemaking and Urban Sustainability* 1, no. 3 (November 1, 2008): 281–301.

Hoffman, Frederick Ludwig. *The Statistical Experience Data of the Johns Hopkins Hospital: Baltimore, Md., 1892-1911*. Johns Hopkins Press, 1913.

Hoffman, Morton. "The Role of Government in Influencing Changes in Housing in Baltimore: 1940 to 1950." *Land Economics*, 1954, 125–140.

Holt, Luther Emmett. *The Diseases of Infancy and Childhood*. D. Appleton and Company, 1902.

Hood, Ernie. "The Apple Bites Back: Claiming Old Orchards for Residential Development." *Environmental Health Perspectives* 114, no. 8 (August 2006): A470–76.

Horwitz, Morton J. *The Transformation of American Law, 1870-1960: The Crisis of Legal Orthodoxy*. Oxford University Press, 1992.

Howard, George Washington. *The Monumental City: Its Past History and Present Resources*. J. D. Ehlers, 1873.

Howard, William. *Public Health Administration and the Natural History of Disease in Baltimore, Maryland 1797-1920*. Carnegie Institution of Washington, 1924.

Howe, Frederic C. "The Case for Municipal Ownership." *Proceedings of the American Political Science Association* 2 (1905): 89–104. doi:10.2307/3038373.

Hughes, Thomas. *Networks of Power: Electrification in Western Society, 1880-1930*. JHU Press, 1993.

Hughes, Thomas P. *American Genesis: A Century of Invention and Technological Enthusiasm, 1870-1970*. University of Chicago Press, 2004.

Hurley, Andrew. *Environmental Inequalities: Class, Race, and Industrial Pollution in Gary, Indiana, 1945-1980*. University of North Carolina Press, 2009.

Imbroscio, David. "Beyond Mobility:the Limits of Liberal Urban Policy." *Journal of Urban Affairs* 34, no. 1 (February 1, 2012): 1–20. doi:10.1111/j.1467-9906.2011.00578.x.

Institute, American Gas. *Proceedings of the American Gas Institute*. The Institute, 1916.

"Interchange: The History of Capitalism." *Journal of American History* 101, no. 2 (September 1, 2014): 503–36. doi:10.1093/jahist/jau357.

Ives, James E. "Loss of Light Due to Smoke in Baltimore, MD. from October, 1929, to September, 1930." *Public Health Reports*, 1933, 113–125.

Jackson, Kenneth T. *Crabgrass Frontier: The Suburbanization of the United States*. Oxford University Press, 1985.

Jacobs, David E, Robert P Clickner, Joey Y Zhou, Susan M Viet, David A Marker, John W Rogers, Darryl C Zeldin, Pamela Broene, and Warren Friedman. "The Prevalence of Lead-Based Paint Hazards in U.S. Housing." *Environmental Health Perspectives* 110, no. 10 (October 2002): A599–606.

Jacobs, Jane. *The Death and Life of Great American Cities*. Vintage Books, 1961.

Jacobs, Paul, and Center for the Study of Democratic Institutions. *Prelude to Riot: A View of Urban America from the Bottom*. Random House, 1968.

James Wynne. *First Report of the Committee on Public Hygiene*. Philadelphia: T.K. and P.G. Collins, 1849.

Jaskot, Emily. "*Warren* v. *Fitzgerald*, 189 Md. 476 (1947): A Crossroads in Baltimore's Mass Transit History." *Legal History Publications*, January 1, 2009. http://digitalcommons.law.umaryland.edu/mlh_pubs/15.

Jelinek, C. "Occurrence and Methods of Control of Chemical Contaminants in Foods." *Environmental Health Perspectives* 39 (June 1981): 143–51.

John, Richard R. *Network Nation*. Harvard University Press, 2010.

Johnson, Michael P. "Environmental Impacts of Urban Sprawl: A Survey of the Literature and Proposed Research Agenda." *Environment and Planning A* 33, no. 4 (2001): 717 – 735. doi:10.1068/a3327.

Jones, Christopher F. *Routes of Power*. Harvard University Press, 2014.

Jones, Christopher, and Daniel M. Kammen. "Spatial Distribution of US Household Carbon Footprints Reveals Suburbanization Undermines Greenhouse Gas Benefits of Urban Population Density." *Environmental Science & Technology* 48, no. 2 (2014): 895–902.

Judd, Dennis R., and Todd Swanstrom. *City Politics*. Routledge, 2015.

Judd, Richard William. *Socialist Cities: Municipal Politics and the Grass Roots of American Socialism*. SUNY Press, 1989.

Kahn, Matthew E. "The Environmental Impact of Suburbanization." *Journal of Policy Analysis and Management* 19, no. 4 (2000): 569–86.

Kahrl, Andrew W. "Capitalizing on the Urban Fiscal Crisis Predatory Tax Buyers in 1970s Chicago." *Journal of Urban History*, May 28, 2015, 1–20.

Kaplan, Emanuel, and John M. McDonald. "The Blood Lead Value as an Aid in the Diagnosis of Lead Poisoning." *Journal of Pharmacology and Experimental Therapy* 63 (1938): 17.

Kasarda, John D. "Structural Factors Affecting the Location and Timing of Urban Underclass Growth." *Urban Geography* 11, no. 3 (May 1, 1990): 234–64. doi:10.2747/0272-3638.11.3.234.

Katz, Michael B. *In the Shadow Of the Poorhouse: A Social History Of Welfare In America*. Basic Books, 1996.

Katznelson, Ira. *When Affirmative Action Was White: An Untold History of Racial Inequality in Twentieth-Century America*. W. W. Norton & Company, 2006.

Keating, John Marie. *Cyclopædia of the Diseases of Children: Medical and Surgical*. Lippincott, 1890.

Kehoe, R. A. "Exposure to Lead." *Occupational Medicine* 3, no. 2 (February 1947): 156–71.

Kehoe, Robert A., Frederick Thamann, and Jacob Cholak. "Normal Absorption and Excretion of Lead." *Journal of the American Medical Association* 104, no. 2 (January 12, 1935): 90–92.

Kelker, De Leuw and Company. *Report and Recommendations on the Routing of Street Railway Lines and Methods for the Improvement of Traffic Conditions in the City of Baltimore to the Traffic Survey Commission of Baltimore*. Baltimore: Waverly Press, 1926.

Keller, Morton. *Regulating a New Economy: Public Policy and Economic Change in America, 1900-1933*. Harvard University Press, 1990.

Kelly, Albanis Ashmun. *The Expert House Painter: A Reliable Guide for the Experienced House Painter and Manual of Instruction for the Less Expert Workman ... Formulas Given for Various Paint Mixtures, Tests for Ascertaining Purity and Value of Materials, How to Choose and Combine Proper Colors in Their True Scientific Relations, Etc*. David McKay Company, 1920.

Kelton, Paul. *Epidemics and Enslavement: Biological Catastrophe in the Native Southeast, 1492-1715*. University of Nebraska Press, 2007.

Kemp, Janet E. *Housing Conditions in Baltimore: Report of a Special Committee of the Association for the Improvement of the Condition of the Poor and the Charity Organization Society*. Arno Press, 1974.

King, Thomson. *Consolidated of Baltimore, 1816-1950: A History of Consolidated Gas Electric Light and Power Company of Baltimore*. The Company, 1950.

Kipnis, Ira. *The American Socialist Movement 1897-1912*. Haymarket Books, 2005.

Kleeck, Mary Van. *Artificial Flower Makers*. Russell Sage Foundation, 1913.

Klingle, Matthew W. *Emerald City: An Environmental History of Seattle*. Yale University Press, 2008.

Kober, George Martin, and William Clinton Hanson. *Diseases of Occupation and Vocational Hygiene*. P. Blakiston's Son & Company, 1916.

