Science Policy and the COVID-19 Pandemic

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Emma Yeats

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

Emma Yeats

Sociotechnical advisor: Peter Norton, Department of Engineering and Society

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Countries that are diverse in their politics, their GDPs and their cultures can be compared by their pandemic responses. How did some successfully contain the virus while others were left exposed? A review of four representative nations, China, the United States, Brazil, the United Kingdom, and two regions, Oceania and the African continent, indicates that science policy is of salient importance. Where national policy responses to the pandemic were significantly influenced by anti-science agendas, the responses were less effective than in those countries where it had no influence.

Review of Research

The current body of literature emphasizes the importance of a unified and coordinated government response to any pandemic, and the negligence of several administrations amid COVID-19 has sparked research interest globally and, particularly, in the United States. Political disagreements between countries, notably between the US and China, severely affected governments' abilities to respond efficiently and maintain medical supplies, and hurt scientific collaboration (Colglazier 2020). Wallace-Wells (2020) contributes slow responses to "a combination of cultural hubris and geopolitical prejudice" that deterred western nations from considering the outbreak in China a threat.

Researchers consider distrust in science policy the culprit in the shunning of face masks and disregard for social-distancing measures. Under the excuse of medical freedom, defiance "came to symbolize allegiance to President Trump" in the United States (Hotez, 2021), where 54 percent of people "trust science a lot" and 46 percent have doubts or don't trust it at all (Barry, 2020). Disinformation campaigns were common, deepening the idea that scientists were uncertain about coronavirus measures (Hotez 2021; Stevens 2020). Countries who responded poorly affected their neighbors, as well; statistical modeling shows that "anarchy in uncoordinated state policies" increased case numbers in surrounding areas while also influencing them to relax on restrictions (Holtz, 2020).

However, there is also doubt in the effectiveness of scientists' response to the pandemic. Distrust of science is present in all groups of the US, especially in communities of color (Dembosky, 2021; Armstrong et al., 2007), and researchers have failed to safely and equally communicate public health evidence. Instead of clearly presenting what they did and did not know about the pandemic, health experts lacked transparency in hopes of producing a unified response from the public (Wallace-Wells, 2020). Because scientists are unaccustomed to working under the time constraints a global pandemic introduces, the rushed pace in early COVID-19 generated skepticism (Krishnan and Dasgupta, 2020). Most researchers did not have time to deliberate, or when they did, they did it publicly and left policymakers and the public confused (Han, G. and Zhou, 2020) or "thinking that mathematical models are in general unreliable or inherently flawed" (Holmdahl & Buckee, 2020).

It is important to note that disease modelling, and the science behind it, is imperfect. As epidemiologists argue, disease models are not crystal (Adam, 2020; Richards, 2021). Many parameters integral to these models can only be estimated at the beginning of an epidemic (Adam, 2020). Thus, models and simulations are primarily used as "order-of-magnitude" estimations to help researchers make general conclusions (Ingeno, 2020).

The consensus of most researchers is to implement intermittent lockdowns to combat COVID-19. As case numbers climb, restrictions on work and travel should be placed and generally people should practice social distancing and mask-wearing (Han, E. et al., 2020).

Those measures should be relaxed as cases fall, until a vaccine becomes accessible and widely-spread (Smolacks, 2020). However, despite the challenges, the literature agrees that scientists should consider culture an additional parameter in disease modeling and when advising administrations on responses (Gibney, 2020; Dizikes, 2020). As Stevens (2020) claims, "there is not just one 'scientific' approach to dealing with COVID-19," and thus debates on policy and advice should be transparent.

An Introduction to Anti-Science Policy

Anti-science is not the rational doubt that is essential to scientific research; rather it is an unwarranted rejection of at least some scientific consensus and the policies that are based on it. Anti-science policies have been closely associated with populist political movements. Mudde (2014) defines modern populism as a political movement which appeals to the common person by contrasting themselves with the "corrupt" elite, and states its two enemies: elitism and pluralism. Sismondo (2010) regards it as a rejection of modernity, which has generally held science and technology central, in a time of great change and global integration. In populist politics, scientists and researchers are typically classed among the privileged elites characterized as threats to popular sovereignty.

Anti-science policies are often highly selective; they may accommodate scientifically informed policy in some areas while thwarting it in others. For instance, the Trump administration slashed funding for the Environmental Protection Agency, withdrew from the 2015 International Climate Accord, and attempted to defund the World Health Organization (WHO) in April 2020. However, this administration also allowed Big Tech companies to flourish, and directed NASA to send astronauts to the moon in 2024 (Nature, 2020).

