

An Actor-Network Theory Analysis of the U.S. Opioid Epidemic and its Effect on Winchester, Virginia

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On my honor as a University Student, I have neither given nor received  
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## Introduction

My hometown, Winchester, VA, is one of many rural areas in America that have been severely impacted by the opioid epidemic. My siblings and I have friends and former classmates that have lost their lives from opioid overdoses. The city of Winchester is located in the northwest tip of the state in Frederick County, Virginia (VA). The combined population of the city and surrounding county is approximately 120,000, according to the 2019 census (“U.S. census bureau QuickFacts”, 2021). In 2017, a local physician tried to instill a mandatory showing of an informational video on the epidemic in the school system in Winchester. She felt as if she was disregarded and the issue was not given proper consideration (Anonymous, personal communication, March 2nd, 2021). In the past years it has been widely accepted that this issue has not been given the attention it requires despite an estimated 450,000 deaths related to opioids since 1999 (“Understanding the epidemic”, 2020). Evidence of this is that it took until 2017 before health organizations declared that the United States (U.S.) was dealing with an opioid epidemic (“What is the U.S. opioid epidemic?”, 2020).

What is it about Winchester that makes it a hot spot for opioid abuse? Why is this seemingly robust and peaceful town being disproportionately hurt by the opioid epidemic compared to other more bustling areas in Virginia? In order to reveal answers to these questions I will conduct two comparison studies and discuss characteristics of Winchester that have contributed to the problem. The first will be between Winchester and Danville, VA. The second will be between the states Virginia and Georgia. Danville was chosen because its population is similar to that of Winchester, however, it is still under the regulations and jurisdiction of Virginia. Georgia was chosen because its population is similar to that of Virginia’s and it provides a different set of regulations and guidelines. By looking at these case studies the complexity of the opioid epidemic will begin to take form and the layers of this complex question will begin to unfold.

This research data was collected using discourse analysis coupled with statistical data. I collected information from a multitude of sources including news articles, journals, interviews, documentaries,

surveys and more. The data was assembled categorically, as to allow the information to be analyzed in detail independently or in conjunction with similar information. Keywords such as healthcare, opioid, heroin (a type of opioid), malpractice, treatment, healthcare infrastructure, transportation infrastructure, pharmaceutical, and abuse, were used to collect information.

In order to gain a greater understanding into the Winchester opioid problem, I utilize The Actor-Network Theory (ANT). This framework is useful for assessing the many different actors and actants that influence each other in a network (Cressman, 2009). In addition to using this socio technical framework, I provide discussion of the opioid problem in the context of the ethical framework coined Technological Mediation. By use of these two frameworks, I will argue that the issues facing my hometown are beyond the scope of failed morality, criminal behavior, or physician malpractice, and that there are actors contributing to opioid abuse in Winchester that are not seen in all towns. Overall this thesis will hopefully serve as a lesson on the importance of perspective in engineering and public health.

## **Literature Review**

Opioids have been around for centuries providing pain relief to patients, yet also being the antagonist in stories of addiction and death. When new opioid products were released in the late 1990s and early 2000s, the intended effect of the drugs was far different than the resulting problems that society is dealing with today. One of those issues is that the U.S. opioid epidemic impacts rural regions disproportionately compared to urban regions (Hancock et al., 2017; “HEALing communities study”, 2020). When allocating blame for the opioid epidemic, someone might point towards pharmaceutical companies, physicians, or crime groups. There is merit to these appointments, evidenced by the recent \$8 billion dollar settlement that Purdue Pharma recently made with the government for their injudicious advertisement of their product, Oxycodone, which significantly contributed to opioid addiction rates (“NPR choice page”, 2020). In 2012, there were 255 million painkillers prescribed in the U.S., which is sufficient to supply every adult in the country with a bottle. Furthermore, in the last decade the illicit

opioid industry has exploded, presenting drug trafficking problems across borders and issues with users transitioning from prescribed to illicit opioids ("What caused the opioid crisis?", 2020).

Statistics show that the current market for opioid drugs is still primarily being driven by prescriptions. A study found that 75% of heroin users began their use after being introduced to prescription opioids (Cicero et al., 2014; Muhuri et al., 2013). Many believe that there is the potential to cut the root of the problem out within the regulated, authorized prescription of opioids. If we can reclaim physicians' faith in alternative treatments such as physical therapy and stray them from prescribing opioids, then potentially we can start to see a decrease in the number of prescribed and illicit opioid drug overdoses (Danilovich, 2017). However, some healthcare laws disrupt this by requiring physician referrals in order for a physical therapist to provide treatment (Danilovich, 2017).