Kolko, Gabriel. *Triumph of Conservatism*. Simon and Schuster, 2008.

Kovarik, W. J. "The Ethyl Controversy-How the News Media Interpreted the 1920s Controversy over Leaded Gasoline and the Alternatives." Dissertation, University of Maryland, 1993.

Kovarik, William. "Ethyl-Leaded Gasoline: How a Classic Occupational Disease Became an International Public Health Disaster." *International Journal of Occupational and Environmental Health* 11, no. 4 (2005): 384–397.

K.R. Lee. "Disease in Wartime." *Editorial Research Reports*, Congressional Quarterly, I (1942). http://library.cqpress.com/cqresearcher/cqresrre1942021000.

Kruse, Kevin M. *White Flight: Atlanta and the Making of Modern Conservatism*. Princeton University Press, 2013.

Laidlaw, Mark A. S., Gabriel M. Filippelli, Richard C. Sadler, Christopher R. Gonzales, Andrew S. Ball, and Howard W. Mielke. "Children's Blood Lead Seasonality in Flint, Michigan (USA), and Soil-Sourced Lead Hazard Risks." *International Journal of Environmental Research and Public Health* 13, no. 4 (March 25, 2016): 358. doi:10.3390/ijerph13040358.

Laidlaw, Mark A. S., Sammy Zahran, Howard W. Mielke, Mark P. Taylor, and Gabriel M. Filippelli. "Re-Suspension of Lead Contaminated Urban Soil as a Dominant Source of Atmospheric Lead in Birmingham, Chicago, Detroit and Pittsburgh, USA." *Atmospheric Environment* 49 (March 2012): 302–10. doi:10.1016/j.atmosenv.2011.11.030.

Laidlaw, Mark AS, Howard W. Mielke, Gabriel M. Filippelli, David L. Johnson, and Christopher R. Gonzales. "Seasonality and Children's Blood Lead Levels: Developing a Predictive Model Using Climatic Variables and Blood Lead Data from Indianapolis, Indiana, Syracuse, New York, and New Orleans, Louisiana (USA)." *Environmental Health Perspectives* 113, no. 6 (2005): 793.

Lassiter, Matthew D. *The Silent Majority: Suburban Politics in the Sunbelt South: Suburban Politics in the Sunbelt South*. Princeton University Press, 2013.

Laux, James M. "Diesel Trucks and Buses: Their Gradual Spread in the United States." In *The Economic and Social Effects of the Spread of Motor Vehicles*, edited by Theo Barker, 97–114. Palgrave Macmillan UK, 1987.

LCSW, Sophia F. Dziegielewski, PhD. *The Changing Face of Health Care Social Work, Third Edition: Opportunities and Challenges for Professional Practice*. Springer Publishing Company, 2013.

Leake, J. P., L. Kolb, W. H. Howell, A. J. Chesley, D. L. Edsall, and R. Hunt. "The Use of Tetraethyl Lead Gasoline in Its Relation to Public Health." *Public Health Bulletin* 163 (1926).

Levenstein, Harvey A. *Paradox of Plenty: A Social History of Eating in Modern America*. University of California Press, 2003.

Levine, Marc V. "A Third-World City in the First World: Social Exclusion, Racial Inequality, and Sustainable Development in Baltimore." *The Social Sustainability of Cities*, 2000, 123–156.

Lewis, Tom. *Divided Highways: Building the Interstate Highways, Transforming American Life*. Cornell University Press, 2013.
Lidsky, T. I., and J. S. Schneider. "Adverse Effects of Childhood Lead Poisoning: The Clinical Neuropsychological Perspective." *Environmental Research* 100, no. 2 (2006): 284–293.
Lidsky, Theodore I., and Jay S. Schneider. "Lead Neurotoxicity in Children: Basic Mechanisms and Clinical Correlates." *Brain* 126, no. 1 (January 1, 2003): 5–19. doi:10.1093/brain/awg014.
Lieb, Emily. "Row House City: Unbuilding Residential Baltimore, 1940–1980." Ph.D., Columbia University, 2010. http://search.proquest.com.proxy.its.virginia.edu/pqdtglobal/docview/749877285/abstract/205D40626F444DECPQ/1.
Lieb, Roslyn Corenzwit, Richard A. Merel, Alice S. Perlin, and Michael B. Sadoff. "Abandonment of Residential Property in an Urban Context." *DePaul L. Rev.* 23 (1973): 1186.
Light, Jennifer S. *The Nature of Cities: Ecological Visions and the American Urban Professions, 1920–1960*. Johns Hopkins University Press, 2014.
Lin-Fu, Jane S. "Modern History of Lead Poisoning: A Century of Discovery and Rediscovery." In *Human Lead Exposure*, 23–43, 1992.
Lipfert, F. W. "Estimates of Historic Urban Air Quality Trends and Precipitation Acidity in Selected US Cities (1880-1980)." Brookhaven National Lab, 1987.
Lopez, Russ P. "Public Health, the APHA, and Urban Renewal." *American Journal of Public Health* 99, no. 9 (September 2009): 1603–11. doi:10.2105/AJPH.2008.150136.
Lopez, Russell. *Building American Public Health: Urban Planning, Architecture, and the Quest for Better Health in the United States*. Palgrave Macmillan, 2012.
Lowe, Delbert. *History of the Consolidated Gas, Electric Light and Power Company of Baltimore*, 1928. http://archive.org/details/HistoryOfTheConsolidatedGasElectricLightAndPowerCompanyOfBaltimore.
Lukes, Steven. *Power: A Radical View*. 2nd ed. Palgrave Macmillan, 2005.
Lutz, Catherine, and Anne Lutz Fernandez. *Carjacked: The Culture of the Automobile and Its Effect on Our Lives*. St. Martin's Press, 2010.
Malone, Laurence. "Rural Electrification Administration." *EH.net*. Accessed July 20, 2016. https://eh.net/encyclopedia/rural-electrification-administration/.
Marcus, David K., Jessica J. Fulton, and Erin J. Clarke. "Lead and Conduct Problems: A Meta-Analysis." *Journal of Clinical Child & Adolescent Psychology* 39, no. 2 (February 26, 2010): 234–41. doi:10.1080/15374411003591455.
Marcuse, Peter, and David Madden. *In Defense of Housing: The Politics of Crisis*. Verso Books, 2016.
Markowitz, Gerald, and David Rosner. *Deceit and Denial: The Deadly Politics of Industrial Pollution*. University of California Press, 2002.
———. *Lead Wars: The Politics of Science and the Fate of America's Children*. Berkeley : New York: University of California Press, 2013.
Markowitz, Gerald, and Donald Rosner. "'Cater to the Children': The Role of the Lead Industry in a Public Health Tragedy, 1900-1955." *American Journal of Public Health* 90, no. 1 (January 2000): 36–46.
Marston, Glenn. *Facts on Municipal Ownership in 268 Towns and Cities*. Public Service Publishing Company, 1915.
Maryland Bureau of Industrial Statistics. *Annual Report*, 1893.
Maryland Commission to Study and Report on the Transportation System Operated by the Baltimore Transit Company. *Report of Majority and Separate Report of Commissioner Herbert Levy*. Baltimore: Press of the Daily Record, 1951.
Maryland House of Delegates of the General Assembly. *Report of the Grand Inquest of the State of Maryland into the Background, Causes and Possible Ending of the Current Strike in the Baltimore Transit Company*. Annapolis, Md.: General Assembly, 1956.

Maryland State Accident Commission, and Maryland Court of Appeals. *Reports of Cases under the Workmen's Compensation Act Decided by the State Industrial Accident Commission and the Court of Appeals of Maryland*. George W. King Printing Co., 1916.

Maryland State Highway Administration. "Modern Transportation Milestones in Maryland, 1900-1960." Accessed September 14, 2016. http://sha.md.gov/OPPEN/II-MODT.pdf.

