Viral Strain on the System

Organizational Differences in Healthcare Systems and the Control of Infectious Disease Crises

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ABSTRACT

The crises known as epidemics and pandemics are characterized by significant, measurable differences in their impacts to population health and policy adoption across countries. Although previous research has brought to light certain partial explanations for these variations, organizational differences in healthcare system structure, namely structural universality and ownership and management of healthcare provision, have yet to be considered as important causal factors. Based on unique aspects of universal healthcare and national health services, economic, social, communicative, and political advantages theoretically belong to these two system characteristics. Case comparison between Chile and Uruguay and large-N regression analysis allow for the examining of the roles of structural universality and the national health service in mitigating the effects of an infectious disease crisis. The evidence suggests that structurally universal healthcare plays a meaningful role in state-level management of a crisis, leading to improved health outcomes, a result which implicates the mass redesign of healthcare systems around the world towards structurally universal healthcare.

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AUTHOR'S NOTE

Because I never want to experience another COVID-19.

INTRODUCTION

Research question: Your country of residence is an important determinant of how you will experience an infectious disease crisis, and some countries handle disease outbreaks and long-run crises better than others. In some countries, more people will get infected, and, in the case of lethal pathogens, more will die. Some governments respond quickly and strongly with public policies to combat the spread of disease, and some governments are slow to move or do not respond at all. This variation in infectious disease crisis outcomes is most keenly observable in the cases of an epidemic or a pandemic, when the same disease impacts large expanses of the globe. Heterogeneity across countries' epidemic performance and outcomes becomes highly visible. It also leads to the central research question of this work: why do infectious disease crisis outcomes vary across countries?

Dependent Variable: Infectious disease outcomes can be broken into two specific classes: health outcomes and policy outcomes, both commonly used to track crises cross-nationally (Flemming et al. 2000; Mavedzenge et al. 2013; Roser et al. 2021; Roser & Ritchie 2019). New infections, disease-related deaths, and hospitalizations are all used to measure the population health impacts of an infectious disease crisis. Cross-national variation within each of these measures points to the presence of causal factors driving these differences, some of which may be under the control of countries responding to the disease crisis.

Policy outcomes are typically understood as meaning the creation of or failure to create a policy to respond to a specific issue (Soule & King 2006). In the context of infectious diseases, policy outcomes stand for the adoption of or failure to adopt policies regarded as necessary or useful for the control of the disease. Some examples include national policies on HIV self-testing, test cost and HIV education in secondary schools. It is also important to gauge the relative severity or stringency of the adopted policies when considering policy outcomes. For example, the Oxford Blavatnik School of Government's Containment and Health Index is a composite scoring system based on the presence and severity of thirteen COVID-19-related policies, including those on face coverings, testing, and public information campaigns. As with health outcomes, cross-national variation observable in infectious disease crisis policy outcomes

suggests that some countries may be handling epidemics more effectively than others, which raises the question: why?

Previous research from the public health literature undertaking the study of this variation offers a few concrete explanations, though it still fails to characterize the full scope of differences in infectious disease crisis outcomes across countries. For example, country characteristics such as population density related to level of urbanization, government transparency, and state capacity and development each influence the management of an infectious disease crisis at the state level (Price-Smith 2002; Stevenson & Cooper 2009; WHO 2018). Controlling an outbreak is also impacted by underlying sociocultural factors such as gender inequality and social progressivism and population health traits such as age distribution and lifestyle (Alarcón et al. 2018; Ferrer et al. 2009; Mohor 2017; Stuardo 2017; WHO 2018). The "spatial distribution of pathogens," which influences where and what type of disease outbreaks occur, also has a well understood relationship with climate, based heavily on global longitudinal temperature differences (Price-Smith 2002, 172; WHO 2018). Lastly, global differences in healthcare costs, access to health services, and density of trained medical personnel create variations in healthcare system functioning and in the character of the relationship between the system and the wider public that come to bear amid an infectious disease crisis (Gelormino et al. 2011; Glaser 1966; Langthorne 2019; Light 2003; Menzel & Light 2006; Sen 2015).

Independent variable: In this thesis, I propose a new explanation for variation in the severity of epidemics across countries and in the quality of public policy responses: organizational differences in the healthcare system. I call the first dimension of these organizational differences structural universality. This dimension concerns the amount of the population guaranteed coverage by a given healthcare system and serves as a structural definition of universal healthcare. In this work, I categorize healthcare systems as "structurally universal" if there is a non-excludable coverage option for all legal residents and as "structurally non-universal" if no such option exists.

The second dimension of healthcare system organization relates to the ownership and management of healthcare provision. While healthcare providers often come from a mix of the public and private sector, there is a specific kind of public-sector dominant system known as the

national health service (NHS). These systems are always structurally universal, and under this system, "the state has the responsibility to govern the relation between the main actors in healthcare" (Bohm et al. 2013, 264; Glaser 2001). I argue that this definition necessitates more than widespread public ownership, so I will not consider highly decentralized public systems to be NHSs. However, these systems may still enjoy some of the advantages of NHSs, so they will be studied separately.

Theory: Together, these two dimensions of structural universality and system ownership and management lead to the central hypotheses of this work. I first hypothesize that structurally universal healthcare systems will have better health outcomes during infectious disease crises than non-universal healthcare systems. Similarly, NHSs will experience better health outcomes than countries with other forms of structurally universal systems. I also hypothesize that structurally universal systems will adopt more policy interventions than structurally non-universal systems during an infectious disease crisis and that NHSs will likewise adopt more policy interventions than other forms of structurally universal systems.

The theory underlying these hypotheses can be broken down into four main categories of mechanisms: social, political, communicative, and economic. This first class, social mechanisms, refers broadly to the fact that increasing accessibility to health services leads to healthier populations (Gelormino et al. 2011). By providing coverage for all, structurally universal systems institutionally promise to be more accessible than non-universal systems. Political mechanisms deal with the incentivization of the government to protect the healthcare system when it plays a direct role in it. This means that the government overseeing an NHS should be particularly motivated to control any health crisis quickly to protect the system. Communicative mechanisms address the working relationships between the healthcare system, government, and public. These predeveloped lines of communication expected from structurally universal healthcare and NHSs especially are conduits for better resource distribution and information dissemination, valuable tools during a crisis (Burkle & Burkle 2015). Finally, economic mechanisms primarily concern reduction in healthcare costs, which encourages the use of health services - particularly by those with limited financial resources, who also tend to be most at-risk in a crisis (Langthorne 2019; Menzel & Light 2006).

Data: I adopt a two-pronged mixed-methods approach to analyze the hypotheses, with a case comparison study of matched countries and a large-N multiple regression analysis. The HIV/AIDS crisis and the COVID-19 pandemic provide the disease contexts. Data on the dependent variable, infectious disease crisis health and policy outcomes, were sourced from large health surveillance and research institutions including UNAIDS, the Institute for Health Metrics and Evaluation, Johns Hopkins University, and Oxford University. Data on the independent variable, organizational differences in healthcare systems, were gathered in a novel dataset created for this work. The classification process relied heavily on the reference *Health Care Systems Around the World: A Comparative Guide* (2013) by Sarah Boslaugh and was supplemented with other outside research.

In order to test these hypotheses and the validity of this theory, I also consider alternative explanations for variation in infectious disease crisis outcomes. As noted above, existing research on health crises has identified public health infrastructure and state capacity, public health funding, state transparency, gender inequality, and progressivism as determinants of crisis management. Thus, to isolate the explanatory variables of interest, structural universality and healthcare system ownership and management, measures for these alternative explanations are employed as controls in the regression analysis. I also consider these alternative explanations in the case study.

Research design and findings: The case study compares the experiences of Chile and Uruguay with HIV/AIDS. Based on healthcare system data obtained, Chile has a structurally universal healthcare system while Uruguay has a structurally non-universal healthcare system. However, I show using quantitative data that Uruguay and Chile are otherwise quite similar on background characteristics, and thus provide a good match for a controlled case comparison. To examine causal mechanisms and interpretations of exports on the ground in the two cases, I draw on a mix of primary news sources, government publications and secondary research.

Despite an overall greater number of HIV/AIDS cases over time in Chile versus Uruguay, Chile has remained consistently behind in per capita rates of new HIV infections and AIDS deaths (Roser & Ritchie 2019.). While a complex interplay of many factors defines the situation in both countries, notable variations related to AIDS treatment and patient retention point to structural universality playing an important role in explaining Chile's better per capita health

outcomes. Specifically, Chile is recognized for its extreme focus on AIDS treatment, but in Uruguay difficulties in starting antiretroviral treatment as well as sticking to the regimen indicate significant obstacles to accessing healthcare services (Cabrera et al. 2019; Ferrer et al. 2009; Mohor 2017; Stuardo 2017). I therefore conclude that structurally universal healthcare has played a meaningful role in improving the HIV/AIDS health outcomes in Chile compared to Uruguay.

The large-N regression analysis examines the correlations between the healthcare system organization variables and the infectious disease crisis outcomes when controlling for the alternative explanations. The analysis looks at these relationships for both health and policy outcomes in the contexts of HIV/AIDS and COVID-19.

Results across the two disease contexts indicate partial support for my hypotheses and theory as well as the existence of certain patterns that merit further investigation. First, structurally universal healthcare was associated with improved health outcomes in both the findings on HIV/AIDS and the findings on COVID-19. This relationship was also observed in the qualitative analysis between Chile and Uruguay, in which differential access to regular AIDS treatment appeared to be a significant factor behind the better per capita health outcomes in Chile. Therefore, the data appear to evidence my claims that structural universality meaningfully influences infectious disease crisis outcomes, and that structurally universal healthcare improves health outcomes.

My other theories on the relationship between structural universality and policy outcomes and the relationship between the national health service and health and policy outcomes received partial support that suggest a potential pattern in the impact these explanatory variables have on infectious disease crises. That is, the NHS is associated with better policy outcomes in the long-running HIV/AIDS crisis but not the relatively new COVID-19 pandemic. The opposite association was observed for structurally universal healthcare systems and policy outcomes. These findings suggest that the timeframe of the infectious disease crisis is an important determinant of the particular advantages to policy outcomes held by structurally universal healthcare and the NHS. Specifically, my results suggest that structural universality is a dominant influence on policy creation and severity in the short-term of a crisis, but that the NHS is better suited for long-term policy control.

Significance: This first main contribution of this work is to help in the conceptualization and measurement of healthcare system type across the two dimensions of structural universality and public ownership and management of healthcare provision. The concept of structural universality in particular clarifies the health policy terminology surrounding universal healthcare, in which no clear, measurable distinction has been made between the real-world use of health services and the institutionalized guarantee of access to these services, although the word "universal" has been employed in both ways. Moreover, results from the large-N study indicate that both dimensions of the national health service, public ownership of healthcare provision and its public management, are both critical pieces of this system's influence on infectious disease crises. This reaffirms that the significance of the NHS as a distinct system lies both in public ownership and centralized public management. In sum, this work aids in building our understanding of the most important differences in healthcare systems and how those differences should be measured.

Second, in this work I develop an original theory relating these organizational differences in healthcare systems to the relative performance in policy response and health outcomes from a disease outbreak across countries. This theory targets a gap in our understanding of why experiences with infectious diseases vary across countries after accounting for the existing explanations outlined in the health policy and crisis management literature. Investigation of novel explanations for this variation in infectious disease crisis outcomes is ever important given the expected occurrence and recurrence of disease outbreaks in the modern world. My theory sheds light on the viability of two major institutions – the healthcare system and the government – in aiding or hindering this crisis management.

I find in this study that structurally universal healthcare is a potentially meaningful driver behind infectious disease crisis outcomes. This would mean that the organization of the healthcare system influences the ability of any given country to mitigate the effects of a disease outbreak. This finding has implications for the redesign of healthcare systems across the globe in the wake of the COVID-19 pandemic and in anticipation of the next infectious disease crisis. Such prescient changes would consist in reshaping the organization of healthcare systems to guarantee coverage options for everyone, a step expected to preserve population health when facing a new crisis.

CHAPTER I: THEORY

Infectious disease crises have been a threat to human life since the beginning of time, and despite humanity's tendency towards scientific progress, they are only becoming more commonplace in the modern world (Price-Smith 2002; WHO 2018). When the same infectious disease crisis impacts vast expanses of the globe, an epidemic or a pandemic, some countries succeed in mitigating its effects on population health and generate relevant policies aimed at controlling the crisis. Some do not. This phenomenon forms the basis of the central research question of this work: why do infectious disease crisis outcomes vary across countries? The more completely we can answer this question, the better we can understand how to mitigate the impacts of the next infectious disease crisis. Knowing the distinct factors that are involved in answering this question, too, permits the subsequent development of policies that meaningfully fortify countries and their healthcare systems against infectious diseases. In this chapter, I develop a theory for why structurally universal systems with centralized state ownership and management are better situated and incentivized to control the impacts of the infectious disease crises.