The ultimate goal of pharmaceutical companies is to create and provide medicine that will better the lives of patients, and while doing so achieve monetary gain. In the 1990s and 2000s, the latter of the two mission statements took priority. Pharmaceutical companies failed the public and sacrificed health and safety in greed and the pursuit of monetary gain ("The role of pharmaceutical companies in the opioid epidemic", 2021).

Closely tied to the actions of pharmaceutical companies were the actions of policy and law makers. Lobbyists influenced policy making on behalf of pharmaceutical companies in order to promote the use of opioids and change the community's perception of opioids. Pharmaceutical companies served as some of the biggest benefactors to lobbyist groups that had the ability to influence medical school education, standard of care decisions, and insurance-related decisions ("The role of pharmaceutical companies in the opioid epidemic", 2021).

The current perspective on drug abuse in the U.S. is rooted in the country's approach towards framing the problem. (Bowers & Abrahamson, 2020). The U.S. has generally been set on the idea of prohibition to rid the country of all illicit drugs. Since the mid-to-late 20th century there has been what country officials call, "A war on drugs." This "war" has shifted efforts away from reducing damage (i.e. treat those with addiction problems via medication assisted treatment), to a more punitive effort (Bowers

& Abrahamson, 2020). Two factors offer explanations as to why the U.S. has adopted this approach. One is that the view of prohibition is centered around moral failure and punishment. Whereas an addiction maintenance approach is centered around patient care, reason, and patient worth. The U.S. is considered an individualistic society, where the well-being of the individual comes before that of society (Bowers & Abrahamson, 2020). The second factor returns to laws and policies. The United States Department of Justice has made their approach to solving the epidemic clear: the criminalization of illicit drug use (Mitchell, 2021). For example, despite many other countries implementing safe injection sites for drug users, there was significant resistance towards the opening of these sites in the U.S. (Mitchell, 2021). This is a result of the fear that those sites would destroy surrounding communities, as well as the fear that this would undermine the current stance of the department of justice. Bureaucratic restrictions and policy making have created insufficiencies in healthcare infrastructure and education in regions of the country. In order for proper care to be provided, funding and treatment plans need to be put into writing (Hancock et al., 2017).

Without changing the outsiders' perspective on drug addiction from poor choices and failed morals, to a mental and physical health problem, safe and effective environments will not get the support to be implemented into society (Peele, 2017). Law and policymakers, pharmaceutical companies, crime groups, and physician malpractice are all issues on the top of the list of things that contribute to the epidemic. Given all of the information from current literature, it does not help us understand why Winchester is hurting. Countless other towns in the region and even country have seemingly identical circumstances, but Winchester is impacted more severely. If these bigger actors in the network are not the cause, there is cause for a call to conduct an investigation to find the micro level actors or actants at play.

### **Actor-Network Theory and Technological Mediation**

ANT is unique in that it considers both human and non-human actors when addressing a phenomenon. This is in-line with the heterogeneous engineering of an actor-network, which entails the combination of both social and technical components (Cressman, 2009; Latour, 2005). This concept is

based on the belief that in order to understand the processes that aided in the rise of a phenomenon, there should be no perspective left out (Cressman, 2009; Callon, 1987). In ANT, all actors in the network are equal in significance. Any perceived size, power, and influence of an actor is the effect that is attributed to the actors that are associated with it. There is significant value in ANT, and this research calls upon it to analyze the identified cultural and physical actors, and reveal the interconnectedness of the opioid problem in Winchester. By tracing the associations between these actors, perhaps society will better understand how addictions take form and what actors facilitate rises in addiction rates.

This research will also be interpreted in the context of the ethical framework coined *Technological Mediation*. The technological mediation framework is useful for understanding the complex network of actors and actants involved in the detrimental opioid epidemic. The defining characteristic of technological mediation is the belief that humans and technology themselves are a result of the interaction between each other (Verbeek, 2015). Utilized in mediation theory are the four types of relations between humans and technologies, as defined by Don Idhe: Embodiment relations, hermeneutic relations, alterity relations, and background relations (Verbeek, 2015). I will focus on the embodiment relationship between humans and opioids. According to Idhe, embodiment relations entail the withdrawal of perceptual awareness of the technology by the human. The human no longer focuses on the technology itself, rather it focuses on the thing that it does or in the case of this research: the mental and physical effects of the drug for the user or the monetary value for many non-users (Hogan & Hornecker, 2011).