Maryland State Planning Department. *The Counties of Maryland and Baltimore City: Their Origin, Growth, and Development, 1634-1963*, 1963.

Maryland State Roads Commission. *Preliminary Report of the Maryland State-Wide Highway Planning Survey by the Maryland State Roads Commission in Cooperation with the United States Department of Agriculture, Bureau of Public Roads, 1938.* Annapolis, 1938.

Masnick, George S. "Home Ownership Trends and Racial Inequality in the United States in the 20th Century." Joint Center for Housing Studies, Graduate School of Design and John F. Kennedy School of Government, Harvard University, 2001.

Mason, Lisa H., Jordan P. Harp, and Dong Y. Han. "Pb Neurotoxicity: Neuropsychological Effects of Lead Toxicity." *BioMed Research International* 2014 (January 2, 2014): e840547. doi:10.1155/2014/840547.

Mason, Robert P., Eun-Hee Kim, and Jeffery Cornwell. "Metal Accumulation in Baltimore Harbor: Current and Past Inputs." *Applied Geochemistry* 19, no. 11 (2004): 1801–1825.

Matulef, Mark L. "On-The-Job Lead Poisoning: Early Judicial Treatment of Claims for Recovery from Exposure to Workplace Lead." *U. Balt. J. Envtl. L.* 10 (2002): 1.

Maxwell, Christine M., and Daniel W. Nelson. *A Lead Emission Factor for Reentrained Dust from a Paved Roadway*. Environmental Protection Agency, 1978.

McCarthy, Tom. *Auto Mania: Cars, Consumers, and the Environment*. Yale University Press, 2007.

McCraw, Thomas K. *Prophets of Regulation*. Harvard University Press, 2009.

McDonald, John M., and Emanuel Kaplan. "Incidence of Lead Poisoning in the City of Baltimore." *Journal of the American Medical Association* 119, no. 11 (1942): 870–872.

McElhaney, James. "Retaliatory Evictions: Landlords, Tenants and Law Reform." *Maryland Law Review* 29, no. 3 (1969): 193–226.

McElroy, Karl Thayer Pomeroy, and Willard Dell Bigelow. *Foods and Food Adulterants : Part Eighth : Canned Vegetables*. Washington, Govt. Print. Off., 1893.

McKhann, Charles F., and Edward C. Vogt. "Lead Poisoning in Children." *Journal of the American Medical Association* 101, no. 15 (1933): 1131–1135.

McNeill, J. R. *Something New Under the Sun: An Environmental History of the Twentieth-Century World*. W. W. Norton & Company, 2001.

McNeill, William H. *Plagues and Peoples*. Anchor, 1976.

Medical News. Henry C. Lea's Son & Company, 1895.

Melosi, Martin V. *Effluent America: Cities, Industry, Energy, and the Environment*. University of Pittsburgh Press, 2000.

———. *The Sanitary City: Environmental Services in Urban America from Colonial Times to the Present*. Abridged. University of Pittsburgh Press, 2008.

Michael K. Brown. "Divergent Fates: The Foundations of Durable Racial Inequality, 1940-2013." Demos, 2013. http://www.demos.org/sites/default/files/imce/Brown.pdf.

Mielke, H W, J C Anderson, K J Berry, P W Mielke, R L Chaney, and M Leech. "Lead Concentrations in Inner-City Soils as a Factor in the Child Lead Problem." *American Journal of Public Health* 73, no. 12 (December 1, 1983): 1366–69. doi:10.2105/AJPH.73.12.1366.

Mielke, Howard W., Mark A. S. Laidlaw, and Chris Gonzales. "Lead (Pb) Legacy from Vehicle Traffic in Eight California Urbanized Areas: Continuing Influence of Lead Dust on Children's Health." *Science of The Total Environment* 408, no. 19 (September 1, 2010): 3965–75. doi:10.1016/j.scitotenv.2010.05.017.

Mielke, Howard W., Mark A. S. Laidlaw, and Chris R. Gonzales. “Estimation of Leaded (Pb) Gasoline’s Continuing Material and Health Impacts on 90 US Urbanized Areas.” *Environment International* 37, no. 1 (January 2011): 248–57. doi:10.1016/j.envint.2010.08.006.

Mielke, Howard W., and Sammy Zahran. “The Urban Rise and Fall of Air Lead (Pb) and the Latent Surge and Retreat of Societal Violence.” *Environment International* 43 (August 2012): 48–55. doi:10.1016/j.envint.2012.03.005.

Mieszkowski, Peter, and Edwin S. Mills. “The Causes of Metropolitan Suburbanization.” *The Journal of Economic Perspectives* 7, no. 3 (1993): 135–147.

Miller, Robert W. “How Environmental Hazards in Childhood Have Been Discovered: Carcinogens, Teratogens, Neurotoxicants, and Others.” *Pediatrics* 113, no. Supplement 3 (April 1, 2004): 945–51.

Millspaugh, Martin, and Vivian Gurney Breckenfeld. *The Human Side of Urban Renewal: A Study of the Attitude Changes, Produced by Neighborhood Rehabilitation*. Fight-Blight, 1958.

Minnesota Population Center. *National Historical Geographic Information System: Version 2.0.* Minneapolis, MN: University of Minnesota, 2011. http://www.nhgis.org.

Mitchell, Maxine. “Contractual Exploitation: A Case Study of the Contract Buyers League in Chicago.” Thesis, Massachusetts Institute of Technology, 1973. http://dspace.mit.edu/handle/1721.1/76425.

Mitchelson, Ronald L., and James S. Fisher. “Long Distance Commuting and Income Change in the Towns of Upstate New York.” *Economic Geography* 63, no. 1 (January 1, 1987): 48–65. doi:10.2307/143850.

Mollenkopf, John H. *The Contested City*. Princeton University Press, 1983.

Molotch, Harvey. “Racial Change in a Stable Community.” *American Journal of Sociology*, 1969, 226–238.

Moody, Heather, Joe T. Darden, and Bruce Wm Pigozzi. “The Racial Gap in Childhood Blood Lead Levels Related to Socioeconomic Position of Residence in Metropolitan Detroit.” *Sociology of Race and Ethnicity* 2, no. 2 (April 1, 2016): 200–218.

Moore, Colleen F. *Silent Scourge: Children, Pollution, and Why Scientists Disagree*. New York: Oxford University Press, 2003.

Morgenstern, Leon. “From Cardiology to Laparoscopy: John Carroll Ruddock, MD (1901-1964).” *Surgical Innovation* 12, no. 3 (September 2005): 185–86.

Morris, Peter J. T. *From Classical to Modern Chemistry: The Instrumental Revolution*. Royal Society of Chemistry, 2002.

Moses, Robert, W. Earle Andrews, Madigan-Hyland, and Brinckerhoff Parsons Quade & Douglas. *Baltimore Arterial Report*. New York City: Robert Moses, 1944.

Mueller, P., H. Helwig, A. Alcocer, W. Gong, and E. Jones. “Concentration of Fine Particles and Lead in Car Exhaust.” In *Symposium on Air-Pollution Measurement Methods*. ASTM International, 1963. http://www.astm.org/DIGITAL_LIBRARY/STP/PAGES/STP45109S.htm.

Mushak, Paul. *Lead and Public Health: Science, Risk and Regulation*. Elsevier, 2011.

Narag, Raymund E., Jesenia Pizarro, and Carole Gibbs. “Lead Exposure and Its Implications for Criminological Theory.” *Criminal Justice and Behavior* 36, no. 9 (2009): 954–973.

National Commission on Urban Problems. *Building the American City: Report of the National Commission on Urban Problems to the Congress and to the President of the United States*. U.S. Government Printing Office, 1968.

National Consumers League. *Child Labor Legislation*, 1905.