Differences in infectious disease crisis outcomes are evident in the realms of both health and policy. For example, substantial variations arise in deaths and new infections among countries facing the same disease crisis, even when those countries are neighbors with similar levels of development. Similarly, governments prompted into action by infectious disease crises respond with vastly different levels of intensity over the creation and adoption of relevant policy. For example, although some countries have robust national policies on disease testing, others have none at all. Based on these variations among health and policy outcomes in an infectious disease crisis, impacts of organizational changes to healthcare systems in these two areas will form the particular focus of this work.

Although work has already been done to discover the causes behind variation in the quality of public health response to disease crises, the existing explanations cannot account for the variation in its entirety. Infrastructure and state capacity, for instance, dictate the resources available to a country and its ability to coordinate its activities. However, both intra-regional variation as well as growing rates of infection-induced mortality in the developed world point to the need to consider other factors (Price-Smith 2002). Disparities in public health funding and

government willingness to work with the international community leave some of the variation in infectious disease crisis outcomes unexplained as well. Recognition of our incomplete understanding of the causes of infectious disease crisis outcome variation justifies the continued investigation into other macro-level factors that may importantly impact these differing experiences.

In this study, I focus on organizational differences among healthcare systems as a novel cause of variation in the efficacy of state responses to epidemics. The healthcare system is one of the key institutions charged with handling an infectious disease crisis, and two of the most important features of healthcare delivery are structural universality and healthcare provision ownership and management. Specifically, I argue that countries with structurally universal healthcare systems exhibit better infectious disease crisis outcomes than countries without the institutionalized promise of inclusion in the healthcare system. Moreover, countries with structurally universal healthcare systems that are owned and managed by the state, known generally as national health services (NHSs), fare best overall.

Structurally universal systems have a variety of advantages over their non-universal counterparts that are relevant to mitigating the effects of an infectious disease crisis, and they range over economic, communicative, social, and political spheres of influence. Economically, removing fear of medical debt provides a sense of security between people and the healthcare system, a relationship that is buttressed by the macroeconomic advantage of eliminating employer-based health insurance and, with it, the threat of losing coverage due to work suspensions or layoffs. All forms of structurally universal systems also experience a heightened level of interaction with government agencies and officials which helps streamline communications between the actors in the healthcare system and the government. The preexistence of these relationships is especially useful during a crisis (Glaser 1966). Structurally universal systems also connect better with broader society than do non-universal systems, a difference that not only makes highly susceptible communities more accessible in a crisis, but also decreases health inequalities overall (Gelormino et al. 2011; Langthorne 2019; Light 2003; Sen 2015). Lastly, with stronger ties between the government and the healthcare system, the government is increasingly incentivized to support the system as an extension of itself (Glaser 1966). Taken together, these mechanisms point to greater trust in the healthcare system backed by greater governmental support in a structurally universal system.

In turn, National Health Systems are expected to enjoy these same advantages along with further benefits. In a national health service, communication with the government is well established through everyday administration and oversight. This relationship is also characterized by empowered medical professionals who play important roles in both the healthcare system and the government, empowering the opinions and demands of health experts (Glaser 1996). Moreover, with the healthcare system and government so closely aligned, the effective functioning of the NHS is of the government's utmost concern, if not as a matter of national pride, as a matter of financial interest. Thus, even more so than with other structurally universal systems, the NHS finds itself listened to and supported by the government, which is very important for one of the main institutions handling an infectious disease crisis.

Although some of the factors that influence a country's ability to mitigate the effects of an infectious disease crisis are already understood, great variation is still unaccounted for. This variation is seen both in differing health outcomes and differing policy outcomes among neighboring countries at similar levels of development. Discovering these other factors should be a key concern of those interested in controlling the impacts of the next infectious disease crisis. One area deserving particular attention is how organizational differences in the healthcare system structure might explain the observed variation. This work attempts to address this issue through the focus on two aspects of healthcare systems. The first is the influence of structural universality on infectious disease crisis outcomes, and the second is the influence of the presence or absence of national health services on these outcomes. Adding nuance to this underexplored understanding of healthcare systems and universal health coverage, this work will attempt to show that organizational differences directly influence substantive variation in experiences of countries with infectious disease crises.

I. Comparative Performance in Disease Crisis Outcomes

Despite the growing confidence among medical experts in the 1970s that humanity was well on its way to besting microbial threats after our great scientific advancements in technology and treatment for bacterial and viral illnesses, ample experience over the last fifty years has proven that incidence of infectious disease crises has actually gone up. Increased ease of travel, urbanization, and environmental destruction have all contributed to the emergence and re-emergence of infectious diseases and their subsequent spread around a region (epidemic) and

around the globe (pandemic) (Kelly 2011; Price-Smith 2002; WHO 2018). Infectious diseases are illnesses that can be spread either directly or indirectly from one person (animal, plant, or other vector) to another (Barreto et al. 2006). All disease outbreaks are labelled by the World Health Organization as emergencies (here I will use the term crises) and are characterized by the complex, multisectoral effort required to control them (WHO n.d.b; WHO 2018). Of note, time is not a dimension used by the WHO in its definitions, and indeed among the infectious diseases listed among their urgent health challenges in the 2020s are HIV, tuberculosis, and malaria (WHO, 2020).

Given the diverse nature of infectious disease crises, this study identifies two outcome genres of interest: population health and health policy. Although these crises have extremely wide spheres of influence that include many other important areas beyond these two, such as the economy and education, these frames of reference were chosen for their clarity and far-reaching impact. Health outcomes in their simplest form are straightforward indicators of a country's ability to mitigate the effects of the crisis. Policy outcomes, on the other hand, represent the degree to which the crisis has elicited a government response. Moreover, the long-term, widespread impacts of policy decisions add an extra layer of salience to disparities in public policy outcomes.

In order to study health outcomes, disease-related deaths, new infections, and hospitalizations will serve as quantitative measures reflecting how the infectious disease crisis has affected population health in each country. The observable variation among these health outcomes represents the broader question of variation in infectious disease crisis outcomes overall. For instance, in 2017 the average number of new cases of HIV infection per 1000 people across 117 countries was 0.68 cases with a standard deviation of 1.39 cases. Moreover, in this same year, Canada saw 0.63 new cases per 1000 people in contrast to 1.85 new cases per 1000 people in the US. The variation in the distribution of new cases across countries does well to demonstrate the variation in health outcomes as an important piece in the overall variation seen with infectious disease crises.

Policy outcomes will represent a narrower impact of infectious disease crises that centers particularly on changes in government behavior. This study will look at policy implementation over time, severity of policy measures, and rate of policy creation relating to the pandemic of interest in order to measure these outcomes. Variation in policy outcomes reflect a larger

variation in government responses around the world, and these differences in turn are a key dimension of infectious disease crisis outcomes. For example, while many countries adopted a national HIV self-testing policy to combat the spread of HIV/AIDS (77 overall), another 108 countries have not adopted this important measure.

When it comes to understanding why this variation exists in health and policy outcomes, previous research has put forward several different explanations with a literature base that embraces public health, political science, economics, and beyond. And while health crisis management literature extends farther than infectious disease crises, in general, the key actors and ends remain consistent throughout. While many factors influence the quality of health crisis management, a review of the literature buttresses the theory that the structure of the health system is worthy of investigation as well.

Public Health Infrastructure and State Capacity

Due to the complexity of large-scale health crises and the variety of institutions that must act in harmony to enact sound management, state capacity and public health infrastructure influence the likelihood of success or failure in this regard. The reverse, then, is also understood to be true: an uncontrolled crisis points to weaknesses in stability, governance, and infrastructure. Burkle and Burkle (2015) describe the West African Ebola epidemic through such reasoning; the global public health emergency was the collective result of the institutional vulnerabilities in Sierra Leone, Guinea, and Liberia that had been left unattended. Furthermore, in the work of Price-Smith (2002), statistical analysis of twenty randomly selected countries discovers a significant correlation between state capacity and infectious disease levels within a seven-year range.

Inefficient decision-making, decentralization, and inaccurate triage management are some of the symptoms of debilitated infrastructure and directly impact quality of crisis outcomes; these issues are not easily solvable in the midst of a crisis, and collaboration and coordination are both essential to unite the institutions necessary for appropriate management (Burkle & Burkle 2015). With a broader perspective, the long-term patterning that dictates quality of response is “an asymmetrical feedback loop operating between infectious disease and state capacity,” as supported by statistical evidence (Price-Smith 2002, pp.71-72). The rationale behind this spiral relationship is that low state capacity leads to more health crises which in turn leads to lower

state capacity; the inverse relationship between high state capacity and fewer incidents holds as well. The asymmetry refers to a relationship, outside of the seven-year window mentioned previously, where population health more precisely predicts state capacity than vice versa (Price-Smith 2002).

To be sure, infrastructure and capacity alone cannot explain the variation in quality of health crisis management. In addition to the asymmetric nature of the feedback loop, which itself points to other factors that drive the prevalence of health crises, this explanatory gap is further evidenced by the fact that infection-induced mortality is on the rise throughout both the developed and developing worlds, including in the United States, the model of high state capacity (Price-Smith 2002). And while state capacity certainly plays a role in quality of crisis management, it is insufficient as a sole determinant.

Therefore, consideration of other variables, such as type of healthcare system, is here seen as a reasonable path forward for this body of research. However, since infrastructure and capacity have an undeniable influence, they must be controlled for in any novel research. This is most simply achieved by only performing case comparisons between states with similar capacities. In his work, Price-Smith (2002) uses GNP, government expenditure, school enrollment, net long-term capital inflow, and military expenditures as indicators.

Public Health Funding

Public health funding is another factor associated with the ability to handle a health crisis. The literature agrees that, in general, increases in funding lead to a better-prepared public health system, which presumably will better manage a crisis (Lurie et al. 2004; Masters et al. 2017; Mays et al. 2004; Plough 2004; Rechel 2019). Notably, Masters et al. (2017) find a median return on investment (ROI) of 14.3 (1430% cash return) for all public health expenditures in high income countries, as well as consistently high ROIs for different health protections related specifically to infectious diseases, including HIV treatment and Measles, Mumps, and Rubella vaccination. The relationship between funding and crisis management is unsurprising given the high costs of many public health services. Furthermore, in order to properly respond to a crisis, public health spending is directed to critical provisions and often cut in other areas, which assuredly has other (if unknown) long-term negative health effects (Lurie et al. 2004; May et al., 2017).

On the local level, public health interventions were calculated to have a ROI of 4 (400% cash return) by Masters et al. (2017), and the data used in the literature to support the salient influence of public health funding include evaluations of several local California health departments and analysis of data collections from the National Public Health Performance Standards Program, a measurable set of performance standards to assess public health systems (Mays et al. 2004; Lurie et al. 2004). First, Lurie et al. (2004) find that, among their sample of California health departments, recent investment could explain some improvements in preparedness according to their assessment of the agencies' performances in a hypothetical crisis scenario (a smallpox outbreak). Similarly, in their analysis of results from over three hundred public health jurisdictions that participated in the National Public Health Performance Standards Program, Mays et al. find that "Public health performance varies significantly with selected measures of public health spending, even after controlling for the effects of other institutional and community characteristics," (2004, pp.439-440).

Moreover, similar relationships between larger scale public health funding and public health capabilities are noted in the literature, and nationwide interventions (for high income countries) boast an even higher ROI than at the local level (ROI 46 for legislative interventions) (Ifanti et al. 2013; Masters et al. 2017; Rechel 2019). For example, in Greece, budget cuts to HIV/AIDS control programs correlated with a 50% increase in new case rates from 2010 to 2011 (Ifanti et al. 2013). Additionally, Rechel (2019) declares the declining public health budgets across Europe since the 2008 economic crisis to be of great importance due to the long-term costs and challenges of such cuts, especially concerning the loss of public health programs such as the withdrawal of the Global Fund against AIDS, TB, and Malaria from middle income countries.

However, some nuance is required when discussing funding, as it is not an unambiguous determinant of response quality from a public health authority. Indeed, there are some examples of agencies spending widely variable sums to achieve the same result, pointing to the importance of other potential variables (Mays et al. 2004). Moreover, Mays et al. (2004) find that different services are more sensitive to funding changes than others, which may mean that an increase in funding may make public health agencies perform better in ways that may not have a significant impact on their ability to handle a crisis. Finally, a striking phenomenon occurs when overall budgets may increase, but little or no improvement is seen because the new funding is restricted

to certain services, as is the case with many federal and state grants (Mays et al. 2004; Plough 2004).