### **Actor-Network Theory Analysis**

In an original survey created for this research, 100 respondents selected the three actors they felt contributed the most to the rise and continuation of the U.S. opioid epidemic (Figure 1). The list of possible actors was chosen based off of my knowledge and familiarity with the subject, which included: Big pharmaceutical companies producing prescription opioids, transportation corridors (highways), healthcare funding, physician malpractice, organized crime groups, the addictive nature of opioid based

drugs, local petty crime, foreign importation of drugs across borders/border protection, economic prosperity, patient education, and lawmakers/policies.

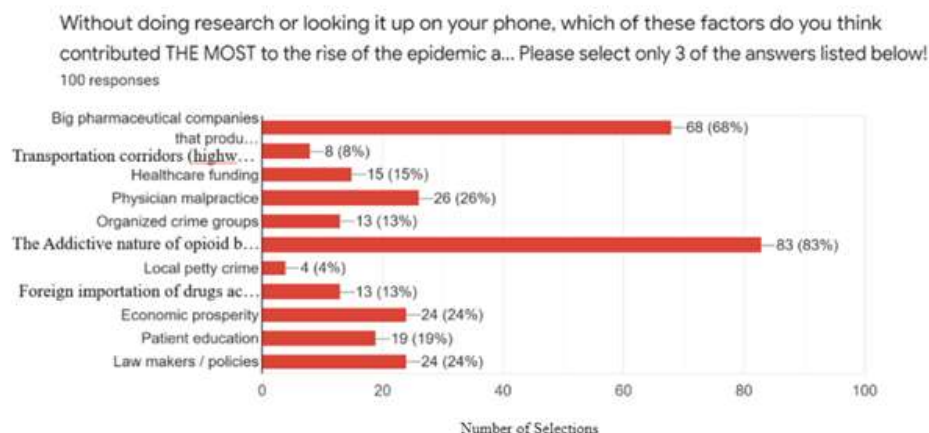


Figure 1. This visual displays the results of the original survey given out to participants for this research. The survey respondents were of ages from 15 to 70 years old. The majority of participants were from the state of Virginia or a neighboring state. The degree of education varied from those currently seeking their bachelors degree, to those that previously received it or one of higher degree, and to some individuals in primary school.

The goal of this survey was to reveal the public's opinion on the subject matter (Figure 1). The findings of this survey reveal the top opinion was that the addictive nature of opioid based drugs is one of the most important contributors to the epidemic. The subsequent two actors that make up the top 3, are big pharmaceutical companies producing prescription opioids and physician malpractice. This thesis aims to uncover different actors or actants in this network that contribute more to the problem than the public is aware.

I selected Danville as a candidate to compare to Winchester because of two key reasons. The first is that it is also in Virginia; therefore, it has similar state regulations and state funding for healthcare, infrastructure, education, and drug-abuse policy. The second is because it is a city in Virginia that has a comparable population to that of Winchester. These similarities allow me to explain the role of particular actors or actants with limited confounding variables.

In 2020, there were 24 fatalities and 59 injuries in the city of Winchester and its surrounding counties due to opioid overdoses ("Overdose deaths spike during coronavirus pandemic | City of Winchester", 2021). In the same year, Danville only reported 6 fatalities and an unreported number of injuries due to opioid overdoses (Crane, 2021). A similar trend is seen when looking at historical data on opioid abuse. According to the Virginia Department of Health (VDH), Winchester and Frederick County had a total of 24 people die from opioid overdoses in 2017, which results in a 22.4 death rate per 100,000 people. In Danville and Pittsylvania County the VDH reported that there were a combined 12 deaths from opioid overdoses, which results in a 11.8 death rate per 100,000 people ("Overdose deaths – Opioid Data", 2021). These reports put on display the discrepancy in opioid impact between the two cities, but further discussion is needed on the differences between the cities.

Interstate 81 (I-81), one of the major transportation routes on the east coast, stretches from Tennessee to New York, and it runs directly adjacent to Winchester. Interstate 66's (I-66) western terminus is just 15 miles south of Winchester and it runs all the way into Washington D.C. Why is it important to know about I-81 and I-66? These major transportation corridors serve as two key actants in the opioid issue in Winchester. As you can see in (Figure 2), a number of

state highways intersect in Winchester, which can take you to West Virginia, Maryland, and to Washington, D.C..