National Research Council. *Lead in the Human Environment: A Report*. National Academies of Science, 1980.

National Urban League. *National Survey of Housing Abandonment*. National Urban League, 1972. http://archive.org/details/nationalsurveyof00cent.

Neal, April P., and Tomás R. Guilarte. “Molecular Neurobiology of Lead (Pb2+): Effects on Synaptic Function.” *Molecular Neurobiology* 42, no. 3 (November 2, 2010): 151–60. doi:10.1007/s12035-010-8146-0.

Needham, Andrew. *Power Lines: Phoenix and the Making of the Modern Southwest*. Princeton University Press, 2014.
Needleman, H L. "The Removal of Lead from Gasoline: Historical and Personal Reflections." *Environmental Research* 84, no. 1 (January 1, 2000): 20–35. doi:10.1006/enrs.2000.4069.
Needleman, Herbert L. *Human Lead Exposure*. CRC Press, 1991.
Neisser, Ulric, Gwyneth Boodoo, Thomas J. Bouchard Jr., A. Wade, Nathan Brody, Stephen J. Ceci, Diane F. Halpern, et al. "Intelligence: Knowns and Unknowns." *American Psychologist* 51, no. 2 (1996): 77–101. doi:10.1037/0003-066X.51.2.77.
Neverdon-Morton, Cynthia. "Black Housing Patterns in Baltimore City, 1885-1953." *The Maryland Historian* 16 (1985): 41–56.
Newcombe, David S., and Dwight R. Robinson. *Gout: Basic Science and Clinical Practice*. Springer, 2012.
Nisbett, Richard E., Joshua Aronson, Clancy Blair, William Dickens, James Flynn, Diane F. Halpern, and Eric Turkheimer. "Intelligence: New Findings and Theoretical Developments." *American Psychologist* 67, no. 2 (2012): 130.
Nivola, Pietro S. *Laws of the Landscape: How Policies Shape Cities in Europe and America*. Brookings Institution Press, 1999.
Norton, Peter D. *Fighting Traffic: The Dawn of the Motor Age in the American City*. MIT Press, 2011.
Notes for a History of Lead: And an Inquiry into the Development of the Manufacture of White Lead and Lead Oxides. D. Van Nostrand, 1888.
Novak, William J. *The People's Welfare: Law and Regulation in Nineteenth-Century America*. University of North Carolina Press, 1996.
Nriagu, Jerome O. "The Rise and Fall of Leaded Gasoline." *Science of the Total Environment* 92 (1990): 13–28.
Ohio State Board of Health. *Annual Report 1914*, 1916.
Oliver, Melvin, and Thomas Shapiro. *Black Wealth / White Wealth: A New Perspective on Racial Inequality*. Routledge, 2013.
Oliver, Sir Thomas. *Lead Poisoning in Its Acute and Chronic Forms*. Pentland, 1891.
Olson, Sherry H. "Baltimore Imitates the Spider." *Annals of the Association of American Geographers* 69, no. 4 (1979): 557–574.
Olson, Sherry H. *Baltimore : The Building of an American City*. Baltimore: Johns Hopkins University Press, 1981.
Orfield, Myron. *American Metropolitics: The New Suburban Reality*. Brookings Institution Press, 2011.
Orser, W. Edward. *Blockbusting in Baltimore: The Edmondson Village Story*. University Press of Kentucky, 2015.
Pacione, Michael. *The City: Economic Structure and Change in the Western City*. Taylor & Francis US, 2002.
Packard, Randall M. *The Making of a Tropical Disease: A Short History of Malaria*. Johns Hopkins Press, 2007.
Park, E., Jackson, D., and Kajdi, L. "Shadows Produced by Lead in the X-Ray Pictures of the Growing Skeleton." *American Journal of Diseases of Children* 41, no. 3 (March 1, 1931): 485–99.
Paul, William George. "The Shadow of Equality: The Negro in Baltimore, 1864-1911." Dissertation, University of Wisconsin–Madison, 1972.
"People You Ought to Know: Nelson Gray An Apple a Day Keeps the Doctor Away." *Afro-American (1893-1988)*. December 12, 1931.
Persky, Joseph, and Wim Wiewel. *When Corporations Leave Town: The Costs and Benefits of Metropolitan Job Sprawl*. Wayne State University Press, 2000.
Peryea, Francis J. "Historical Use of Lead Arsenate Insecticides, Resulting Soil Contamination and Implications for Soil Remediation." In *16th World Congress of Soil Science, Montpellier, France*, 20–26, 1998.

Pietila, Antero. *Not in My Neighborhood: How Bigotry Shaped a Great American City*. Ivan R. Dee, 2010.

Pinkham, C. B. "MEDICAL LICENSURE IN CALIFORNIA." *California and Western Medicine* 35, no. 3 (September 1931): 167–69.

Piven, Frances Fox, and Richard Cloward. *Poor People's Movements: Why They Succeed, How They Fail*. Knopf Doubleday Publishing Group, 2012.

Planches, Louis Jean Charles Marie Tanquerel Des. *Lead Diseases*. Daniel Bixby and Company, 1848.

Platt, Harold L. *The Electric City: Energy and the Growth of the Chicago Area, 1880-1930*. University of Chicago Press, 1991.

Polsky, Colin, Jason Allard, Nate Currit, Robert Crane, and Brent Yarnal. "The Mid-Atlantic Region and Its Climate: Past, Present, and Future." *Climate Research* 14, no. 3 (2000): 161–173.

Popular Mechanics. Hearst Magazines, 1933.

Post, Robert C. *Urban Mass Transit: The Life Story of a Technology*. Greenwood Publishing Group, 2007.

Power, Garrett. "Apartheid Baltimore Style: The Residential Segregation Ordinances of 1910-1913." *Md. L. Rev.* 42 (1983): 289.

Public Affairs Counseling. *The Dynamics of Neighborhood Change*. GPO, 1975.

Pulido, Laura. "Rethinking Environmental Racism: White Privilege and Urban Development in Southern California." *Annals of the Association of American Geographers* 90, no. 1 (2000): 12–40.

Putnam, James J. "A Supplemental Inquiry into the Frequency with Which Lead Is Found in the Urine." *The Boston Medical and Surgical Journal* 121, no. 22 (1889): 530–533.

———. "On Certain Unrecognized Forms of Lead-Poisoning; And on the Possibility of Mistaking Bismuth for Lead in Urine Analyses." *The Boston Medical and Surgical Journal* 109, no. 14 (1883): 315–317.

Putnam, Judith Jones. "Food Consumption, Prices, and Expenditures, 1967-88." U.S. Department of Commerce, 1990.

Putzel, Leopold. *A Treatise on Common Forms of Functional Nervous Diseases*. W. Wood & Company, 1880.

Real Estate Board of Baltimore. *A Survey of Housing Conditions, Baltimore, Maryland*. Baltimore: Industrial Bureau, Board of Trade, 1921.

Reuben, Aaron, Avshalom Caspi, Daniel W. Belsky, Jonathan Broadbent, Honalee Harrington, Karen Sugden, Renate M. Houts, Sandhya Ramrakha, Richie Poulton, and Terrie E. Moffitt. "Association of Childhood Blood Lead Levels With Cognitive Function and Socioeconomic Status at Age 38 Years and With IQ Change and Socioeconomic Mobility Between Childhood and Adulthood." *JAMA* 317, no. 12 (2017): 1244–1251.

Reutter, Mark. *Making Steel: Sparrows Point and the Rise and Ruin of American Industrial Might*. University of Illinois Press, 1988.

Reyes, Jessica Wolpaw. "Environmental Policy as Social Policy? The Impact of Childhood Lead Exposure on Crime." *The B.E. Journal of Economic Analysis & Policy* 7, no. 1 (October 17, 2007): 51. doi:10.2202/1935-1682.1796.