Denial and Isolation: The United States & Brazil

Data clearly shows that countries that experienced the most loss passed overwhelmingly anti-scientific policies during, or in the years leading to, the pandemic. These include the United States and Brazil, two countries that led a global populist wave in 2016-2019 (Kurlantzick, 2019).

While conditions for this wave were building for years, the rise in modern populism and anti-science was never more apparent than in the 2016 election of U.S. President Donald Trump. In his first week in office, Trump ordered several gas pipelines to reopen, froze government regulations on emissions, and expressed intent in repealing the Affordable Care Act, ignoring years of scientific research results in climate change and medicine (McCarthy, 2017).

His presidency was littered with mass lay-offs (Quigley et al., 2020) and attempts to reduce funding at science agencies, including a 13 percent cut for the National Institute of Health (NIH) in 2019. According to Taylor (2020), the administration attempted a 7 percent cut to the NIH budget in February 2020, after the first cases of COVID-19 were reported in the US.

During the critical early days of the pandemic, President Trump and other authority figures actively understated the danger posed by the virus, as described by Lewis (2021). US science advisors claim the administration "tightly controlled what [the Center for Disease Control (CDC)] could put out," and made communication of accurate safety information to the public difficult. The first US COVID-19 tests developed slowly, and initially required hospitalization with extreme COVID-19 symptoms to receive. This, combined with inadequate tracing, reversing guidance on mask wearing, and a lack of federal guidance to the states fueled case numbers and public confusion. Altman (2020) wrote on the negligence of the Trump administration:

> Delegating primary responsibility to states in a crisis is unprecedented. It was… the first time a sitting US president has sought to decentralise authority and responsibility during a national crisis.

Since the inauguration of Democratic President Joe Biden, case numbers have declined from their January 8 peak (fig. 1). Vaccines have been distributed on a massive scale, Congress has passed a $1.9 trillion relief bill and the new president has urged Americans to take precautionary health measures (Pace and Swanson, 2021). However, the results of structural racism led to high case numbers in US Black, Indigenous, and Latinx communities, who for the most part have been left unaided. The evidence suggests that rebuilding public trust in science and political authorities will take years (Lewis, 2020; Dembosky, 2021).

Figure 1. US COVID-19 cases, Feb. 2020 – March 2021 (New York Times, 2021).

Brazil is another case where anti-science and populist policy resulted in huge case numbers. After the recent election of Jair Bolsonaro, whose policies and platforms are strikingly similar to Donald Trump's, scientific research has suffered. Tollefson (2019) asserts,

> Brazil's researchers have faced funding cuts and repeated attempts by the administration to roll back protections for the environment and

> Indigenous populations. Government officials blocked the release of a ministry report on drug use in Brazil. And they have questioned other work by government scientists, including… deforestation reports by a national agency.

Another letter from Brazilian scientists reports that budget cuts "…proposed by the current Bolsonaro government are based on an anti-science ideology," and are making work "untenable for research" as labs were forced to shut down nationwide (Quintans-Júnior et al., 2020).

Ferigato et al. (2020) says, "the federal government's denial of science," and a failure to coordinate, resulted in insufficient aid, underreporting and high mortality among health professionals, pregnant women and indigenous populations. Human Rights Watch (2021) claims that the Bolsonaro administration used a law enacted during the country's military dictatorship in 1964-1985 to "seek prison sentences against people who have criticized [its response to the] Covid-19 pandemic." Urban and Saad-Diniz (2020) accuse the administration of ignoring the 35 million Brazilians without access to clean water, who have no ability to wash hands or stay home, and influencing those with financial means to follow prevention measures to "take their example from the President and [ignore] all public health recommendations."

As of April 6, 2021, Brazil and the United States have the highest case numbers and total related deaths in the world. There are 30,787,596 total cases and 555,638 total deaths in the US, and 13,013,601 total cases and 332,752 deaths in Brazil (Johns Hopkins, 2021).

Collaboration, Unity and Development: Oceania & Africa

Conversely, countries that listened to their scientists and adopted containment measures fared well. Those that found relative success operated as a unified bloc with their geographic peers, rather than a single isolated nation.