The delay Seattle faced in achieving a well-rounded response to the 2003 tuberculosis outbreak among the homeless serves to illustrate this phenomenon. Increases in categorical and decreases in core funding left the city health department severely limited in its capacity to handle the crisis even though the organization overall was experiencing a funding increase. Thus, the Seattle health department was forced to let the crisis have a greater impact and persist for longer than what was characteristic of the city in other similar circumstances because of the lack of funding it could dedicate to that specific response (Plough 2004).

Considering these reservations to the power of public health funding, it is therefore reasonable to suggest, like state capacity, that public health funding is not sufficient to explain variation in quality of crisis management. To bolster this argument, as with state capacity, where it was noted that infection-induced mortality is increasing both in the developed and developing worlds, countries with wildly different incomes (and therefore, presumably, public health budgets) are all facing growing crises (Price-Smith 2002). Moving forward, consideration of another variable, healthcare system, is, then, a reasonable decision, and this variable, public health funding, may be controlled for by grouping countries by healthcare expenditure per capita, which is expected to generally track the measures selected for state capacity.

State Transparency and Sovereignty Concerns

The literature also argues that state transparency affects a country's ability to respond to a health crisis. The main argument here is that governments may exploit state sovereignty during a health crisis as grounds for not informing the international community and refusing aid. The end goal for these states is the preservation of autonomy by refusing to open themselves to outsiders, but the results are overall worse crisis management and outcomes (Price-Smith 2002; Stevenson & Cooper 2009). The primary candidates who would be motivated to invoke this power are: "States historically subject to imperial intervention, or excluded from the process of establishing the institutions and rules governing international systems, that global health governance is merely a vehicle for imposing yet another set of exogenous norms that do not reflect the states' values or goals," (Stevenson & Cooper 2009, 1379).

By refusing international aid to manage crises, countries that choose this path put up a strong political barrier to an effective response (Price-Smith 2002). Threat denial, aversion to commitments, and concerns over national security or sovereignty are all excuses used to prevent external intervention. This behavior generally stems from a distrust of the principal organizations (such as the WHO or the International Association of National Public Health Institutes) providing aid, because these countries do not perceive themselves to be a meaningful part of these groups, even when they are members (Price-Smith 2002; Stevenson & Cooper 2009).

For example, although Myanmar faces several severe public health crises, including an HIV/AIDS epidemic and highly drug-resistant tuberculosis, the government has repeatedly shown hostility to non-state actors offering aid. Such interference even led to the withdrawal of close to $100 million dollars from the Global Fund meant to help control disease (Stevenson & Cooper 2009). Similarly, South Africa and Zimbabwe have rejected international assistance to handle the HIV/AIDS crisis, leaving concerned members of the international community without power to intervene in the health crisis (Price-Smith 2002).

Controlling for this self-inflicted variability relies on identifying the actors most likely to make the decision to refuse help from external agents. Based on the description given by Stevenson and Cooper these are countries with colonial histories that tend away from transparency and compliance with (often considered Western) international norms (2009). Then, in a cross-national study, it will be only appropriate to draw comparisons between countries that either both are prone to this behavior or are both not prone to this behavior. Such a determination can be made based on country scores given by the Corruption Perceptions Index (CPI). Since corruption and transparency have a presumed association with each other, this measure works as a proxy for state transparency (Peisakhin 2012).

In sum, while other factors have been described in the literature as playing significant roles in determining the efficacy of health crisis management, these studies cannot provide a complete explanation for this variation in infectious disease crisis outcomes.Therefore, it remains important to continue seeking out more and better explanations for the disparities we see in infectious disease crises. Specifically, variations in healthcare system structure have not been studied in-depth as features directly responsible for the aforementioned outcomes. Given the studied impacts of universal healthcare, it is reasonable to test the variation in structural

universality as a root cause of disparities in outcomes during an infectious disease crisis. Data favoring a significant relationship between structural universality and crisis outcomes would not only demonstrate the importance of understanding universal healthcare as a physical entity, but also would point to serious implications related to system preparedness in anticipation of the next infectious disease crisis.

II. Variation in Healthcare System Type: Structural Universality & the NHS

In this section I develop the definitions for two key features of healthcare system organization: structural universality and national health services. Structural universality refers to the institutionalization of healthcare coverage for all legal residents of a country. This looks like a healthcare system with one or some combination of coverage plans that guarantee access to all individuals in this group. The national health service is a particular type of structurally universal healthcare system characterized by the two dimensions of public ownership of the sources of healthcare provision and centralized management led by the national government. I theorize that variation in structural universality and who owns and manages the healthcare system meaningfully differentiate countries from one another, especially in consideration of healthcare costs and inequalities in access to healthcare.

Structural universality Healthcare policy suffers from an extreme lack of standardization in its vocabulary, which is displayed quite clearly in the concept of "universal" healthcare or health coverage. It is mentioned frequently in health policy debates, set as a global goal, and generally attributed to certain country systems and not to others (Sen 2015; Vladeck 2003; WHO 2019b). Beginning with this term, this study seeks to add some necessary conceptual clarity to the health policy vernacular.

"Universal" is understood at the most basic level as meaning "healthcare for all" (Sen 2015, 1). However, in terms of healthcare system structure, an important distinction must be made between an institutional promise of universal inclusion and the empirical success of universal inclusion. To illustrate this point, the World Health Organization's universal health coverage service coverage index (UHC SCI) is used to measure real-world accessibility to health services, and, according to this index, the United States and United Kingdom score almost identically - 83.9 and 87.0 out of 100, respectively (compared to a global range of 25.0-88.7)

(2019a). So, by this measure, the US and UK achieve this type of empirical "universality" about equally well. However, fundamental differences in healthcare system structure between the two countries are well understood and lead to a general referral to the US as possessing a non-universal system compared to the UK's universal one, despite similarly impressive performances according to the WHO. Here lies the root of this previously unaddressed issue: Can universality be determined structurally?

By "structurally," I refer to the formal organization of the healthcare system. That is, the features of the system that are determined by policy rather than practice, chiefly the coverage plans available, are structural features of the system. Relating to universality, the focus becomes whether or not the healthcare institution itself is built to include everyone, ie to be universal.

My answer is yes. As the WHO's reporting shows, understanding universal healthcare through in-practice achievement, though extremely valuable, is very difficult and yet-unachieved by countries with healthcare systems labelled universal. It is also nearly approached by countries generally not considered to have universal healthcare systems. Therefore, it is appropriate to introduce a new way of looking at universality in health coverage, what I will now refer to as structural universality.

Structurally universal healthcare is an institutionalized guarantee of healthcare for all. The achievement of this goal is irrelevant to this conceptualization as this concern belongs to empirical universal coverage, like the UHC SCI measurement. A structurally universal health system may be constituted in many different ways but is fundamentally characterized by the existence of a single or multiple healthcare coverage plans that are mandatory/compulsory in their enrollment and leave no citizens excluded. As such, systems with any sort of coverage gaps, where some percentage of people are involuntarily left without a dedicated coverage option and are forced to seek it individually in the private market, are not considered universal with this definition.

Definition of a structurally universal healthcare system: a healthcare system with one or some combination of coverage plans accessible to all legal residents with mandatory/compulsory enrollment and with no coverage gaps caused by exclusionary coverage plans.

When making judgements on structural universality, the financing system acts as a first good indicator for whether a healthcare system is universal or non-universal. This is because certain financing schemes directly imply which side the system falls on structural universality based on who pays and how. However, the financing scheme often falls short of fully determining structural universality, particularly when the population is covered by multiple plans. In this case, a more in-depth look at the coverage options available is necessary to identify if any groups are excluded and forced individually into the private sector for healthcare coverage.

Returning to financing, the three main schemes are private insurance, social health insurance, and general tax revenues (Glaser 1966; OECD 2017; Schieber et al. 2006; Sekri & Savedoff 2005). Large private insurance markets are generally indicative of structurally non-universal systems since most private insurance plans are exclusionary (Sen 2015). The only exception occurs when acquiring private insurance is mandatory. By necessity, then, plans are all-inclusive up to a point since everyone must be able to access coverage through the private sector. An example of a country with this system is the Netherlands, where "insurers are obliged to accept anybody for the basic package of services, and the insurance premium is unrelated to individual risks" (OECD 2017, 172).

On the other hand, healthcare financing through general tax revenues is generally indicative of a structurally universal healthcare system. Unless participation under this financing scheme is determined by law to only cover specific groups (such as the poor or the military), these systems are structurally universal since participation in financing is automatic through the paying of taxes (OECD 2017). The general tax revenue scheme is also very closely related to the NHS, as will be discussed later.

More complex analysis is required for determining the structural universality within the social health insurance financing scheme, a popular choice around the world. Social health insurance is a public system based primarily on employer and employee contributions (Glaser 1966; OECD 2011). However, while these schemes often cover large segments of the population, they are not inherently universal as is commonly the case with systems funded by general tax revenue. Special attention must be given specifically to who is eligible to participate. In some cases, the government may handle contributions of low-income groups, increasing the likelihood of a universal system. On the other hand, certain classes of workers, such as the self-employed or

those from certain labor sectors, may be excluded from the main social health insurance plan, which suggests that the system is non-universal. Ultimately, participatory information is required to distinguish between structurally universal and non-universal healthcare systems when social health insurance is the main financing scheme.

Another complicating factor is the occasional existence of several financing schemes for different classes of people, such as government employees, traditional workers, the self-employed, and the poor. If the combination of plans provides comprehensive coverage of the population, then the system is classified as structurally universal. If certain groups are excluded from all plans and forced to seek out coverage individually in the private sector, then the system is non-universal. Oftentimes when multiple plans exist, the purpose is to provide plans that cover the entire population. However, determining structural universality can still be a challenge since the multiple plans must be analyzed for coverage gaps. Ultimately, the deciding factor is whether or not individuals excluded from one plan have guaranteed access to another. If yes, then the system is structurally universal. If no, then it is non-universal.

Provision management and ownership Provision management and ownership, referring to the identity of the owner and administrator of the primary sources of healthcare provision (hospitals, clinics, etc.), defines a second dimension that further divides structurally universal systems. Although provision most often comes from some mixture of public and private institutions, especially in non-universal systems, full government ownership and management of a structurally universal system is undeniably distinct from its counterparts. This study refers to this type of universal system with public ownership as a national health service (NHS) and will be viewed as a distinct class under the structural universality umbrella.

Categorization of NHSs is most often a straightforward process that looks at the primary ownership of healthcare facilities within a country. Helpfully, systems with financing schemes based on general tax revenue are particularly good indicators of the NHS as well given the outsized role of the government in this financing scheme. However, some ambiguity does exist regarding countries with small to non-existent private sectors and strong public healthcare providers that are largely decentralized. This phenomenon commonly occurs particularly within the states of the former Soviet Union whose health infrastructures reflect NHSs but the actual

management has become increasingly decentralized away from the government (Bohm et al. 2015; Memia 2015; Tomini et al. 2012).

For this study, when healthcare systems owned by the government are characterized by increasing disaggregation, they are not considered to be NHSs. The justification for this decision is rooted in the importance of government management in a centralized healthcare system. When the system is clearly pulling farther and farther away from this level of oversight, it no longer reflects the significance of a NHS which intrinsically links the healthcare system to the national government. However, continued consideration of these publicly owned non-NHSs in this work will analyze just how significant this decentralization is to the performance of the system in an infectious disease crisis.

Definition of a national health service: a structurally universal healthcare system in which primary healthcare provision management and ownership is primarily handled by the national government.

Although the lack of a widely agreed upon, scientific definition of universal healthcare is pervasive throughout the existing literature, the research on the subject still offers valuable insights into the known influences of system structure. These findings will inform the theory presented in this work towards elucidating a causal relationship between healthcare system structure and infectious disease crisis outcomes; ultimately, this matter, too, attempts to relate universal healthcare with a specific effect, but with a clearer application of the idea of universal healthcare through the term “structural universality.” And while the current literature has not explicitly made this link, it does agree that a universal healthcare system affects overall health, among other things, by making it a more equitably distributed resource. Such information forms a crucial foundation for the theoretical mechanisms that will fortify the hypothesized beneficial impacts of structurally universal healthcare systems, and NHSs more specifically, in infectious disease crises.