———. "Environmental Policy as Social Policy? The Impact of Childhood Lead Exposure on Crime." *The B.E. Journal of Economic Analysis & Policy* 7, no. 1 (October 17, 2007): 51. doi:10.2202/1935-1682.1796.

Rhyne, Charles. "The Workable Program—A Challenge for Community Improvement." *Law and Contemporary Problems* 25, no. 4 (October 1, 1960): 685–704.

Rick Nevin. "How Lead Exposure Relates to Temporal Changes in IQ, Violent Crime, and Unwed Pregnancy." *Environmental Research* 83, no. 1 (May 2000): 1–22.

———. "Understanding International Crime Trends: The Legacy of Preschool Lead Exposure." *Environmental Research* 104, no. 3 (2007): 315–336.

Riggleman, John. "Variations in Building Activity in United States Cities." Dissertation, Johns Hopkins University, 1934.

Robert Bullard, D.W. King, G.S. Johnson, and A.O. Torres. “Environmental Justice Milestones and Accomplishments: 1964-2014.” Texas Southern University: Barbara Jordan-Mickey Leland School of Public Affairs, February 2014.
Roberts, Samuel. *Infectious Fear: Politics, Disease, and the Health Effects of Segregation*. University of North Carolina Press, 2009.
Robinson, Morton J., Felix E. Karpinski, and Heinrich Brieger. “The Concentration of Lead in Plasma, Whole Blood and Erythrocytes of Infants and Children.” *Pediatrics* 21, no. 5 (May 1, 1958): 793–97.
Rochester, Anna. *Infant Mortality: Results of a Field Study in Baltimore, Md., Based on Births in One Year*. DC: United States Children’s Bureau, 1923.
Rodgers, Daniel T. *Atlantic Crossings*. Harvard University Press, 2009.
Rome, Adam. *The Bulldozer in the Countryside: Suburban Sprawl and the Rise of American Environmentalism*. Cambridge University Press, 2001.
Rose, Mark H., and Raymond A. Mohl. *Interstate: Highway Politics and Policy Since 1939*. Univ. of Tennessee Press, 2012.
Rosner, David, and Gerald Markowitz. “A ‘Gift of God’?: The Public Health Controversy over Leaded Gasoline during the 1920s.” *American Journal of Public Health* 75, no. 4 (1985): 344–352.
Rubenstein, James, and Robert Ferguson. “Baltimore Relocation Study.” *Journal of Housing*, November 1978, 534–38.
Ruby, M. V., R. Schoof, W. Brattin, M. Goldade, G. Post, M. Harnois, D. E. Mosby, S. W. Casteel, W. Berti, and M. Carpenter. “Advances in Evaluating the Oral Bioavailability of Inorganics in Soil for Use in Human Health Risk Assessment.” *Environmental Science & Technology* 33, no. 21 (1999): 3697–3705.
Ruddock, John C. “Lead Poisoning in Children with a Special Reference to Pica.” *Journal of the American Medical Association* 82, no. 21 (1924): 1682–1684.
Rusk, David. *Baltimore Unbound: A Strategy for Regional Renewal*. Johns Hopkins University Press, 1996.
Russell, Edmund. *War and Nature: Fighting Humans and Insects with Chemicals from World War I to Silent Spring*. Cambridge University Press, 2001.
Ryan, Brent D. *Design After Decline: How America Rebuilds Shrinking Cities*. University of Pennsylvania Press, 2012.
Salkever, David S. “Assessing the IQ-Earnings Link in Environmental Lead Impacts on Children: Have Hazard Effects Been Overstated?” *Environmental Research* 131 (2014): 219–230.
Sallis, James F., Brian E. Saelens, Lawrence D. Frank, Terry L. Conway, Donald J. Slymen, Kelli L. Cain, James E. Chapman, and Jacqueline Kerr. “Neighborhood Built Environment and Income: Examining Multiple Health Outcomes.” *Social Science & Medicine* 68, no. 7 (April 2009): 1285–93. doi:10.1016/j.socscimed.2009.01.017.
Sampson, Robert J. *Great American City: Chicago and the Enduring Neighborhood Effect*. University of Chicago Press, 2012.
Sampson, Robert J., and Alix S. Winter. “The Racial Ecology of Lead Poisoning: Toxic Inequality in Chicago Neighborhoods, 1995-2013.” *Du Bois Review: Social Science Research on Race* 13, no. 2 (October 2016): 261–83. doi:10.1017/S1742058X16000151.
Sanders, Elizabeth. *Roots of Reform: Farmers, Workers, and the American State, 1877-1917*. University of Chicago Press, 1999.
Sandler, Gilbert. *Jewish Baltimore: A Family Album*. JHU Press, 2000.
Satter, Beryl. *Family Properties: Race, Real Estate, and the Exploitation of Black Urban America*. Macmillan, 2010.
Sayers, Royd Ray, Arno Carl Fieldner, William Parks Yant, Bernard George Herman Thomas, William John McConnell, and United States Bureau of Mines. “Exhaust Gases from Engines Using Ethyl Gasoline.” U.S. Dept. of the Interior, Bureau of Mines, December 1924. Lehigh University Library.

Schallenberg, Richard H. “The Anomalous Storage Battery: An American Lag in Early Electrical Engineering.” *Technology and Culture* 22, no. 4 (1981): 725–52. doi:10.2307/3104570.
Schenker, Eric, and John Wilson. “The Use of Public Mass Transportation in the Major Metropolitan Areas of the United States.” *Land Economics* 43, no. 3 (1967): 361–67. doi:10.2307/3145165.
Schneiderman, Michael, Cal K. Cohn, and Glenn Paulson. “Air Pollution and Urban Freeways: Making a Record on Hazards to Health and Property.” *Catholic University Law Review* 20 (1970): 5.
Schucker, George W., Edward H. Vail, Elizabeth B. Kelley, and Emanuel Kaplan. “Prevention of Lead Paint Poisoning among Baltimore Children. A Hard-Sell Program.” *Public Health Reports* 80, no. 11 (1965): 969.
Schultz, Frederick. *Solder, Its Production and Application: With a Brief History of Tin and Lead*. Macneal Printing Company, 1908.
Schwarz, Kirsten, Richard V. Pouyat, and Ian Yesilonis. “Legacies of Lead in Charm City’s Soil: Lessons from the Baltimore Ecosystem Study.” *International Journal of Environmental Research and Public Health* 13, no. 2 (February 6, 2016): 209. doi:10.3390/ijerph13020209.
Schwarz, Kirsten, Kathleen C. Weathers, Steward TA Pickett, Richard G. Lathrop Jr, Richard V. Pouyat, and Mary L. Cadenasso. “A Comparison of Three Empirically Based, Spatially Explicit Predictive Models of Residential Soil Pb Concentrations in Baltimore, Maryland, USA: Understanding the Variability within Cities.” *Environmental Geochemistry and Health* 35, no. 4 (2013): 495–510.
Sealander, Judith. *Grand Plans: Business Progressivism and Social Change in Ohio’s Miami Valley, 1890-1929*. University Press of Kentucky, 2015.
Seiler, Cotten. *Republic of Drivers: A Cultural History of Automobility in America*. University of Chicago Press, 2009.
Self, Robert O. *American Babylon: Race and the Struggle for Postwar Oakland: Race and the Struggle for Postwar Oakland*. Princeton University Press, 2005.
Sellers, Christopher C. *Crabgrass Crucible: Suburban Nature and the Rise of Environmentalism in Twentieth-Century America*. University of North Carolina Press, 2012.
———. “The Dearth of the Clinic: Lead, Air and Agency in Twentieth-Century America.” *Journal of the History of Medicine and Allied Sciences* 58, no. 3 (2003): 255–91.
Shelton, Ella Mae, Marvin L. Whisman, and Paul W. Woodward. “Trends in Motor Gasolines: 1942-1981.” Department of Energy, Bartlesville Energy Technology Center, 1982. http://www.osti.gov/scitech/biblio/6834004.
Silbergeld, Ellen K. “The Unbearable Heaviness of Lead.” *Bulletin of the History of Medicine* 77, no. 1 (2003): 164–71.
Simmons, Scott E., and Housing and Urban Development Department. *An Investigation of the Archaeological Resources Associated with Piers 5 and 6 and the Harrison’s at Pier 5 Complex (18BC62 & 18BC63) Baltimore, Maryland*. Baltimore Center for Urban Archaeology Research Series 1. Baltimore, MD: Baltimore Center for Urban Archaeology, 1990.
Sinkler, Wharton. “On Lead Palsy in Children; With a Report of Three Cases.” *Transactions of the Association of American Physicians* 9 (1894): 133–43.
Sklar, Martin J. *The Corporate Reconstruction of American Capitalism, 1890-1916: The Market, the Law, and Politics*. Cambridge University Press, 1988.
Skocpol, Theda. *Protecting Soldiers and Mothers*. Harvard University Press, 2009.
Skowronek, Stephen. *Building a New American State: The Expansion of National Administrative Capacities, 1877-1920*. Cambridge University Press, 1982.
Smith, J. Lewis. “Original Communications.” *The American Journal of Obstetrics and Diseases of Women and Children* 17 (1884): 546–50.
Smith, Jason Scott. *Building New Deal Liberalism: The Political Economy of Public Works, 1933-1956*. Cambridge University Press, 2006.
Smith, Wilbur. “Baltimore Metropolitan Area Transportation Study,” 1964.