Oceania, which includes Australia, New Zealand and the Pacific Islands, is one such region where case numbers have remained low. New Zealand, well-known for its successful containment policies, immediately responded to the warnings of scientists and researchers and introduced border-control policies to delay its arrival (Baker et al, 2020). Leading scientists and politicians accredit the policies to preventing the virus from settling into the Pacific Islands, where COVID-19 could have been disastrous. Baker et al. (2020) write:

> Our disease models indicated that we could expect the pandemic to spread widely, overwhelm our health care system, and disproportionately burden indigenous Maori and Pacific peoples.

Australia has also been successful, and is a model in transparent communication with the public. The Department of Health maintains a website on current preventative measures and tips for citizens (AGDH, 2021). Restrictions for each state and locality were "clearly communicated through daily televised press conferences, public signage and advertising," and, as Haseltine (2021) reports,

> With case numbers so low, the media is able to publish the exposure locations that [each] infected person visited in addition to traditional contact tracing.

When COVID-19 began, Australia's two major political parties put differences aside to "work on a unified pandemic response," (Haseltine, 2021). Aboriginal and Torres Strait Islander peoples responded independently, but were supported and provided resources by the Australian government, resulting in zero deaths in these communities (NACCH0, 2021; Haseltine, 2021).

After a re-emergence of measles in 2019, the South Pacific Islands have retained low case numbers with complete border shutdowns and implemented travel restrictions. Diarra et al.

(2020) cites coordination between Australia, New Zealand and The Pacific Community (SPC) to support communities with resources and guidance.

The economic success of this region, however, is mixed. New Zealand has experienced a very strong economic recovery. While the nation's tourism industry and some exports are suffering, a "V-shaped economic rebound is vindication of the COVID-19 'elimination' strategy New Zealand has pursued" (Withers & Bloomberg, 2020). But, as the World Health Organization (2020) points out, the country "certainly benefitted from being a high-income, island country with an advanced health system." The Pacific Islands, however, have seen an increase in extreme poverty after disruptions to pivotal tourism industries (Shen, 2020), and Australia fell into its first recession in almost 30 years (Khalil, 2020).

To this end, we turn to the African nations. Approximately 10 million COVID-19 related deaths were predicted in the continent due to poor living conditions, high population density and traffic (Binagwaho, 2020). Yet, as of March 8, 2021, the overall death toll had only reached 106,280 in the entirety of the continent, just over 1 percent of what was expected (Galal, 2021). Researchers accredit the low mortality and total number of cases to, "…travel restrictions, curfews, and school closures… implemented early in Africa compared with other continents, often before an African country had detected a case" (Mbow et al., 2020).

Several countries employed new technology to keep case numbers low. Being a landlocked nation, Rwanda relies on truck transportation for essential goods, including medicine. In order to prevent the pandemic from spreading between borders, Rwanda and the East African Community (EAC) invested in the "Regional Electronic Cargo and Drivers Tracking System" to track the flow of cases. Using this software, truck drivers could share COVID-19 results digitally and receive treatment, and countries would know when quarantine was necessary to keep cases low (Karuhanga, 2020).

Several Sub-Saharan countries also made attempts to protect economically vulnerable populations. In Ethiopia, the Federal Housing Corporation announced a 50 percent reduction in rent in the cities of Addis Ababa and Dire Dawa (Mwangi, 2020). Government leaders in Rwanda decided to completely forfeit their April 2020 salaries (Matengo, 2020). In Ghana, electricity costs were cut by half and potable water was made free for all Ghanians for three months, in order to make up for lost income (Asare & Donkor, 2020).

It has been reported that the experiences of Sub-Saharan African countries in handling ongoing outbreaks and managing infectious diseases such as Ebola, tuberculosis, malaria and HIV were advantageous in the fight against COVID-19. Pre-existing emergency plans on public health interventions, community engagement programs, and a workforce of emergency medical experts and trained health care workers were quickly re-directed to ensure a fast response to the virus. (Umviligihozo et al, 2020)

What's even more interesting is that of the COVID-19 deaths reported in Africa, 47.8 percent occurred in South Africa (Galal, 2021). South Africa became, in 2019, the "Second Most Populist Country" in the World, after Brazil, when an estimated 39 percent of the population held strong populist views (Phillips et al., 2019). Distrust in this country lies directly in politicians, and was only exacerbated by the pandemic; as Cohen (2021) shares, politicians have inflated prices of protective equipment to health workers amid budget constraints, resulting in unfilled posts at overburdened hospitals.