Economic Impacts of Healthcare System Type

A large literature examines the effects of health care system type on the economy, particularly long-run growth and the process of economic development (Lim 2017; Menzel &

Light 2006; Strauss & Thomas 1998; Sterret et al. 2014). These outcomes range from micro to macro and are generally presented in a positive light. At present, the literature widely accepts a causal relationship between the health of a nation and its economic productivity and development, a relationship which is most salient in poor, developing countries (Lim 2017; Strauss & Thomas 1998). As an extension, universal healthcare is considered the concretion of individual improvement in health on the mass scale, such that "It minimizes costs and waste and increases economic growth by raising worker productivity, lowering labor costs, and allowing employers to focus on their business," (Menzel & Light 2006, p.37). While disagreement still exists over an unambiguous economic endorsement of universal healthcare, as will be discussed below, that the type of healthcare system in place impacts a nation's economy is the driving belief grounding this body of work.

Perhaps one of the best-known economic effects of universal healthcare is the competitive advantage afforded to businesses headquartered in countries with this system type. Those on the outside, however, often must offer health insurance as a benefit to attract workers, which burdens them with additional costs not held by their international competitors (Menzel & Light 2006). For this reason, in 2002 Ford, GM, and Chrysler cosigned a letter to the Canadian government showing support for their national health system, a factor which saved as much as several dollars an hour of paid work and was an important consideration in auto investment in the country (Sterret et al. 2014). Furthermore, American companies in particular have been estimated to spend up to triple the amount that foreign companies do on healthcare per worker (Sterret et al. 2014).

Moreover, universal healthcare or the lack thereof has been linked to a variety of economic effects on the individual scale (Lim 2017; Menzel & Light 2006; Sterret et al. 2014). Higher levels of entrepreneurship, which is associated with economic growth and increased GDP, result when people escape the fear of losing employer-based health insurance in their current jobs (Sterret et al. 2014). This fear, known as "job lock," along with reducing self-employment, decreases employee mobility which can stifle productivity and invention when people remain in jobs that they are not best suited for to retain healthcare coverage (Sterret et al. 2014).

Another serious, well-documented effect is the general eradication of medical bankruptcy in the developed world (Lim 2017; Menzel & Light 2006). Medical bills are a primary cause of

personal bankruptcy in the United States, an outcome incomparable to similar countries that differ by healthcare system (Menzel & Light 2006). This impact is especially salient within the lower socioeconomic classes, and an increase in Medicaid eligibility is hypothesized to decrease household bankruptcies significantly in the US (Lim 2017; Menzel & Light 2006).

However, not all research presents universal healthcare in such a positive light. In his case study of South Korea, a country lauded for its rapid adoption of this system, Lim (2017) finds that increased healthcare coverage leads to a drop in aggregate output. This result is explained through the argument that an increase in the healthcare budget is paid for by increases in worker premiums, incentivizing marginal workers to leave, shrinking aggregate labor. This is coupled with decreased savings motives and disposable income volatility, leading to diminished aggregate capital (Lim 2017). It is worth noting, though, that such economic case arguments are contested with examples such as Hong Kong and Denmark, which are well-regarded for their business eminence and entrepreneurship, respectively (Sterret et al. 2014).

Inequalities in Access to Healthcare and Health Outcomes across Healthcare Systems

In addition to the economic effects, the literature on universal healthcare draws a connection between this system and decreases in inequalities in healthcare access and health outcomes (Gelormino et al. 2011; Langthorne 2019; Light 2003). Such work is complementary to the "rainbow" model of Dahlgren and Whitehead, which identifies healthcare as one of the principal social determinants of health and health inequalities (Gelormino et al. 2011). In their review of the effects of healthcare reforms on inequalities in healthcare across Europe, Gelormino et al. declare that "Nationalized, publicly funded health systems are the most effective at reducing inequalities in access to medical services and in reducing the effects on health of income distribution," (2011, p.226). The inverse, also expounded upon in their work, is that when the private sector plays a larger role, these inequalities are exacerbated (Gelormino et al. 2011).

This argument is based on such findings as Schoen's and Doty's international survey (the United Kingdom, United States, Australia, Canada, and New Zealand) of healthcare outcomes, which ranked the United Kingdom highest and the United States lowest in equal access (Schoen & Doty 2004 as cited in Gelormino et al. 2011, p. 220). Furthermore, "Inequalities in the United States by income were much more pronounced than in any other country," suggesting that public

financing in healthcare is an important element in health equity (Gelormino et al. 2011, p.220). Similarly, Langthorne (2019) notes the difference in healthcare accessibility in the UK during two periods of austerity: the 1930s and following the 2008 recession. The institution of the National Health Service, which occurred between the two, all but eliminated the barriers to access in the latter instance (Langthorne 2019).

Some proposed mechanisms underlying this effect of universal healthcare are lack of stigma over the healthcare service, lack of fear concerning medical expenses, control and coverage of prescription drug prices, and a more-or-less single tier system (Gelormino et al. 2011; Langthorne 2019; Light 2003). Stigma exists when use of a particular healthcare service is directly related to socioeconomic status, such as the poor law infirmary of Depression-era England. Also, as discussed above concerning the personal economic effects of universal healthcare, patrons of this system do not face a significant amount of cost related deterrents (Langthorne 2019). Furthermore, price controls on prescription medications (a common practice outside the US) keep the cost down both for providers and consumers, without stifling research endeavors (Light 2003). Indeed, studies show that, when left solely to insurance, out-of-pocket payments for pharmaceuticals lead to increased "inequalities in access to care and contribute to impoverishment," (Gelormino et al. 2011, p.226). Lastly, multiplicity of coverage through public and private sources creates a two-tiered system, with an unequal distribution of private insurance (Gelormino et al. 2011). Exemplary cases include Portugal, Greece, and France, where inequalities in access and outcomes are closely tied to a growing private insurance sector (Gelormino et al. 2011).

During a health crisis, healthcare systems must work beyond their normal functioning capacity and require the support of strong institutions to do so. This is because health crises impact people across geographical, social, and economic lines. The ability to support a large number of people at once becomes essential to preserving population health. Although not explicitly linked to a nation's performance in a health crisis, the literature agrees that a universal health system affects overall health, among other things, by making it a more equitably distributed resource. While many factors influence quality of health crisis management, a review of the literature suggests that the health system via its impact on health quality and inequality,

may be an important causal factor. I systematically develop the mechanisms behind this insight in the next section.

III. How Does the Healthcare System Type Impact Crisis Performance?

Building off the research discussed above, I develop several possible mechanisms to explain how the type of healthcare system could affect infectious disease crisis health outcomes and public policy responses. The four classes of mechanisms are broadly defined as economic, social, communicative, and political. The theoretical implications behind each mechanism suggest that universal healthcare systems, which lack institutionalized coverage gaps, are better at mitigating the effects of an infectious disease crisis and, moreover, that national health services (NHSs) perform best among universal structures.

Economic Mechanisms

The economic mechanisms deal primarily with the increased costs of medical care experienced in non-universal systems that are placed on both businesses and individuals. The incentive for businesses to cut down the weighty expenses of employer-based health insurance, widespread loss of employer-based health insurance from crisis-related unemployment spikes, and the threat of personal bankruptcy from medical debt lead to the same ultimate conclusion – people cannot afford the medical treatment available to those in otherwise identical circumstances but who have access to a universal healthcare system (Langthorne 2019; Menzel & Light 2006; Sterret et al. 2014). Perilous employer-based health insurance and extreme personal medical costs are therefore likely to make a meaningful difference in an infectious disease crisis.

First, the competitive disadvantage levied at businesses in countries without universal healthcare because of the necessity to provide employer-based health insurance is a well-documented complaint (Menzel & Light 2006; Sterret et al. 2014). This limitation, however, can further serve as a means by which countries without universal healthcare underperform in infectious disease crises compared to those with universal healthcare because of employers' incentivization to layoff, or otherwise disenfranchise, their employees. The stress put on the economy by a disease crisis will be felt by most members of the private sector, who will in turn

try to save money by shifting more health costs onto their employees or laying them off entirely (Menzel & Light 2006). In both cases, though more pronounced in the latter, individuals face the risk of medical debt due to the costs of medical services in already uncertain economic times. This fear will lead to greater hesitation in accessing medical treatment, possibly vital during a disease outbreak. The under-access translates to worse health outcomes compared to countries where businesses do not encounter this challenge and so do not experience a sudden, massive increase in uninsured individuals.

Second, oppressive medical costs often arise in non-universal healthcare systems and undoubtedly are of concern to individuals from countries with such systems during a disease crisis. Fear of personal ruin through medical bankruptcy, a phenomenon not experienced in most of the developed world minus the United States, can be sufficient to dissuade people from seeking out necessary care (Menzel & Light 2006). Certainly, it is a consideration forced upon a much larger pool of people under high-risk circumstances than in everyday life, and the results of delaying medical treatment are longer periods without professional disease control and more advanced cases of illness which require more resources to manage. On the other hand, extinguishment of cost-related deterrents by universal healthcare systems can encourage people to seek help when needed, meaning earlier disease control and treatment (Langthorne 2019).

Social Mechanisms

Social mechanisms cover the long-term impacts of regularly or rarely accessing health services, which are closely related to the magnitude of the economic barriers to healthcare. Specifically, differences in accessibility are expected to lead to either more or less developed relationships between the healthcare system and the wider public and to meaningfully influence the general health of the population. During an infectious disease crisis, people lost in coverage gaps or members of high-risk communities may view medical care as something foreign and costly, which discourages them from seeking it out when necessary. Structurally universal systems, lacking institutionalized coverage gaps and guaranteeing access to all, efficiently deals with these challenges in ways that non-universal systems cannot. Furthermore, overall healthier populations, which occur in part from greater accessibility to healthcare, are more robust in the face of a health crisis, and ultimately weather crises better than less healthy populations (Gelormino et al. 2011).

One of the fundamental differences between universal and non-universal healthcare systems is the different levels of accessibility, namely that non-universal systems have far greater coverage gaps. Although universal access may be empirically imperfect due to such factors as geographic distance from medical providers and wait times, non-universal systems by definition exclude a portion of the population, causing irreconcilable coverage gaps.

This contrast between system types defines another means by which healthcare systems can impact infectious disease crisis outcomes. As described above, the risk of medical debt faced by the uninsured may be too threatening for them to overcome, even for the sake of their own wellbeing. Furthermore, in universal systems, at least, locations of weaknesses in coverage are generally inferable and relatively small-scale compared to the nationwide spread of the uninsured under non-universal systems. Therefore, without universal access, not only will people be deterred from acquiring medical assistance, but also reaching the people in the gaps will be difficult to do effectively in crisis.

Concerning high-risk communities, that is, those most susceptible to devastation from an infectious disease crisis, universal systems are better at protecting them because of preexisting relationships. These communities, often impoverished and isolated, fall into the coverage gaps described above, and so particularly suffer under a non-universal system. However, when these groups are accustomed to accessing healthcare under normal circumstances, as they can in a universal system because of the alleviation of cost barriers, they have an established connection to medical providers. Based on this relationship, they are more encouraged to seek out help in crisis, or, conversely, the system may be able to reach them. Either way, without the previous shared experience, these communities are very difficult to contact successfully in unstable conditions.

Finally, tying together multiple ideas from above, decreasing coverage gaps and inequalities in access to health services is expected to generate a healthier population overall, one more resilient against an infectious disease crisis. This argument is most clear in the comparison of countries with low state capacity and high state capacity. The asymmetric distribution of health resources based on economic power directly corresponds to extremely disparate health profiles in poor versus rich countries that favor the rich (Price-Smith 2002; Sen 2015). A similar result is suspected among countries with similar state capacities if their healthcare systems generate significant differences in coverage and barriers to accessing health services. Though the

differences in accessibility may be less dramatic when the state capacities are alike, these differences could still develop into larger underlying chasms in population health (Gelormino et al. 2011; Langthorne 2019).

In the context of an infectious disease crisis, these population health differences that developed in the long-term can come to light. First, a robust population is expected to experience fewer serious disease cases and fewer cases overall, which not only leads to a lower death count than unhealthy counterparts but also lessens the burden on the healthcare system. Second, the asymmetrical feedback loop of Price-Smith (2002) directly points to the influence of population health on state capacity, which in turn helps dictate the frequency and severity of infectious disease crises.

Therefore, since universal healthcare is argued to decrease health inequalities and increase access to health services, the general population health is predicted to be better in countries with this system type over non-universal systems (Gelormino et al. 2011; Langthorne 2019; Light 2003; Sen 2015). This advantage should be highlighted in an infectious disease crisis when countries with universal healthcare experience better health outcomes than their non-universal counterparts. Countries with national health services, then, should have the healthiest population of countries with universal healthcare since the government is expected to put its power towards decreasing accessibility barriers. The likewise result is better infectious disease crisis health outcomes than in other countries lacking a NHS.