Sovacool, Benjamin K., Roman V. Sidortsov, and Benjamin R. Jones. *Energy Security, Inequality and Justice*. Routledge, 2013.

Starr, Paul. “Professionalization and Public Health: Historical Legacies, Continuing Dilemmas.” *Journal of Public Health Management and Practice* 15, no. Supplement (November 2009): S26–30. doi:10.1097/PHH.0b013e3181af0a95.

State of Maryland. *Report of the Committee on Highway Financing to the Governor and Legislative Council of Maryland*, 1967.

Statistical Abstract of the United States. U.S. Government Printing Office, 1922.

Statistical Abstract of the United States. U.S. Government Printing Office, 1939.

Stegman, Michael A. *Housing Investment in the Inner City: The Dynamics of Decline; a Study of Baltimore, Maryland, 1968-1970*. M.I.T. Press, 1972.

Sternlieb, George, Robert W. Burchell, and Virginia Paulus. *Residential Abandonment: The Environment of Decay*. Monticello, Ill., Council of Planning Librarians, 1972.

Stewart, D. D. “Lead Convulsions: A Study of Sixteen Cases.” *The American Journal of the Medical Sciences* 109, no. 3 (1895): 288–306.

Stilgoe, John R. *Borderland: Origins of the American Suburb, 1820-1939*. Yale University Press, 1990.

Stott, Richard. “Urban Electrification.” *Reviews in American History* 20, no. 2 (1992): 211–15. doi:10.2307/2703103.

Straus, Nathan. *Two-Thirds of a Nation: A Housing Program*. Knopf, 1952.

Strayer, George Drayton. *Report of the Survey of the Public School System of Baltimore, Maryland, Volume I*, 1921.

Stretesky, Paul B., and Michael J. Lynch. “The Relationship between Lead and Crime.” *Journal of Health and Social Behavior* 45, no. 2 (2004): 214–229.

Sugrue, Thomas J. *The Origins of the Urban Crisis: Race and Inequality in Postwar Detroit*. Revised edition. Princeton: Princeton University Press, 2005.

Szasz, Andrew. *EcoPopulism: Toxic Waste and the Movement for Environmental Justice*. University of Minnesota Press, 1992.

Sze, Julie. *Noxious New York: The Racial Politics of Urban Health and Environmental Justice*. MIT Press, 2006.

Szymanski, Ann-Marie. “Regulatory Transformations in a Changing City: The Anti-Smoke Movement in Baltimore, 1895–1931.” *The Journal of the Gilded Age and Progressive Era* 13, no. 03 (July 2014): 336–376. doi:10.1017/S153778141400022X.

Tarr, Joel. *The Search for the Ultimate Sink: Urban Pollution in Historical Perspective*. University of Akron Press, 1996.

Taylor, Dorceta. *Toxic Communities: Environmental Racism, Industrial Pollution, and Residential Mobility*. NYU Press, 2014.

Taylor, J.E. *Making Salmon: An Environmental History of the Northwest Fisheries Crisis*. University of Washington, 2001.

Taylor, Keeanga-Yamahtta. “Back Story to the Neoliberal Moment: Race Taxes and the Political Economy of Black Urban Housing in the 1960s.” *Souls* 14, no. 3–4 (2012): 185–206.

Taylor, Mark Patrick, Miriam K. Forbes, Brian Opeskin, Nick Parr, and Bruce P. Lanphear. “The Relationship between Atmospheric Lead Emissions and Aggressive Crime: An Ecological Study.” *Environmental Health* 15, no. 1 (2016): 1.

Teaford, Jon C. *The Rough Road to Renaissance: Urban Revitalization in America, 1940-1985*. Johns Hopkins Univ Pr, 1990.

———. “Urban Renewal and Its Aftermath.” *Housing Policy Debate* 11, no. 2 (2000): 443–465.

Tepper, Lloyd Barton, and Linda S. Levin. *A Survey of Air and Population Lead Levels in Selected American Communities: Final Report*. Environmental Protection Agency, 1972.

Ter Haar, G.L., D. L. Lenane, J. N. Hu, and M. Brandt. “Composition, Size and Control of Automotive Exhaust Particulates.” *Journal of the Air Pollution Control Association* 22, no. 1 (January 1972): 39–46.

The Encyclopedia of Founding and Dictionary of Foundry Terms Used in the Practice of Moulding. Wiley, 1894.

The Engineer and the City. National Academies, 1969.

Thibodeaux, Jarrett. "A Historical Era of Food Deserts: Changes in the Correlates of Urban Supermarket Location, 1970–1990." *Social Currents* 3, no. 2 (June 1, 2016): 186–203. doi:10.1177/2329496515604639.

Thomas, Henry. "A Case of Generalized Lead Paralysis, With a Review of the Cases of Lead Palsy Seen in the Hospital." *Bulletin of the Johns Hopkins Hospital* 15, no. 159 (June 1904): 209–12.

Thomas, Henry M., and Kenneth D. Blackfan. "Recurrent Meningitis, due to Lead, in a Child of Five Years." *American Journal of Diseases of Children* 8, no. 5 (1914): 377–380.

Thompson, Gustave Whyte. *Painting Defects: Their Causes and Prevention; an Address*. Gustave Thompson, 1915.

Thompson, William P. "The Lead Industry." In *1795-1895: One Hundred Years of American Commerce ... a History of American Commerce by One Hundred Americans, with a Chronological Table of the Important Events of American Commerce and Invention Within the Past One Hundred Years*, 433–41. D. O. Haynes & Company, 1895.

Thornton, John. *Africa and Africans in the Making of the Atlantic World, 1400-1800*. Cambridge ; New York: Cambridge University Press, 1998.

Todd, Albert May. *Municipal Ownership, with a Special Survey of Municipal Gas Plants in America and Europe*. Public ownership league of America, 1918.

Tonney, Fred O., and Clarence R. DeYoung. "Smoke Eradication to Save the Health Value of Urban Sunshine." *American Journal of Public Health and the Nations Health* 21, no. 4 (April 1, 1931): 344–54. doi:10.2105/AJPH.21.4.344.