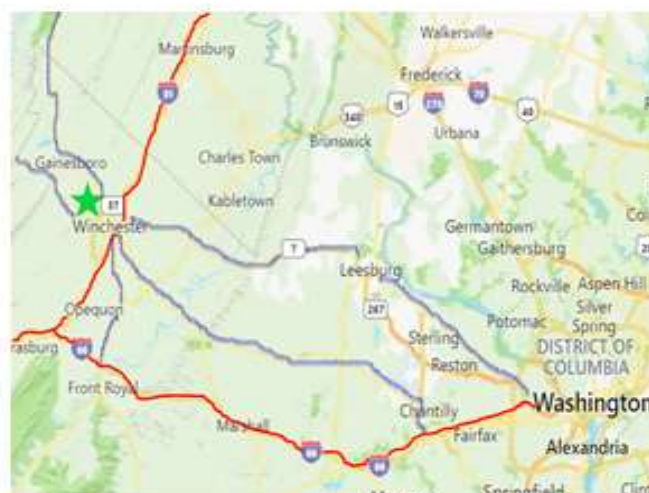


Figure 2. In the figure above, Winchester is identified with a green star above its location on the map. I-81 and I-66 are the two major transportation corridors and are traced with the color red. Other state highways that lead to Washington, D.C. or into West Virginia are traced in the color blue.



According to Virginia State Police Investigators, drug traffickers seek out “cross-roads” locations, as it enables them to efficiently distribute their product (“Heroin: The hardest hit”, 2016). In addition, Winchester is accessible from two of the largest ports on the eastern seaboard in Hampton Roads, VA and Baltimore, Maryland. Port proximity and access to I-81 and I-66, allow distributors to use Winchester to access the large opioid market in Maryland, West Virginia, and Kentucky (“Heroin: The hardest hit”, 2016). Investigators note that because Winchester is used as a meeting point between traffickers, it ends up being a location where drugs are sold.

Danville is a town in the central part of southern Virginia, bordering the

Virginia-North Carolina (NC) state line (Figure 3). Danville, and the accompanying

Pittsylvania county, have an approximate

population of 100,000 (“Population of counties in Virginia (2021)”, n.d.). Furthermore, in Figure 4, you can see that Danville’s transportation infrastructure is less interconnected with major transportation corridors and cities. The largest roadway that goes through Danville is US 29, which connects it with Charlottesville, VA and Winston-Salem, NC. The aforementioned death rate statistics and its significant decrease in magnitude as compared to Winchester is in part a result of the transportation corridors in this

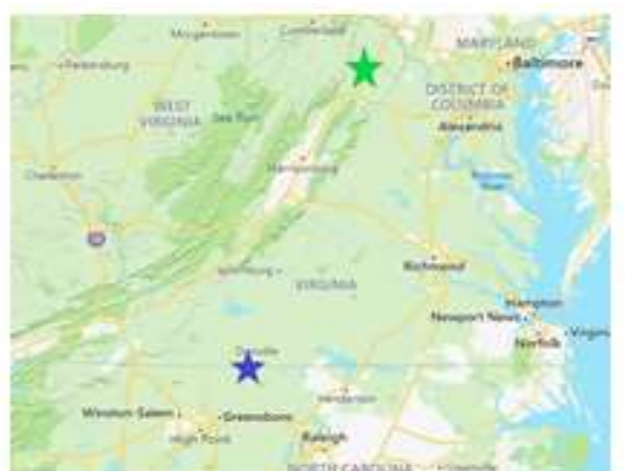


Figure 3. The above map displays the entire state of Virginia. It marks Winchester with a green star and Danville with a blue star.



Figure 4. The above visual marks Danville with a blue star and also has state highway 29 traced in blue. Route 29 is not a busy transportation corridor but is the most prominent in the Danville area.

area, or lack thereof. The Danville area does not encounter large amounts of drug trafficking as it does not lie in the path of a major transportation network.

This actant (transportation corridors), when incorporated into the already vast network of actors and actants, facilitated the growth of the opioid problem for Winchester. The comparison between Winchester and Danville areas is evidence of this effect. With a greater influx of opioids into a town, the integrity of healthcare infrastructure is tested. The degree of healthcare education for both patient and provider becomes more important. A patient who was once abusing prescription drugs now has the opportunity and a vast supply of illicit opioids.