Communicative Mechanisms

Communicative mechanisms concern the ability of distinct major players in a health crisis (the health system, government, the public, and the private sector) to coordinate their efforts. Increased rapidity and fluidity of communication between these key institutions enable them to collaborate better regarding resource management and the dissemination of information, which is a valuable tool during a crisis (Burkle & Burkle 2015). Universal systems, and NHSs more so, are likely to have more established lines of communication in a crisis from the daily management of healthcare by the government. Disease surveillance is therefore likely to be stronger.

To begin, the streamlined communication pathway between the healthcare system and the government is developed when the government is responsible for provision, financing, or both,

and serves as a great resource in an infectious disease crisis. Because of preexisting networks between governmental and health institutions, information, ideas, and needs from the healthcare system already have an effective means of being translated to the government, including to elected policymakers. Furthermore, an established relationship also means that the personnel from both the healthcare system and government best equipped to take charge and coordinate efforts during a crisis are already clearly distinguished based on their work histories. In contrast, completely private health systems are completely independent from the government, and providers within the system are also isolated from each other. These inherent communication gaps are a major obstacle to collaboration between key institutions at the best of times, and the pathway stands little chance of being developed in the chaos of a disease crisis.

A NHS, moreover, experiences stronger communication ties between all direct medical providers with each other and with the government itself. Unlike other forms of socialized medicine, the healthcare system and the government in a national health service are parts of the same whole. NHSs in particular empower leadership from the healthcare system working from within the government (Glaser 1966). This increased interdependence means a fully functioning working relationship and a greater history of interactions between the two institutions. Other universal systems only have a semi-developed version of this from government participation in the financing scheme and public healthcare sectors of varying strengths, while private systems have none at all.

One unique advantage of this open line of communication is the quicker mobilization of private industry for the production of resources most needed by medical providers. The government remains constantly and accurately aware of what the health system needs and with what urgency it needs it - information it can then quickly disseminate to policymakers and research institutions and use to apply informed pressure on private businesses producing necessary health supplies and services. Rapidly providing the necessary resources to confront a health crisis equates to better health outcomes than under non-universal systems, whose lack of communication pathways interfere with necessary knowledge transmission.

Similarly, pre-existing connections between the government and health system under universal healthcare may result in better mass communication to the public overall, which creates a public better informed on how to stay safe in a disease crisis. Using the far-reaching influence of the government, the recommendations of medical providers are received and amplified

quickly and directly to lower-level policy makers and the people in general. Such precise and uniform campaigning reaches a wide audience and provides necessary knowledge to the public on how to control the crisis. On the other hand, countries without universal healthcare have governments not beholden in any way to the ideas of those in the health system and are therefore not required to magnify their exact medical messages, nor is there necessarily an effective means to get the message out.

Finally, just as NHSs give medical and public health counsel to the government to inform policy decisions and protect the public, they also communicate important geographic data which describe how different parts of the country are managing the crisis. This knowledge aids the performance of effective triage for the distribution of resources and the faithful analysis of subnational needs. Non-universal systems must work much harder to obtain such data, and even then do not possess the same ability to redistribute supplies as necessary. This difference leads to inequalities in disease crisis outcomes because of the universal system's improved capacity to identify and rectify difficulties handling the crisis, being able to formulate and act upon the most constructive response.

Political Mechanisms

Lastly, political mechanisms revolve around the fundamentally different way that the government interacts with the healthcare system in a country with a completely state-owned national health service. Through policy changes, resource management, information dissemination, and leadership, the government wields immense influence over the management of an infectious disease crisis. The more sensitive the government is to the impacts of such a crisis on the healthcare system, the more detailed the governmental intervention should be. No government is so sensitive as the one managing a NHS, and so I expect national health services to be the most proactive in responding to epidemics.

When healthcare is under state provision, the government is more incentivized politically and financially to protect and aid the healthcare system as an extension of itself. It becomes a part of the national identity, with the expectation that the government will manage it well for the sake of the whole society. Moreover, expenses incurred by the healthcare system are directly covered by the government, giving obvious motivation to keep costs down by maintaining a healthier country on the whole. In other systems, these expenses are still present but make their

way back to the government in more prolonged, indirect ways, such as increased numbers of patients entering non-universal welfare systems like Medicare with severe chronic illnesses because they could not afford treatment beforehand. This time gap effectively prevents the cost from being clearly recognized as a failing of the healthcare system and thus does not provide meaningful financial incentive to the government.

Similarly, the national health service's government faces additional pressure from the healthcare providers and medical professionals themselves. In this case, the political and communication motives overlap as these groups by necessity have a direct line of influence with the government as essentially the "boss" of the whole enterprise. Non-universal systems and even other universal systems that do not use state provision have no such relationship.

In the case of an infectious disease crisis, the government supporting a NHS will take serious precautions to protect not only the citizenry but also the system itself because of the incentives outlined above. Prioritizing quick, aggressive, and effective responses more than other governments logically results in significantly different crisis outcomes. Moreover, NHSs give medical providers, those directly battling the crisis, a means by which they can be directly listened to, which will fortify the gravity given to their requests.

IV. Hypotheses

Evaluation of the existing research and the theoretical mechanisms detailed above lead me to a set of hypotheses linking healthcare system features and policy and public health outcomes. A review of the previously studied causes of variation in health crisis outcomes found room for additional explanations for this phenomenon. Furthermore, a review of existing literature on the effects of universal healthcare systems pointed out several effects that can be attributed to this type of system. Finally, the theoretical mechanisms build off this work and are constructed into four narrative genres - economic, communicative, social, and political - which demonstrate the potential for a causal relationship between the type of healthcare system and the public health and public policy outcomes in an infectious disease crisis.

These theoretical exercises lead to concrete implications that can be summarized into two classes of hypotheses: health hypotheses and public policy hypotheses. This distinction is important because of the different facets of crisis outcomes. These can be both health-related, dealing with disease rates and spread, or they can be public policy related, focusing on the

government's ability to realize a response. These are ultimately two distinct classes and should be treated as such.

Furthermore, each class can then be broken down into a pair of hypotheses – one that focuses on outcome differences between countries with structurally universal and non-universal healthcare systems, and another that focuses on these differences between countries with national health services versus any other type of structurally universal provision. This distinction plays a key role in understanding exactly what factors may influence variation in infectious disease crisis outcomes.

This description of hypothesis structuring leads to the first class: health hypotheses. These deal with health outcomes such as new case incidence and fatality rates during an infectious disease crisis. The first of these relates the healthcare system with health outcomes.

Hypothesis 1a: countries with structurally universal healthcare systems will have better health outcomes during infectious disease crises than countries with non-universal healthcare systems.

Due to more manageable health expenses and more accessible healthcare, especially for marginalized groups, countries with structurally universal healthcare should see more people take advantage of medical provision in a crisis, which leads to less serious cases that are caught and treated faster than in the non-universal counterpart. Furthermore, the stronger relationship between the universal healthcare system and government allows for effective communication during a crisis. Information gained from this coordination can be used for effective resource management and triage, which may ultimately lead to saved lives.

The second in this pair of hypotheses is the following:

Hypothesis 2a: countries with national health services will have fewer infections and fatalities during infectious disease crises than countries with other forms of structurally universal health systems.

While having all the other advantages of a universal health system, NHSs will have particular political incentivization to respond quickly and effectively to an infectious disease crisis. The

more aggressive the response is from the outset, the fewer cases, and therefore deaths, may be expected overall.

The second class, public policy hypotheses, considers the ability of the government to move from conception to complete realization of policy measures intended to mitigate the effects of the infectious disease crisis. The first of the pairs of hypotheses is:

Hypothesis 1b: countries with structurally universal healthcare systems will adopt effective policy interventions faster during infectious disease crises than countries with non-universal healthcare systems.

This is supported by the theoretical assumption that governments overseeing universal systems will be better informed on the specific health needs of the country through communication with healthcare providers. Not only will these governments acquire the information faster, they may also be able to apply these new policies through pre-established frameworks from the day-to-day governmental management of healthcare that does not have a reciprocal in non-universal systems.

Similarly, the other half of this pair of hypotheses is:

Hypothesis 2b: countries with national health services will adopt effective policy interventions faster during infectious disease crises than countries with other forms of structurally universal health systems.

Like in the first class of hypotheses, the specific advantage of NHSs is that the governments in these cases are especially motivated to act because of the political binds between the healthcare system and the government. Moreover, the requests of the medical providers may be given special weight because of the structure of the system and the government's responsibilities within it. The extra incentives along with the increased influential input from healthcare providers put extra pressure on the governments of national health services to respond to infectious disease crises and provide the tools to make the response as effective as possible.

Conclusion

As infectious diseases continue in their march alongside human history, it remains ever important to question what makes us successful at combating our microbial foes while recognizing that explanations provided in existing literature are incomplete, warranting the pursuit of other factors. Along with crisis outcomes, healthcare system structure similarly varies transnationally, specifically concerning structural universality, such that some guarantee access to health services through non-excludable, compulsory financing while others do not. Moreover, within the structurally universal systems, the government involvement is distinctly greater for NHSs versus other system types.

With this variation in system structure in mind, the next step is to theorize the impacts of these differences on countries' experiences with an infectious disease crisis, such as an epidemic or pandemic. The economic, communicative, social, and political advantages attributed to structurally universal systems, and NHSs more so, suggest that these will mitigate the effects of an infectious disease crisis more effectively than a non-universal system. Such advantages include removing cost barriers to health services by all but eliminating the risk of severe medical debt, streamlining communication channels between healthcare workers and government officials, habituating members from precarious socioeconomic groups to healthcare beforehand so that they are more likely to seek it out (or be sought out) when in a crisis, and incentivizing the government to support the healthcare system by directly linking them together.

Taking together the transnational variation in disease crisis experiences, both in terms of raw health outcomes, such as deaths and new cases, and policy outcomes, concerning implementation and severity, with transnational variation in structural universality which is predicted to influence ability to respond to a health crisis, it is logical to test this novel macro-level factor against the disparities in disease crisis outcomes. According to this theory, structurally universal systems, especially NHSs, are expected to experience better health and policy results than non-universal counterparts. A mixed methods approach utilizing regression analyses and a case study will assess these hypotheses' validity.

The results of this study will contribute both to researchers in health policy academia as well as to health policymakers through the identification of a gap in understanding of the term "universal" in policy research and discourse and the testing of the novel term "structural universality" through both its initial application and subsequent evaluation in the context of two

infectious disease crises: HIV/AIDS and COVID-19. Support for the theory will greatly bolster the argument for expanding healthcare coverage at the structural level and meaningfully add to ongoing debates on the value of government-managed healthcare. Regardless of results, this work is the first to my knowledge to definitively conceptualize “universality” as it is used in common vernacular to describe a type of healthcare system and apply this definition.

CHAPTER II: DATA AND RESEARCH DESIGN

This thesis uses a mixed-methods approach, developing a qualitative case comparison study and a quantitative large-n study using regression models. Data collection for the dependent variable, infectious disease crisis outcomes and public policy responses, relied mostly on large health surveillance and research bodies. The independent variables, structural universality and healthcare provision as two main features of healthcare system type, were coded through novel research. Data collection for the case comparison utilized both primary and secondary sources on the HIV/AIDS crisis in Chile and Uruguay. Alternative explanations for the observed variation in health and policy outcomes include state capacity, public health funding, government transparency, gender inequality, and social progressivism, and they are controlled for with related measures.

I begin by introducing the case study. The case comparison between Chile and Uruguay gives an in-depth look at two similar countries' experiences with the same infectious disease crisis: HIV/AIDS. Chile has a structurally universal, non-national health service healthcare system whereas Uruguay's is nonuniversal. However, I show in this chapter using matching methods that the two countries are otherwise very similar on background conditions that are expected to impact the course of the HIV/AIDS crisis. It is therefore plausible that any substantial differences between the countries are attributable, at least in part, to differences in their healthcare systems.

I also describe in this chapter primary and secondary source materials such as news articles, domestic research, and government publications inform the study. I use these materials to examine the hypothesized mechanisms linking healthcare system and pandemic outcomes. In order to support the hypotheses, the important factors from the case comparison are expected to reflect the theoretical economic, communicative, social, and political mechanisms that advantage structural universal healthcare. That is, Chile should have notably better health and policy outcomes than Uruguay, and the literature studies should point to the theoretical benefits of a structurally universal system (and the drawbacks of a non-universal system) presented in the previous chapter. Of note, Chile does not have a NHS, so those factors and hypotheses are not valid to apply to this case.