Transportation Research Board (National Research Council). *Expanding Metropolitan Highways: Implications for Air Quality and Energy Use -- Special Report 245*. Washington, D.C.: National Academy Press, 1995.

Troesken, Werner. "Race, Disease, and the Provision of Water in American Cities, 1889-1921." *The Journal of Economic History* 61, no. 3 (2001): 750–76.

———. *The Great Lead Water Pipe Disaster*. MIT Press, 2006.

———. *Water, Race, and Disease*. NBER Series on Long-Term Factors in Economic Development. MIT Press, 2004.

Tyler, Paul McIntosh. "Trends in White-Pigment Consumption." U.S. Dept. of the Interior, Bureau of Mines, 1936.

United Church of Christ. *Toxic Wastes and Race in the United States: A National Report on the Racial and Socio-Economic Characteristics of Communities with Hazardous Waste Sites*. Public Data Access, 1987.

United States Bureau of Mines. *Mining Industry of the United States of America*. U.S. Government Printing Office, 1922.

United States. Bureau of Mines, and Geological Survey (U. S.). *Minerals Yearbook*. Washington : Bureau of Mines : Supt. of Docs., U.S. G.P.O., 1933.

United States Bureau of the Census. *Historical Statistics of the United States, Colonial Times to 1970*. U.S. Department of Commerce, 1975.

United States Commission on Civil Rights. *Hearing before the United States Commission on Civil Rights. Hearing Held in Baltimore, Maryland, August 17-19, 1970.* Washington: GPO, 1971.

United States International Trade Commission. *Synthetic Organic Chemicals : United States Production and Sales*. GPO, 1925.

———. *Synthetic Organic Chemicals : United States Production and Sales*. GPO, 1926. http://archive.org/details/syntheticorganic1924unit.

United States Task Force on Environmental Problems of the Inner City. *"Our Urban Environment and Our Most Endangered People;": A Report to the Administrator of the Environmental Protection Agency*. U.S. Government Printing Office, 1972.

Urban Renewal Study Board. *Report of the Urban Renewal Study Board to Mayor Thomas D'Alesandro, Jr.*, 1956.
U.S. Bureau of Mines. *Motor Gasolines, Summer 1960*. Bartlesville, Okla.: U.S. Dept. of the Interior, Bureau of Mines, Petroleum Research Center, 1960.
U.S. Census. *Census of Housing: City Blocks: Baltimore, Md.* Washington, D.C.: GPO, 1961.
———. *Fifteenth Census of the United States: 1930, Distribution Volume I, Retail Distribution Part II -- Reports By States, Alabama-New Hampshire*. U.S. Government Printing Office, 1934.
U.S. Commission on Civil Rights. *1961 Commission on Civil Rights Report: Housing*. GPO, 1961.
U.S. Congress. *Air Pollution, 1967: Hearings, Ninetieth Congress, First Session*. U.S. Government Printing Office, 1967.
———. *Federal-Aid Highway Act 1970, Hearings Before the Subcommittee on Roads of the Committee on Public Works, House of Representatives, Ninety-First Congress, Second Session, on H.R. 16788 and Related Bills*, 1970.
———. *Hearings Before the Committee on Interstate and Foreign Commerce of the House of Representatives on Food Bills H.R. 3109, 12348, 9352, 276, and 4342 for Regulating the Adulteration, Misbranding, and Imitation of Foods, Beverages, Candies, Drugs, and Condiments in the District of Columbia and The Territories, and For Regulating Interstate Traffic Therein, and for Other Purposes*. GPO, 1902.
———. *National Defense Migration: Part 15, Baltimore Hearings*. GPO, 1941.
———. *The Inner City Environment and the Role of the Environmental Protection Agency: Hearing Before the Subcommittee on the Environment*, 1972.
U.S. Department of Health, Education and Welfare. *Survey of Lead in the Atmosphere of Three Urban Communities*. U.S. Department of Health, Education, and Welfare, Public Health Service, Division of Air Pollution, 1965.
U.S. Department of Housing and Urban Development. *Abandoned Housing Research: A Compendium*. GPO, 1973.
U.S. EPA. *Air Quality Data for Non-Criteria Pollutants, 1957 through 1970*. GPO, 1977.
———. *Air Quality Data for Non-Criteria Pollutants, 1971 through 1975*. GPO, 1978.
———. *Lead National Ambient Air Quality Standard: Environmental Impact Statement*, 1978.
———. *National Air Quality and Emissions Trends Report*. GPO, 1985.
———. *National Assessment of the Urban Particulate Problem: Baltimore*. Environmental Protection Agency, Office of Air and Waste Management, Office of Air Quality Planning and Standards, 1974.
(U.S.), Geological Survey. *Flow Studies for Recycling Metal Commodities in the United States*. U.S. Dept. of the Interior, U.S. Geological Survey, 2004.
Vail, Charles Henry. *Modern Socialism*. Commonwealth Company, 1897.
Von Hoffman, Alexander. "Enter the Housing Industry, Stage Right: A Working Paper on the History of Housing Policy." *Joint Center for Housing Studies* 1 (2008).
Vose, Clement E. *Caucasians Only: The Supreme Court, the NAACP, and the Restrictive Covenant Cases*. University of California Press, 1959.
Warner, Sam Bass. *The Urban Wilderness: A History of the American City*. University of California Press, 1995.
Warner, Sam Bass, and Andrew Whittemore. *American Urban Form: A Representative History*. MIT Press, 2012.
Warren, Christian. *Brush with Death : A Social History of Lead Poisoning*. Baltimore; London: Johns Hopkins University Press, 2001.
Warren, Kenneth. *Bethlehem Steel: Builder and Arsenal of America*. University of Pittsburgh Pre, 2010.
Webster, George. *Report of Commission on Occupational Diseases To His Excellency Governor Charles S. Deneen.* Chicago: Warner Printing Co., 1911.
Weiner, Edward. *Urban Transportation Planning in the United States: History, Policy, and Practice*. Springer Science & Business Media, 2012.