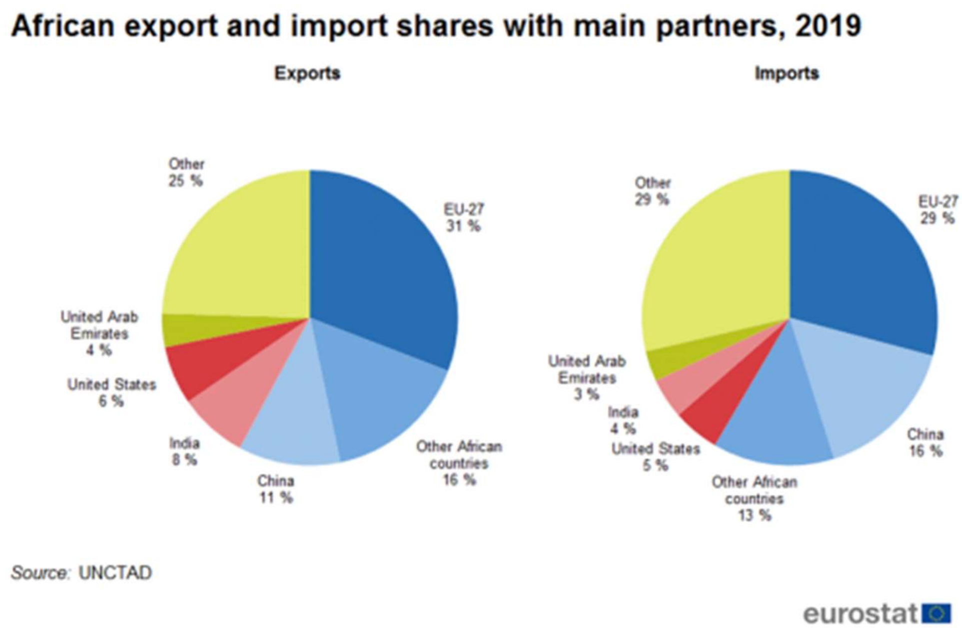

Figure 2. African exports and imports (Eurostat, 2020).

On the economic spectrum, a fraction of African trade was intercontinental before the pandemic. In 2019, only 13-16 percent of international trade was between African countries; the largest trading partners were the European Union and China (fig. 2). Thus, "a drop in world demand and the resultant commodity price drops, affected production and export performance of African countries more than did their own COVID-19 control measures" (Gondwe, 2020). One simulation estimated a total fall of 1.4 percent in Africa's GDP due to COVID-19, unless African economies could be diversified to stimulate more intercontinental trade (Gondwe, 2020).

This was a relatively successful approach, with all but four African countries' GDP values falling less than the global average, and with many economies actually growing over 2020 (Oxford Business Group, 2021; Varrella, 2021; OECD News Release, 2020). On January 1, 2021, African countries opened their markets under the African Continental Free Trade Area (AfCFTA), the largest free trade area by countries participating, estimated to include around

1.3 billion people across the continent and produce a combined GDP of $3.4 trillion. This trade agreement could lift up to 30 million Africans out of extreme poverty through job creation and industrialization (Kuwonu, 2021), and have huge implications for gender equality, as women are expected to be the largest portion of informal traders, representing up to 80 percent in some countries (Bayat, 2020). With this new agreement, the economic effects of COVID-19 are expected to diminish, and the continent hopes to set an example of unity and cooperation in an era of increasing isolationism (Kende-Robb, 2021).

Biased Data is Bad Science: The United Kingdom and The People's Republic of China

In the UK and China, the pandemic response was impaired by biased data. According to Yamey and Wenham (2020): "the U.K. government initially pursued a dangerous, discredited herd-immunity strategy that led to a huge death toll." They contend that the government then positioned "scientists to take the blame for its failure to respond to the crisis." Evidently, this "herd-immunity strategy", was pushed by a secretive and non-collaborative government advisory board. Landler and Castle (2020) allege:

> The government's influential Scientific Advisory Group for Emergencies — known by its soothing acronym, SAGE — operates as a virtual black box. Its list of members is secret, its meetings are closed, its recommendations are private and the minutes of its deliberations are published much later, if at all. Yet officials invoke SAGE's name endlessly without ever explaining how it comes up with its advice — or even who these scientists are.

However, shortly after PM Johnson contracted COVID-19 himself, the country reversed its policies and began to follow models of greater scientific merit.