The linear regression analysis is used to search for significant correlations between the healthcare system structure and infectious disease crisis outcomes. Here, the quantitative data for health and policy outcomes were applied for both HIV/AIDS and COVID-19. HIV/AIDS data were retrieved in the fall of 2020 and were last actualized by UNAIDS with the WHO policy data 2019 and the UNAIDS National Commitments and Policy Instrument 2019. COVID-19 data were retrieved on February 1st, 2021 such that the data were current through the end of January 2021. With this data, Chapter IV then tests cross-nationally the strength of structural universality and government provision ownership and management as potential explanations for variation in infectious disease crisis outcomes.

For the linear regression to endorse the hypotheses, significant negative correlations are expected between the health outcomes and structurally universal systems as well as the NHSs. On the other hand, significant positive correlations are expected between these explanatory variables and the policy outcomes. With each regression model, increasing control variables should strengthen the correlation.

I. Operationalization of the Dependent Variables: Health and Policy Outcomes

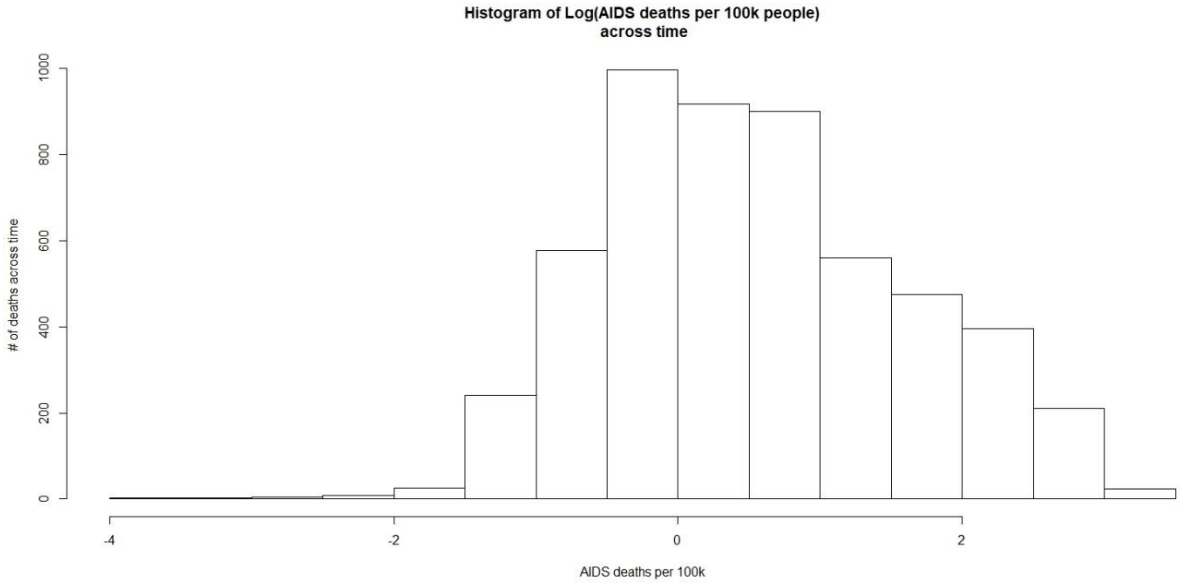
In order to assess the impacts of differences in healthcare system organization on infectious disease crisis outcomes, comparable measures for infectious disease crisis outcomes were chosen. In this work, infectious disease crisis outcomes are broken into the two categories: health outcomes and policy outcomes. The measures of these outcomes are found for two separate infectious disease contexts: HIV/AIDS and COVID-19. Both crises have affected millions of people around the world while demonstrating noticeable variations in crisis outcomes across countries, both in health and in policy measures (WHO 2020). In this section, I will describe which measures I use for health outcomes and policy outcomes in each of the two disease contexts and demonstrate the cross-national variability in these outcomes.

Health and Policy Outcomes: HIV/AIDS

Beginning with the health outcomes in the HIV/AIDS pandemic, these measures signify the impacts of the crisis on the health of each country's population. Specifically, disease-related

deaths and new infections are points used commonly to summarize the severity of an epidemic or pandemic on population health including in the cross-national comparative scholarship on HIV/AIDS (Flemming et al. 2000; Roser & Ritchie 2019; UNAIDS 2017). The number of AIDS deaths per 100,000 people is used in the quantitative analysis as representative of the health outcomes of the crisis, and the total number of new cases of HIV, the share of the population infected with HIV, and the number of AIDS deaths per 100,000 people are used to characterize the HIV/AIDS-related health situations in Uruguay and Chile to contextualize their qualitative comparison. Data were retrieved from the Institute for Health Metrics and Evaluation (2018) and visualized for the qualitative comparison by *Our World in Data* (Roser & Ritchie 2019). The data covers the period from 1990-2017. Identifying the variation within these measures supports their use as representations of one facet of the dependent variable in this study (Figure 1).

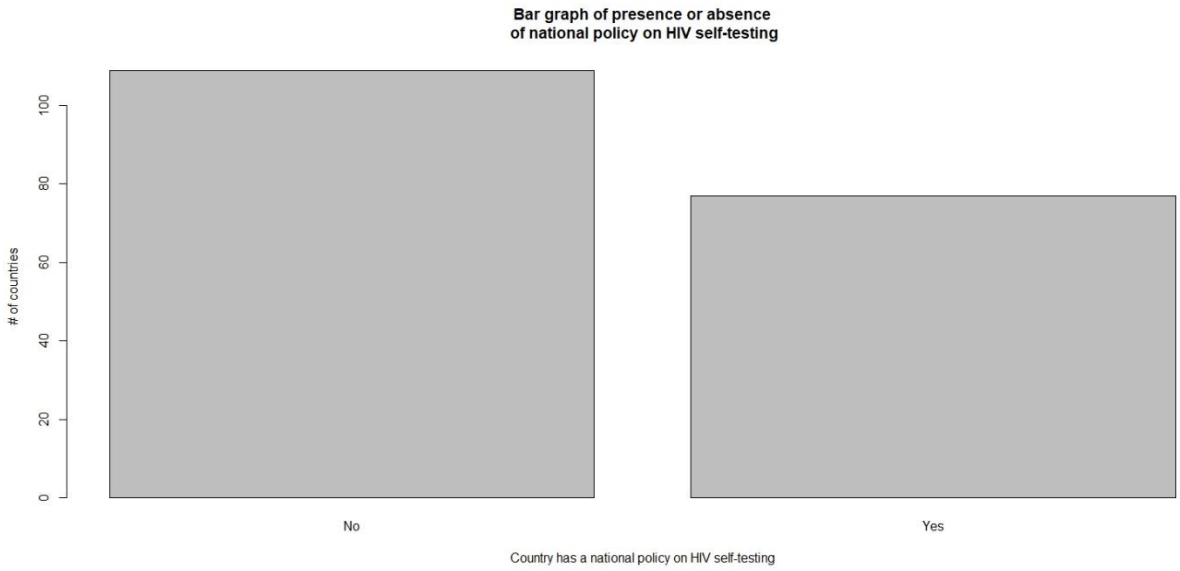
Figure 1



The HIV/AIDS policy outcomes, on the other hand, look at government responses to the ongoing crisis. Interestingly, the multi-decade duration of the pandemic allows for analysis of how the government has responded through policy to a long-term crisis. The first measure in this case is whether or not the country has a national policy on HIV self-testing (used here as a binary "Yes" or "No"). The second measure is whether or not the country has a national policy guaranteeing free HIV testing (used here as a binary "Free to all" or "Not free to all"). This data was sourced entirely from UNAIDS and was last actualized with the WHO policy data 2019 and

data from the UNAIDS National Commitments and Policy Instrument 2019 (2020). Again, the importance of these measures as policy outcomes indicative of an effective response to HIV/AIDS is demonstrated through their tracking by UNAIDS as well as through their employment in the HIV/AIDS comparative scholarship (Mavedzenge et al. 2013; Souteyrand et al. 2008; UNAIDS 2020). Variation within these measures also supports their use as representations of policy outcomes, indicating the influence of causal factors that affect adoption of these policies (Figure 2).

Figure 2

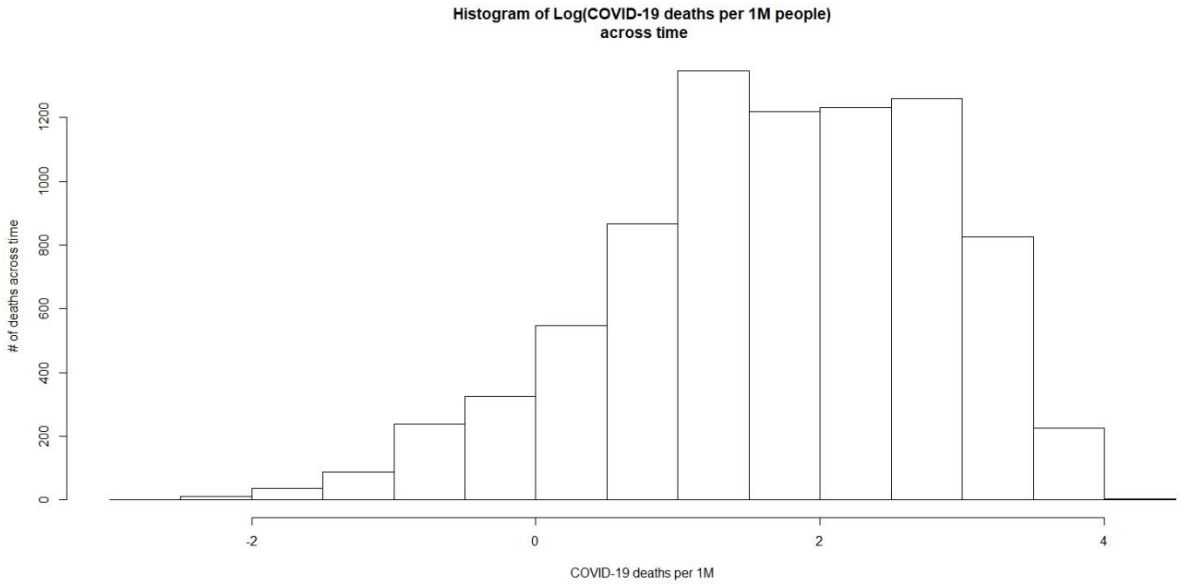


Health and Policy Outcomes: COVID-19

Moving on to the health outcomes in the COVID-19 pandemic, these measures again indicate how the crisis has impacted the population health of the nations under study. COVID-19 deaths, new cases, and related hospitalizations have all been tracked since the start of the pandemic to summarize the population health impacts of the crisis (Dong et al. 2020; Roser et al. 2021; WHO 2021). The number of COVID-19 deaths per one million people is used in the quantitative analysis as representative of the crisis health outcomes. Data were retrieved from Johns Hopkins University Center for Systems Science and Engineering and cover the period between the 8th week of 2020 (beginning with February 4th) to the 4th week of 2021 (ending with January 31st) (CSSE at Johns Hopkins University 2021; Dong et al. 2020). Variation within

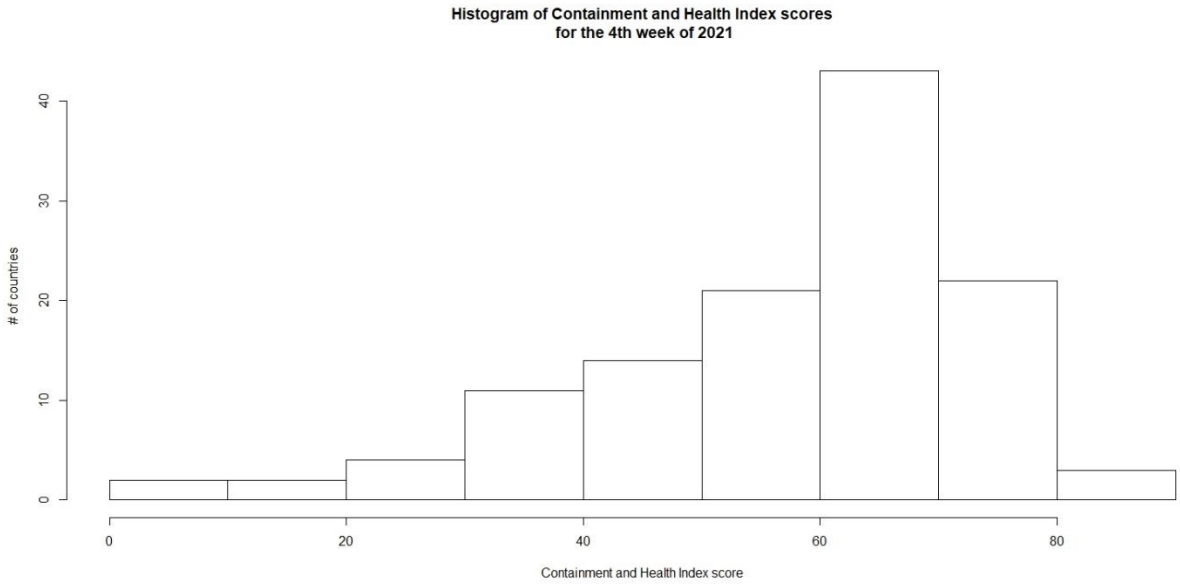
this measure again supports its use as a representation of the health facet of the dependent variable in this study (Figure 3).