Weinstein, James. *The Corporate Ideal in the Liberal State, 1900-1918*. Beacon Press, 1968.
Weinstein, Paul A., and Baltimore Urban Observatory. *Baltimore, the Emergence of a Manpower System: A Study Prepared for the Baltimore Urban Observatory*. Dept. of Economics, University of Maryland, 1974.
Weiss, Bernard, and David C. Bellinger. "Social Ecology of Children's Vulnerability to Environmental Pollutants." *Environmental Health Perspectives* 114, no. 10 (October 1, 2006): 1479–85.
Welke, Barbara Young. *Recasting American Liberty: Gender, Race, Law, and the Railroad Revolution, 1865-1920*. Cambridge University Press, 2001.
Wells, Christopher W. *Car Country: An Environmental History*. University of Washington Press, 2013.
———. "Fueling the Boom: Gasoline Taxes, Invisibility, and the Growth of the American Highway Infrastructure, 1919–1956." *Journal of American History* 99, no. 1 (June 1, 2012): 72–81. doi:10.1093/jahist/jas001.
Wells, William H., and John Taylor. *Manual of the Diseases of Children*. Blakiston's Son & Company, 1901.
Weyforth, William Oswald, and United States Employment Service Maryland Division. *Manpower Problems and Policies in the Baltimore Labor Market Area during World War II*. U.S. Dept. of Labor, U.S. Employment Service for Maryland, 1946.
White, Richard. *"It's Your Misfortune and None of My Own": A New History of the American West*. University of Oklahoma Press, 1991.
———. *Railroaded: The Transcontinentals and the Making of Modern America*. W. W. Norton & Company, 2011.
Wiebe, Robert H. *The Search for Order, 1877-1920*. Macmillan, 1967.
Wiese, Andrew. *Places of Their Own: African American Suburbanization in the Twentieth Century*. University of Chicago Press, 2009.
Wigle, Donald T. *Child Health and the Environment*. 1st ed. Oxford University Press, USA, 2003.
Wikberg, Terry. "Building Baltimore: The Baltimore City Interstate Highway System." Maryland Legal History Publications, 2000. http://digitalcommons.law.umaryland.edu/mlh_pubs/13.
Willcox, James. "Type Founding." *Annual Report of the Commissioner of Patents*, 1851, 398–406.
Williams, H. "Housing as a Health Officer's Opportunity." *American Journal of Public Health and the Nation's Health* 32, no. 9 (September 1942): 1001–4.
Williams, Huntington. "Cyanide Poisoning, Acute and Nonfatal, Apparently from Hotel Silver Polish." *Journal of the American Medical Association* 94, no. 9 (1930): 627–630.
———. "Law Enforcement and the 'Baltimore Plan.'" In *Housing and Health*. New York: Milbank Memorial Fund, 1951.
Williams, Huntington, Wilmer H. Schulze, H. B. Rothchild, A. S. Brown, and Frank R. Smith Jr. "Lead Poisoning from the Burning of Battery Casings." *Journal of the American Medical Association* 100, no. 19 (1933): 1485–1489.
Williams, Mason B. *City of Ambition: FDR, LaGuardia, and the Making of Modern New York*. W. W. Norton & Company, 2013.
Williams, Rhonda Y. *The Politics of Public Housing: Black Womens Struggles against Urban Inequality*. Oxford University Press, 2004.
Williamson, Thad. *Sprawl, Justice, and Citizenship: The Civic Costs of the American Way of Life*. Oxford University Press, 2010.
Willoughby, Carl E., and Elwood S. Wilkins. "The Lead Content of Human Blood." *Journal of Biological Chemistry* 124, no. 3 (August 1, 1938): 639–58.
Wilson, William Julius. *The Truly Disadvantaged: The Inner City, the Underclass, and Public Policy, Second Edition*. 2 edition. Chicago ; London: University Of Chicago Press, 2012.
Wood, Horatio C. *American Medico-Surgical Bulletin*. The Bulletin Publishing Company., 1896.
Worster, Donald. *Dust Bowl: The Southern Plains in the 1930s*. New York: Oxford University Press, 2004.

Wright, Carroll Davidson. *The Slums of Baltimore, Chicago, New York, and Philadelphia*. US Government Printing Office, 1894.
Wright, Gwendolyn. *Building the Dream: A Social History of Housing in America*. MIT Press, 1983.
Wyllie, J. "A Family Outbreak of Lead Poisoning from Burning of Storage Battery Casings." *Canadian Medical Association Journal* 70, no. 3 (March 1954): 287–90.
Zahran, Sammy, Mark A. S. Laidlaw, Shawn P. McElmurry, Gabriel M. Filippelli, and Mark Taylor. "Linking Source and Effect: Resuspended Soil Lead, Air Lead, and Children's Blood Lead Levels in Detroit, Michigan." *Environmental Science & Technology* 47, no. 6 (March 19, 2013): 2839–45. doi:10.1021/es303854c.
Zimring, Carl A. *Cash for Your Trash: Scrap Recycling in America*. Rutgers University Press, 2009.
Zipp, Samuel, and Michael Carriere. "Introduction Thinking through Urban Renewal." *Journal of Urban History* 39, no. 3 (May 1, 2013): 359–65. doi:10.1177/0096144212467305.
Zunz, Olivier. *The Changing Face of Inequality: Urbanization, Industrial Development, and Immigrants in Detroit, 1880-1920*. University of Chicago Press, 2000.

Acknowledgments

This dissertation is dedicated to my parents. Among other things, I thank them for their constant love, and for encouraging me and helping me to follow my passions and to care about the environment and people. In addition to being wonderful parents, I greatly admire their work as public educators whose work in libraries and special education classrooms have improved the lives of people. Thanks, mom and dad.

Nothing has been more important to my success in this endeavor than having such a steadfast, generous, empathetic, adventuresome, and funny partner. This dissertation is dwarfed by a much more important outcome of the last few years: the love and fun I have shared with my wife, Katy. We also made an awesome creature named Axel. Thanks, Katy. And thanks to my little buddy Axel, too.

Katy and my sister, Erika, also served as my editors, reading all of the chapters of my dissertation. Katy is a nurse practitioner by training, but a damn good editor. Erika is a professional editor. She is also my best friend, and someone who I have more or less copied my entire life, from being a punk rocker, to studying environmental problems, to being a writer (or trying, in my case). Thanks, Erika.

Many other friends and family have helped me. My old friends in Missoula, although they barely knew what I was up to, have helped sustain me as a human with a life outside of the academic world. Katy and I also made many new friends in Virginia – in graduate school, but also in work and in our neighborhoods – that have been great sources of support and camaraderie. I thank all of them.

There are a lot of good graduate advisors out there, but some of them are exceptionally good. I was lucky enough to have two exceptional graduate advisors – Edmund Russell and Brian Balogh. I cannot thank Ed enough for continuing to be my advisor after leaving for the University of Kansas and Brian for agreeing to be my other advisor after Ed left. Ed and I talked on the phone every couple of weeks for much of the time we were apart – an exceptional dedication on Ed's part to remaining in contact. Brian, meanwhile, asked me if I wanted the "full rabbi" treatment. I am so glad I said yes – it is hard to describe how much support you feel having Brian in your corner. In addition to their support and emphasis on professional development, Ed and Brian provided incredible feedback that has fundamentally shaped my dissertation. Thanks, Ed, and thanks, Brian.

Many other professors and graduate students have also greatly improved this project. Christian McMillen has been a friend, teacher and mentor from the beginning of my time at the University of Virginia. I recruited Andrew Kahrl's expertise later in the project, but he has been an incredibly supportive and responsive advisor. Professors McMillen and Kahrl served on my committee. Kristin Wells, a public health expert, also graciously agreed to be on my committee and provided me with great feedback. I want to thank all of them for their crucial role in the dissertation. I would also like to thank Nathan Connolly, who agreed to be my "dream mentor" as part of my fellowship at the Miller Center. Professor Connolly's feedback has also been crucial to the dissertation and how I am rethinking it as I begin the process of transforming it into a book. My thanks to other people who have provided feedback and guidance on portions of the dissertation, including Sarah Milov, Guian McKee, Robert Stolz, Robert Gioielli, Max Edelson, Kathy Brosnan, Emma Rothschild, Jay Turner, Stephen Macekura, Tom Finger, and Dave Liffey. A special thanks to Jaime Allison, Cecilia Marquez and Justin McBrien for being not only great colleagues, but, more importantly, great friends through this whole process.

I owe thanks for many institutions that helped fund this project and helped me carry out my research. Special thanks go to Linda Carson at the Johns Hopkins Hospital; Marjorie Kehoe at the Alan Mason Chesney Medical Archives; all the staff at the wonderful Enoch Pratt Library; Saul Gibusiwa at the Baltimore City Archives; Aiden Faust at the Langsdale Special Collections; all the staff at the University of Virginia libraries, especially Inter Library Loan. For funding, I wish to thank the History Project at Harvard University; the Raven Society; the Corcoan History Department; the University of Virginia Graduate School of Arts and Sciences; the Miller Center of Public Affairs; and the Scholar's Lab at the University of Virginia. I would also like to thank the Mellon Foundation for the opportunity to work for a year at the Digital Scholarship Lab at the University of Richmond. And I would like to thank the people at the DSL lab, especially Robert Nelson and Justin Madron, who I learned a great deal from, and Brent Cebul, who was a great fellow to be locked in a windowless office with. I would also like to thank all of the people who make these institutions work, with a special shout out to Jennifer Via, who has always been an incredible help in the Corcoran History Department.