The main model the United Kingdom based this later response on was also initially shrouded in controversy; it was labelled by software engineers as “a buggy mess” and “totally unreliable” (Adam, 2020). Neil Ferguson, a mathematical epidemiologist at Imperial College London who spearheaded the model’s design, admits it was pieced together haphazardly from a 2005 simulation used to determine, “what would happen in Thailand if H5N1 avian flu mutated to a version that could spread easily between people” (Adam, 2020).

While it took time to make the code presentable, its results were later reproduced and verified by several other scientists in June 2020 (Chawla, 2020). While the group’s rush to produce results is understandable considering the urgency of the early pandemic, a lack of professionalism on the scientists’ end contributed to a trust infringement between researchers and the public.

A final interesting case study is at the pandemic’s origin. It appears that China responded quickly once the virus was discovered. By the time a large number of cases appeared in early/mid-January 2020, mainly due to geographic movement around Chinese New Year celebrations, officials in China began to take vigorous (perhaps, even, extreme) containment measures, outlined by AlTakarli (2020):

> …more than 1,800 teams of epidemiologists were assigned to trace tens of thousands of people a day in Wuhan… In addition, a community-wide temperature screening was implemented through ‘installing infrared thermometers in airports, railway stations, long-distance bus stations, and ferry terminals’ … [and] the search was later expanded to include screening people at work, in shops and on streets. Furthermore, the government followed more aggressive ways of health checking by sending officials to residents’ houses and forcing ill people to be isolated.

It is noteworthy to mention that China is a scientific powerhouse, having overtaken the United States in total number of science publications in 2018. Hu (2020) attributed the progress partially to “generous public funding for science and technology at a time when such funding elsewhere has been under greater scrutiny and less available than before,” a direct reference to the populist-led wave of cuts in scientific program budgets in the last few years. China has also achieved a full economic recovery since the pandemic began (Withers, 2020). On the surface, the response appears to be a major success.

However, researchers have questioned the official reported case numbers since the pandemic began. The sharp decline in China’s COVID-19 statistics in March 2020 raises concern and “falls outside of recognized and accepted medical norms” (Thomas, 2020). Many researchers speculate the pandemic began months before the released timeframe of December 2019, likely in October of that year (Reston, 2021). Researchers at the Washington University School of Medicine in St. Louis estimate that actual case numbers and death estimates were likely ten times what was reported by China in February 2020 (He et al.2020).

Chilling evidence for these claims lies in reports from crematoriums near Wuhan, as reported by Thomas (2020):

> …whereas the eight crematories in Wuhan operated for about 4 hours a day, on average, before the outbreak, and typically in the morning in keeping with Chinese funeral rituals, a change occurred at around January 25, 2020. At this point, the crematories were found to be operating almost round the clock or at about six times normal levels… [and] the increased hours of operation would show an excess of about 680 per day above the normal or a total of about 816 deaths a day. Additional cremation staff are reported to have been imported to Wuhan, as well as 40 mobile cremation stations… to cope with the increasing need.

A linear estimate shows that in this period (from January 25 to February 12, 2020) the cumulative deaths would be above 9,300. Using the case fatality rate officially reported by

China, this would suggest nearly 300,000 total cases appearing in those 19 days *in the Wuhan area alone*.

The total cumulative cases reported in the entirety of China up until February 7, 2020 was around 13,600 and the total deaths were 545 (Thomas, 2020). If these reports are inaccurate, the irresponsibility of the Chinese government in spreading false data in the early pandemic likely resulted in millions of cases around the world.

Conclusion

Anti-scientific policies clearly hurt national responses during the COVID-19 pandemic, and the point has been made that populism is a heavy contributor to anti-science rhetoric. Disinformation, ignorance, corruption and bias alike are made clear to see in this era, with the consequences being monumental loss of life. Despite the challenges, a path forward has revealed itself through ethical technological development, unity, and scientific collaboration. Progress is more visible now than in decades.

With the introduction of several COVID-19 variants, the pandemic is far from over. However, as Krishnan and Dasgupta (2020) optimistically claim, “it has provided us with an opportunity to introspect and chart the way forward.” As researchers, we expect others to follow our advice and expertise, but have now realized this is unsubstantiated. Moving into the future and into new scientific issues, if we cannot count on changes in policy, then they must be made within the way we do science itself. The scientific community is in a unique position to incite change by avoiding pushing a definitive and scientific “right answer”, and emphasizing the scientific process instead. By rebuilding trust with citizens and officials, we may be able to show, rather than tell, how we respond to challenges we face in the future.

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