The second comparison study concerns the states Virginia and Georgia. This change in scope is strategically done to look into how state funding and regulations impact Winchester. Georgia was selected because its total population is similar to Virginia's population and because it is in the southeastern region of the country with Virginia. Georgia is ranked 8th in total population in the United States with 10,736,059 people, and Virginia is ranked 10th with 8,626,207 people (Kershner, 2020). Despite Georgia having a greater population, Virginia suffers more from the opioid epidemic. In 2018, the National Institute on Drug Abuse reported that there were 1,193 and 866 overdose deaths involving opioids in Virginia and Georgia, respectively. The U.S. reported statistic was 67,367 deaths involving opioids for 2018, making Virginia responsible for 1.77% and Georgia 1.28% of all opioid deaths in the country ("Virginia: Opioid-involved deaths and related harms", 2020; "Georgia: Opioid-involved deaths and related harms", 2020).

This finding motivated me to investigate two specific actants in Georgia: the state's budget for healthcare and its prescription drug monitoring program quality. Even though Georgia recorded lower fatalities, that same year the state spending on healthcare was \$4.4 Billion (Tharpe, 2017). Virginia's healthcare budget was upwards of \$14 Billion ("PBPublic", 2016). Furthermore, according to the Georgia Department of Health's Prescription Drug Monitoring Program, approximately 2 million patients received

opioid prescriptions in 2018 ("Prescription Drug Monitoring Program (PDMP)", 2018). In Virginia that statistic was approximately 3.5 million ("2018 Annual report: Virginia prescription monitoring program", 2018). In addition, data from 2021 on states with the most Medicaid coverage shows Georgia ranked 50th and Virginia ranked 15th (McCann, 2021).

Healthcare funding, physician behavior, and medical coverage are three actors that contribute to the problem of opioid addiction. However, in the data listed above, they appear to have no effect. Healthcare spending and medical coverage are lower in Georgia than they are in Virginia, even though Georgia has about 2 million more people. One could speculate that physician malpractice in Georgia is not as common as it is in Virginia using the difference in total prescribed opioids as evidence. However, that discrepancy could just be a result of Virginia's higher healthcare coverage rate.

I would argue that the geographical location and transportation infrastructure of Georgia does not draw the attention of drug traffickers. Trafficking into Georgia only offers a single market, Atlanta, Georgia. The port of Savannah is one of the larger ports on the east coast; however, it poses no significant advantage to traffickers as there are also the ports of South Carolina and Miami that service territories in those respective states ("The largest and busiest ports in the US", 2021). Georgia lacks the key actant that Virginia has: a vast and robust transportation corridor.

The inherent values and behaviors of those that live in Winchester ultimately decide whether or not increased trafficking due to highways or decreased healthcare funding will negatively impact the town. One element that I wanted to explore was the political beliefs of the inhabitants of Winchester and its surrounding counties. In the 2020 election the city of Winchester voted Democratic (54.9% - 43.3%), while the surrounding counties all voted Republican with the largest margin being (69.6% - 28.9%) ("Live election results: 2020 Virginia results", 2020).

These results provide some insights when taking into consideration the differences in Republican and Democratic beliefs and actions on the opioid epidemic. Research has shown that historically

Republican administrations have pursued hidden, targeted legislation initiatives that are centered around program redesign (Grogan et al., 2019). In order to avoid blame for program retrenchment and still claim efforts to address the opioid problem, the administration allocates money differentially to social groups to have them make decisions (Grogan et al., 2019). Democrat administrations on the other hand, take large-scale approaches to addressing the problem and spend more money than Republican administrations. Furthermore, there is some association of political belief with the degree of restriction in drug monitoring programs (Schneider, 2017). Democratic beliefs are typically associated with a higher degree of restriction than Republican beliefs. Even though Winchester typically votes democrat, it is surrounded and socially connected by republican counties which might contribute to the issue due to the republican beliefs and policies in place. This fact perhaps is responsible for the lack of attention that the opioid problem has received in the past years in and around Winchester.

### **Technological Mediation Analysis**

The technological mediation framework views the opioid epidemic as the result of interactions between humans and opioids. Humans have designed opioids to be more effective and safe. In the past decades pharmaceutical companies have continuously developed new products to replace older ones, claiming better results and decreased susceptibility to addiction. Users have also mediated the forms of opioids and the ways that it can be administered to the body. These methods include pills or liquids by mouth, nasal sprays, skin patches, or shots injected into a vein or muscle ("What are opioids, and how do I take them?", 2019).