Figure 3



The COVID-19 policy outcome looks at not only what steps governments have taken to control the virus, but also at the severity of the policies implemented through the Oxford Blavatnik School of Government's Containment and Health Index. The index is scaled from zero to one hundred and consists of a composite of thirteen metrics, including face covering policies, testing policies, and public information campaign development level (Hale et al. 2021; Roser et al. 2021). The policy outcomes that comprise this index highlight the extraordinary commonality in cross-national policy interventions used to respond to COVID-19 and thus signify grounds on which the different ways governments have addressed the pandemic can be compared (Hale et al. 2021). Data were retrieved from the Blavatnik School of Government at Oxford and cover the same period as the health outcome measure from the 8th week of 2020 to the 4th week of 2021 (Hale et al. 2020). Again, variation within this measure points to the influence of certain causal factors that require further explanation (Figure 4).

Figure 4



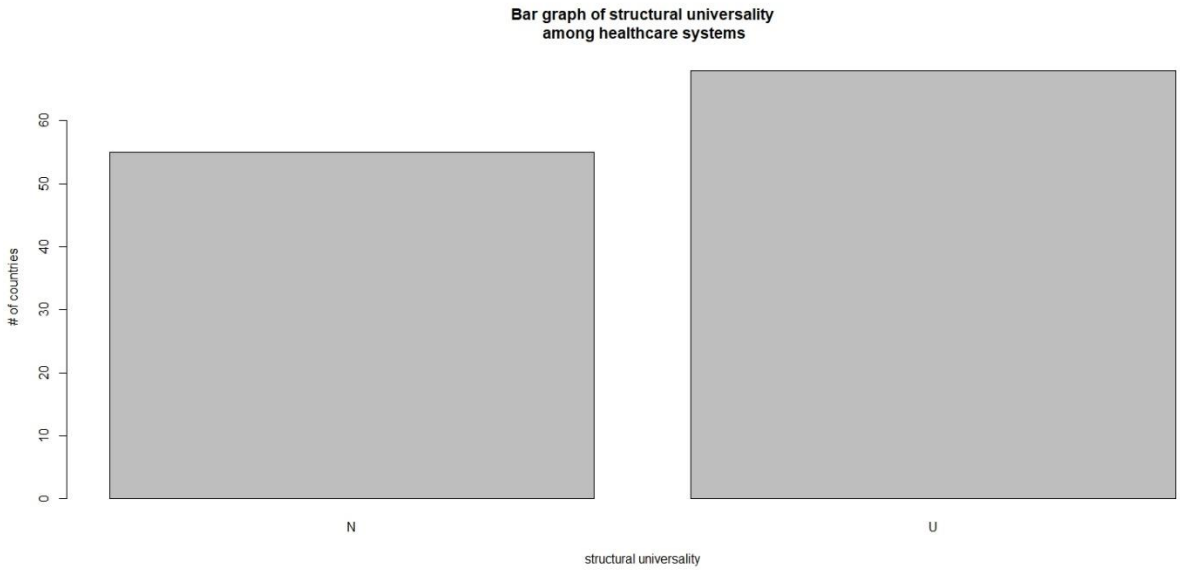
II. Operationalization of the Independent Variable: Healthcare System Organization

Organizational differences in the healthcare systems of countries around the world is the explanation proposed in this study to account for the variation in infectious disease crisis outcomes detailed above. The two key dimensions of healthcare system organization identified are structural universality and identity of the owner and manager of healthcare provision. Recall that my definition of a national health service is a structurally universal system characterized by public ownership and management of healthcare provision. Given the lack of existing data on both these dimensions, for this study I created a dataset for the categorization of healthcare systems first as structurally universal or structurally non-universal, then, if structurally universal, whether or not the system was a NHS.

Concerning the data collection for organizational differences in healthcare systems, namely structural universality and the presence or absence of a NHS, 123 countries were coded individually on both these dimensions. First countries were categorized as structurally universal or non-universal, and then among the universal systems, categorized "Yes" or "No" as NHSs. The principal source material was the reference work *Health Care Systems Around the World: A Comparative Guide* (2013) by Sarah Boslaugh which was supplemented with a wider literature search (Appendix, Table A). As described in Chapter I, structural universality and public ownership and management of healthcare provision are important features of the healthcare

system likely to impact health and policy outcomes of an infectious disease crisis. That these organizational features vary among the healthcare systems around the world signify that these differences could be driving the observed variation in pandemic outcomes (Figure 5).

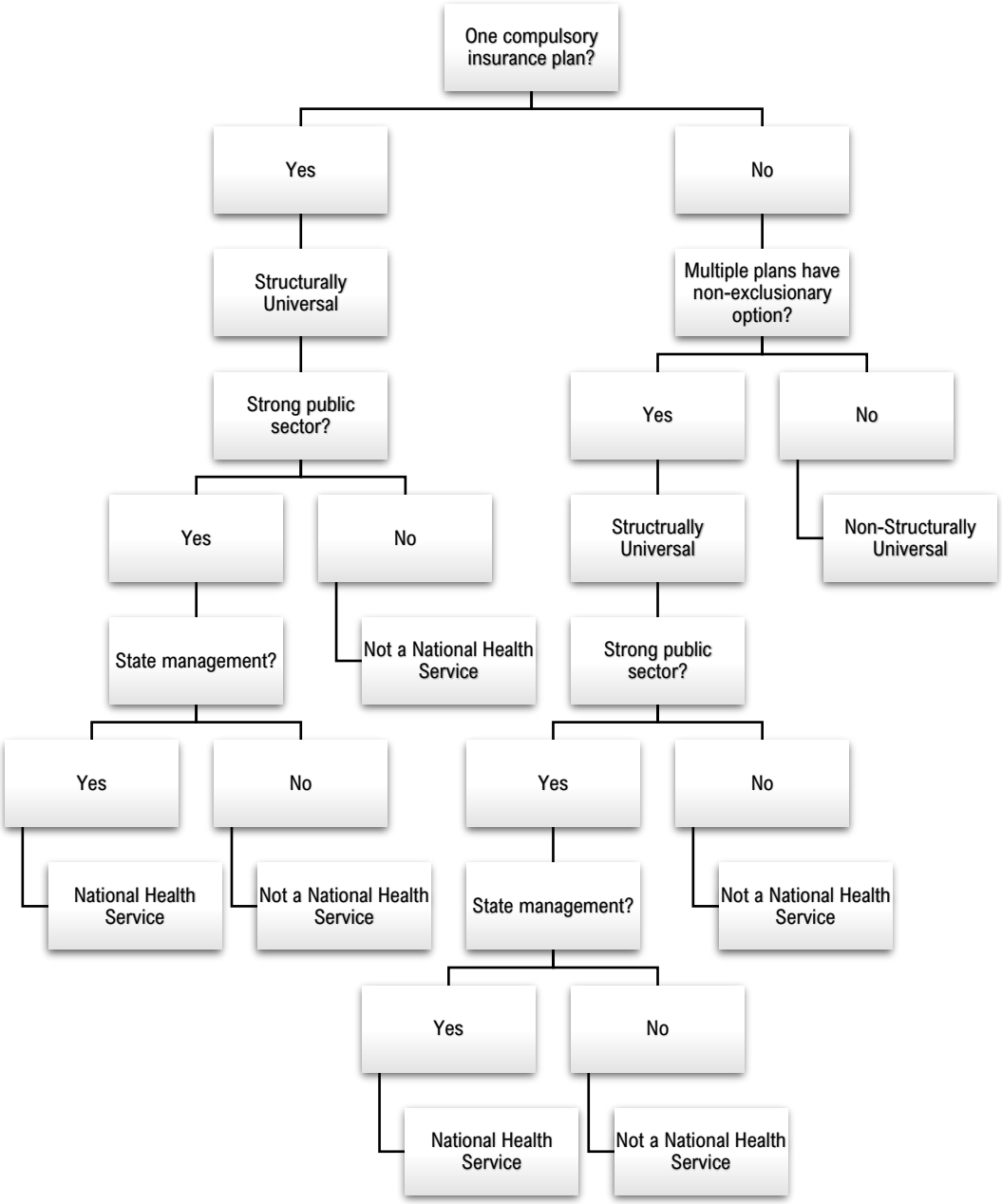
Figure 5



Classifying structural universality relied on the assessment of coverage gaps in the health plans available to each country's population. Particularly the following questions formed the scheme for coding this variable 1) What coverage options are available to a given population? 2) Are these plans exclusionary? And 3) If they are exclusionary, is there a separate option for those still lacking coverage? Figure 6 shows a schematic version of the process. To an extent, the financing system helped inform these decisions, especially at the option extremes. That is, when financing was primarily private; where private insurance was exceedingly common, but not required; and where the national options were highly exclusionary, then the system clearly was structurally non-universal. On the other hand, a system financed through general tax revenue as the only public plan, with limited private options was clearly structurally universal. More nuance was required with the social health insurance systems, which generally tied coverage to employment. Similarly, when a multiplicity of plans was present, sometimes structural universal coverage was achieved and other times not. In these cases, ultimately reviewing the literature for the possibility of uninsured persons provided the final say on the structural universality of these more-ambiguous systems.

The subsequent coding step among the structurally universal systems was whether or not the system was a NHS. This categorization was based chiefly on the ownership of the main healthcare provision institutions within a country. This does not necessarily signify that all provision is state-owned, but rather that the majority of healthcare provision comes out of public facilities. Interestingly, for some systems largely characterized by public ownership, the common trend has been towards decentralization, especially in the former Soviet bloc, for example, Albania (Bohm et al. 2015; Memia 2015; Tomini et al. 2012). These cases where management power has drifted further and further away from the model of centralized state control are not coded as NHSs.

Figure 6


One compulsory insurance plan?
Yes
No
Structurally Universal
Multiple plans have non-exclusionary option?
Strong public sector?
Yes
No
Yes
No
Structrually Universal
Non-Structurally Universal
State management?
Not a National Health Service
Strong public sector?
Yes
No
Yes
No
National Health Service
Not a National Health Service
State management?
Not a National Health Service
Yes
No
National Health Service
Not a National Health Service

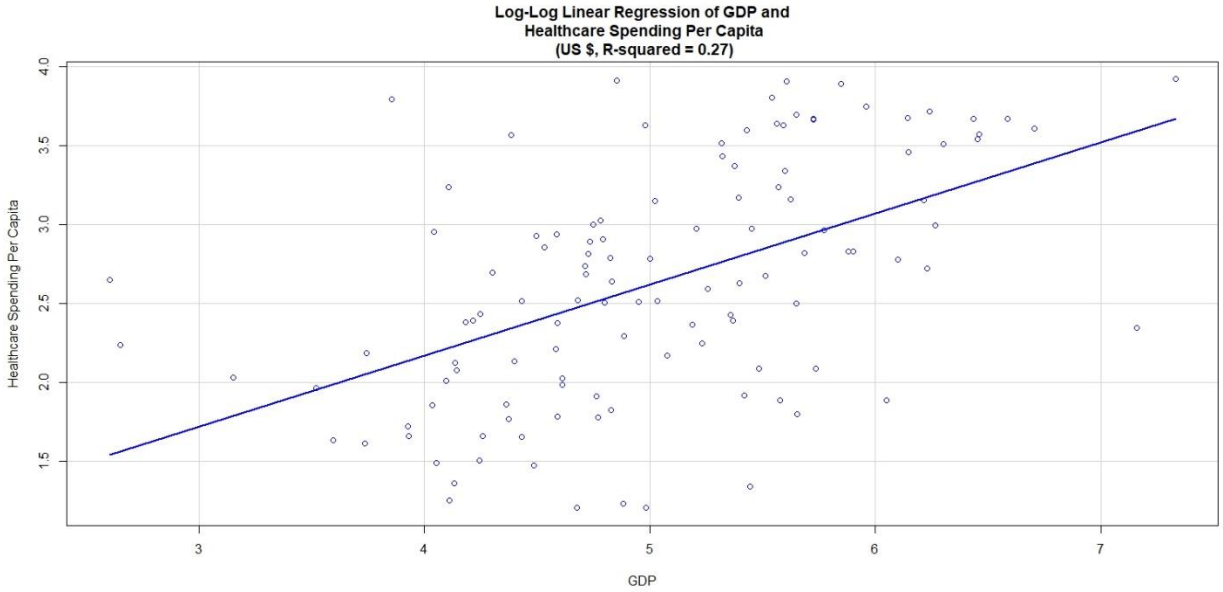
III. Operationalization of Alternative Explanations

State Capacity and Public Health Funding

Previous research has shown that higher levels of state capacity and increased public health funding contribute to better outcomes in an infectious disease crisis (Burkle & Burkle, 2015; Lurie et al., 2004; Masters et al., 2017; Mays et al., 2004; Plough, 2004; Price-Smith, 2002; Rechel 2019). In general, better funded public health and healthcare institutions in richer countries are expected to mitigate the effects of this type of crisis better than their poorer counterparts. Some of the rationale behind these observations are that, for example, low-capacity countries are weakened more than high-capacity countries by an infectious disease crisis and become, in turn, more vulnerable against the next one (Price-Smith, 2002), or that changing the funding on a health protection program will proportionately change the efficacy of the program (Infanti et al., 2013).