In this context, technological mediation shifts the focus of the problem away from solely being the opioids themselves, and reveals interactions between humans and opioids that ultimately exacerbate the issue (Figure 5). The embodiment relation between human and opioid can be seen with how physicians and patients interact in rural communities like Winchester. Patients sometimes have to travel great distances to a doctor's appointment and they want their problems to be resolved immediately. It isn't uncommon for a patient to miss appointments or permanently neglect the doctor altogether. A patient like

this would be hard to commit to a physical therapy or rehab center as an alternative to opioids. In addition, patients will plead with their doctor that they traveled far and are in tremendous pain. Physicians are then in a position that may cause them to overlook the standard that opioids are only to be used in serious or last resort situations. They want to help relieve their patient of pain, so they prescribe them with an opioid. Thus, in the medical world a reliance begins to form of the new standard of care prescribing opioids. Figure 5 shows this concept at a higher level. The combining of perspectives from patients, pharmaceutical companies, and opioids themselves ultimately determine the interpretation of opioid production and consumption and what values are given significance in the mediation of that problem.

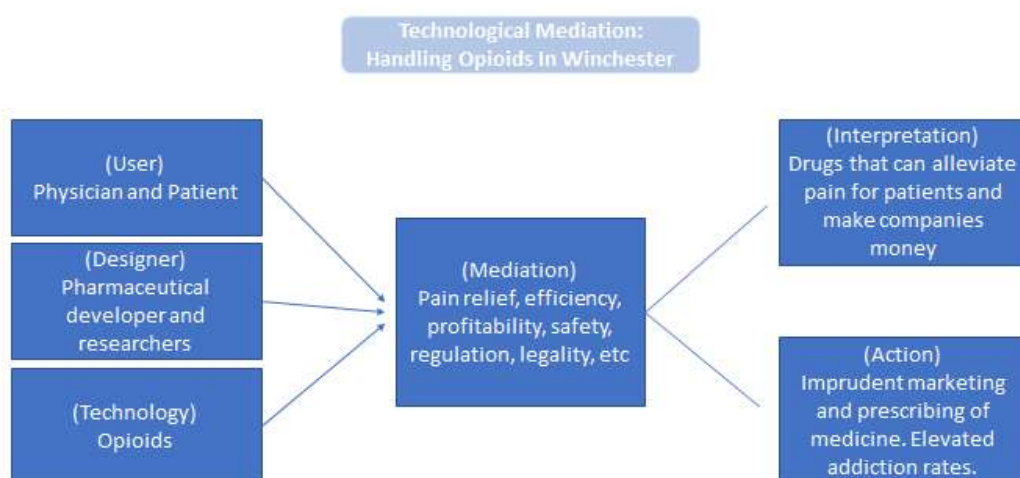


Figure 5. This diagram serves as a visual representation of the Technological Mediation framework being applied to the research question.

## Conclusion

A large contributing factor to the rise of the U.S. opioid epidemic were the actions of biotechnology companies, policy makers, and physicians. However, the answer as to what has caused Winchester to be disproportionately affected by the epidemic lies within the transportation infrastructure surrounding the area, its geographical location, and the societal beliefs and behavior of those living there.

Drug developers, engineers, corporate leaders, and healthcare professionals are not solely responsible for the epidemic. The problem is bigger than just a few bad decisions by users and ill-advised practices by the designers. This epidemic should serve as a cautionary tale to not just the pharmaceutical industry that developed the opioid products, but to all that played a role in the greater mediation of the problem. As a society, there must be discussion about the potential negative consequences that are both precedent and unprecedented, prior to releasing a precarious technology like an opioid drug. Pharmaceutical engineers are no longer just designing drugs, they are designing how humans and drugs interact with each other. When a product as high-risk to the safety of consumers as an opioid is causing harm to society, it is the responsibility of those that created it to identify where and why it went wrong. This thesis hopefully inspires those who are tackling complex problems to continue to peel back the layers and not settle for answers that present themselves first. By exploring deeper connections between the human and non-human actors in the opioid epidemic across all of the U.S., public health officials will be able to find more of the hidden actors impacting the opioid crisis as was done with Winchester's case. With a clearer understanding of all actors involved officials will be able to make great strides in eliminating the opioid crisis.

*Word count: 3976*

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