Surprisingly, very little multicollinearity is observed between measures of state capacity (GDP) and public health funding (healthcare spending per capita) (Figure 7), so they can (and ought to) be controlled for independently. So, for data analysis in this study, these concerns will be controlled for using Gross Domestic Product (GDP), Gini coefficient, healthcare spending per capita, and the Human Development Index (HDI) score. These measures will help to account for the influence of state capacity and funding on the transnational outcomes observed for both the HIV/AIDS crisis and the COVID-19 pandemic, and they are sourced respectively from the World Bank (n.d.), Boslaugh's (2013) reference work, and the United Nations Human Development Program (2018).

Figure 7



Government Transparency

Questions of government transparency also have been shown to influence outcomes in an infectious disease crisis (Price-Smith, 2002; Stevenson & Cooper, 2009). Countries that are exceptionally self-conscious about their sovereignty, either from imperial histories or repeated exclusion from international conversations, will tend to be less transparent and unwilling to clue in the rest of the world on the state of a domestic crisis (Price-Smith, 2002; Stevenson & Cooper, 2009). This lack of transparency can lead to lost aid that will not be provided to deal with an infectious disease crisis as well as threat denial that allows a simmering crisis to boil over (Price-Smith, 2002; Stevenson & Cooper, 2009).

I use Corruption Perceptions Index (CPI) values from Transparency International and listed in Boslaugh's reference work (2013) to account for transparency in the data analysis. This control will help to distinguish countries likely to self-sabotage on these grounds, thus exacerbating their crisis outcomes.

Gender Inequality

Study into the experience of Chile with the HIV/AIDS pandemic reveals that gender inequality negatively impacts health outcomes. Gender inequality is an important discriminatory factor that leads to disparities in access to the benefits of the healthcare system (Alarcón et al.

2018). In the experience of Chile with HIV/AIDS, an example of the affects of this kind of discrimination is the decreased adherence to antiretroviral treatment in women compared to men (Stuardo 2017). Furthermore, due to the strength of the machismo ideology, research found the belief that infidelity is an acceptable, if not expected behavior widespread among men (Ferrer et al. 2009). This second example is particularly important concerning HIV/AIDS, since maintaining multiple sexual partners is a significant risk factor for contracting the virus.

Therefore, I will be using Gender Inequality Index values from the UN Development Program (2019) to control for this variable in the regression analysis. This control will account for the negative health effects caused by gender discrimination.

Social Progressivism

Also discovered from investigation into Chile's handling of the HIV/AIDS pandemic, progressivism is another variable found to impact infectious disease crisis outcomes. Specifically, the taboo surrounding topics of sex and sexuality, including HIV, creates a lack of willingness to address the infectious disease crisis as well as prompts a normative backlash when it is broached. The consequences, then, may be a slowed or ineffective government response and a disinclination among the sick to be open and seek care (Ferrer et al. 2009; Mohor 2017).

In order to account for this variable in the regression analysis, the measure "Acceptance of gays and lesbians" from the Social Progress Index by the Social Progress Imperative (2020) will be used as a proxy for social progressivism. This will control for the influences of social ideology on the disease crisis outcomes.

IV. Case Study Development and Analysis

The HIV/AIDS case comparison provides the means for a qualitative analysis of the relationship between healthcare system organization and infectious disease crisis outcomes as they pertain to the central hypotheses of this work. The countries Chile and Uruguay were paired using quantitative measures of important background drivers of epidemic outcomes from the alternative explanations provided above. These include: the Gini coefficient, the HDI, the CPI, and GNI per capita, also from the World Bank (n.d.). In order to identity two countries that were a good match, I use the *optmatch* package in R to identify two countries that are quite similar on

background features but that have different healthcare system types. The healthcare system of Chile is structurally universal but not a NHS. On the other hand, Uruguay has a structurally non-universal system. Outside of healthcare system coding data and background quantitative data, information for the case study came from a mix of primary and secondary sources, including news articles, domestically produced research, and government reports.

The central explanatory variable for the case study was structural universality. Analysis of source material allowed me to identify factors that both helped and hindered each country's handling of the HIV/AIDS crisis. Thus, these factors were divided as either positive or negative influences. Then, each of these factors were taken into consideration through the perspective of the theory of this work. That is, the factors were noted as 1) relating to the structure of the healthcare system, in support of my hypotheses 1a and/or 2a, 2) relating to a previously identified control variable (such as state capacity), or 3) relating to a novel explanatory variable. The two novel explanatory variables recognized were gender inequality and social progressivism, and these were subsequently incorporated into the regression analysis.

V. Linear Regression Model Creation and Analysis

Multiple linear regression analysis allows for the assessment of the significance of the relationship between multiple predictor variables (both together and individually) and a dependent variable. The quantitative analysis performed here tests for these relationships between the organization of the healthcare system and the infectious disease crisis outcomes. Models with increasing numbers of control variables are used to isolate the relationships of interest. These controls either originate from the existing research of explanations for variation in infectious disease crisis outcomes while others originate from the case comparison of Chile and Uruguay. Linear regression is performed for each of the hypotheses central to this study for each pandemic case, HIV/AIDS and COVID-19.

The models presented in Chapter IV were created using the package stargazer in R. The formula for the models is expressed as:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_p x_p$$

Depending on the table, *y* is the dependent variable, either the health or policy outcome measure for either HIV/AIDS or COVID-19. The *x*s are the predictor variables. The number of *x*s in a

particular model depends on the number of control variables used. β_{1-p} are the regression coefficients which show the strength of the relationship between the given predictor variable and the outcome variable while controlling for the other predictor variables. β_0 is the y-intercept.

In using linear regression to infer a causal relationship between organizational differences in healthcare systems I must acknowledge certain vulnerabilities of the process. First, there may be unmeasured confounding factors that shape both healthcare system type and infectious disease crisis outcomes which would bias my estimate. While I have included controls for the most prominent variables (state capacity, human development, healthcare spending, etc.), it is difficult to identify and measure all confounders. Second, this study does not allow me to exploit variation over time with changes in healthcare system organization. With this variation, I could include country fixed effects to control for all unmeasured country-level features or initial conditions. Finally, third, I do not model temporal or spatial dependence in the data. Accounting for the influence of time and space on each country's experience is a worthwhile consideration for future research.

Conclusion

The hypotheses of this study are analyzed both with a qualitative case comparison and a quantitative multiple regression. Data on the dependent variable, infectious disease crisis outcomes, was obtained primarily through international research and surveillance institutions. Because the regression analysis looks at health outcomes and policy outcomes through two different disease contexts, HIV/AIDS and COVID-19, measures for these two categories of the dependent variable were obtained for both disease cases.

Data on healthcare system organization was collected as a novel initiative for this study. 123 countries were coded on the dimensions of structural universality and government ownership and management of healthcare provision. This dataset was then applied both in the case study and linear regression.

The case study was based on the review of primary and secondary material on the HIV/AIDS crisis in Chile and Uruguay. These countries were matched from the healthcare system organization dataset, and they represent a comparison between a structurally universal healthcare system and a structurally non-universal one. The factors identified in each case were

considered to be related to previously acknowledged control variables, related to structural universality, or a novel explanatory variable.

Finally, regression analysis allows for a large-N look at the strengths of these organizational features of healthcare systems in accounting for variation in health and policy outcome variables in the contexts of HIV/AIDS and COVID-19. Creating models that control for the listed alternative explanations allow for the narrowing-in on the influences of the key independent variables structural universality and presence or absence of a NHS.

Taken together, the case comparison and regression analysis allow for a mixed-methods approach to test the hypotheses of this study. Identifying specific references to aspects of the structurally universal system in Chile as well as identifying significant, logical relationships between the independent variables and health and policy outcomes are the expected results for the support of these hypotheses.

CHAPTER III: FINDINGS FROM THE QUALITATIVE ANALYSIS

The following case study takes an in-depth look at the handling of the HIV/AIDS pandemic in Chile and Uruguay, representative countries for structurally universal and structurally non-universal healthcare systems. To examine the relationship between organizational differences in healthcare systems and infectious disease crisis outcomes, I draw comparisons between the two countries to elucidate variations in experiences with HIV/AIDS related to the unique healthcare system structures. This study is directly relevant to my hypotheses 1a and 2a, which posit that countries with structurally universal healthcare systems will experience better health and policy outcomes than countries with non-universal systems. My expectation, then, is that the ongoing HIV/AIDS crisis should be less impactful on the population health of Chile compared to the population health of Uruguay. I also expect Chile to have adopted more policy measures than Uruguay aimed at controlling the crisis. These differences should also reflect the economic, social, communicative, and political mechanisms detailed in Chapter I which argue why structurally universal healthcare should lead to better health and policy outcomes.

The case study method allows for a more nuanced comparison of the effects of healthcare system type while also implicitly controlling for confounding variables missed in large-N studies since the countries compared were selected for their similarities on factors other than structural universality. Specifically, the countries were matched using the R package optmatch on the following variables: GNI, Gini coefficient, HDI, and CPI. Primary news material, secondary research, and government publications served as the backbone for the analysis.

The study first discusses the experiences of Chile and then the experiences of Uruguay with HIV/AIDS. For each country, I first introduce the healthcare system and provide insight into the current state of the crisis. I then go on to review the positive and negative factors highlighted in the source material that have impacted each country's HIV/AIDS outcomes.

While many of the findings implicate alternative explanations affecting these countries' abilities to control the crisis, there appears to be support for hypothesis 1a. Although Chile leads Uruguay in total cases, Chile performs better in per capita measurements for the share of the

population infected with HIV and, especially the death rate from HIV/AIDS (Roser & Ritchie 2019). Research on the two countries reveals that while one of Uruguay's largest challenges has been HIV patient retention with antiretroviral treatment regimens, Chile is notable for its focus on post-infection care. Taken together, these findings indicate that structural universal healthcare in Chile is encouraging better health outcomes compared to Uruguay. Furthermore, this difference appears to be chiefly driven by social mechanisms in which access to health services is easier for Chileans in at-risk groups than similar Uruguayans.

This result signifies first that structural universality does play a meaningful role in determining the health outcomes a country experiences from an infectious disease crisis. It also validates the theorized social mechanisms from Chapter I as conduits for structurally universal healthcare to improve health outcomes, in particular by making health services more accessible.

I. Course of the HIV/AIDS Pandemic in Chile

Chile as a representative of a country with a structurally universal healthcare system has seen many barriers and successes in its work to control the HIV/AIDS crisis. Though leading the region in new HIV cases from 2010 to 2016, it has consistently maintained a smaller share of the population HIV-positive and fewer AIDS deaths per capita than Uruguay (Roser & Ritchie 2019; UNAIDS 2017). However, concerning policy outcomes, the two countries are relatively similar. Several factors appear to have influenced these outcomes, including state capacity, rapid government response, expansion of PrEP availability, expansion of HIV testing, and dedication to improving AIDS treatment. However, several negative healthcare and social factors have hurt Chile's ability to manage the crisis as well, for example, not enough focus on prevention and early detection and social conservatism and stigmatization.

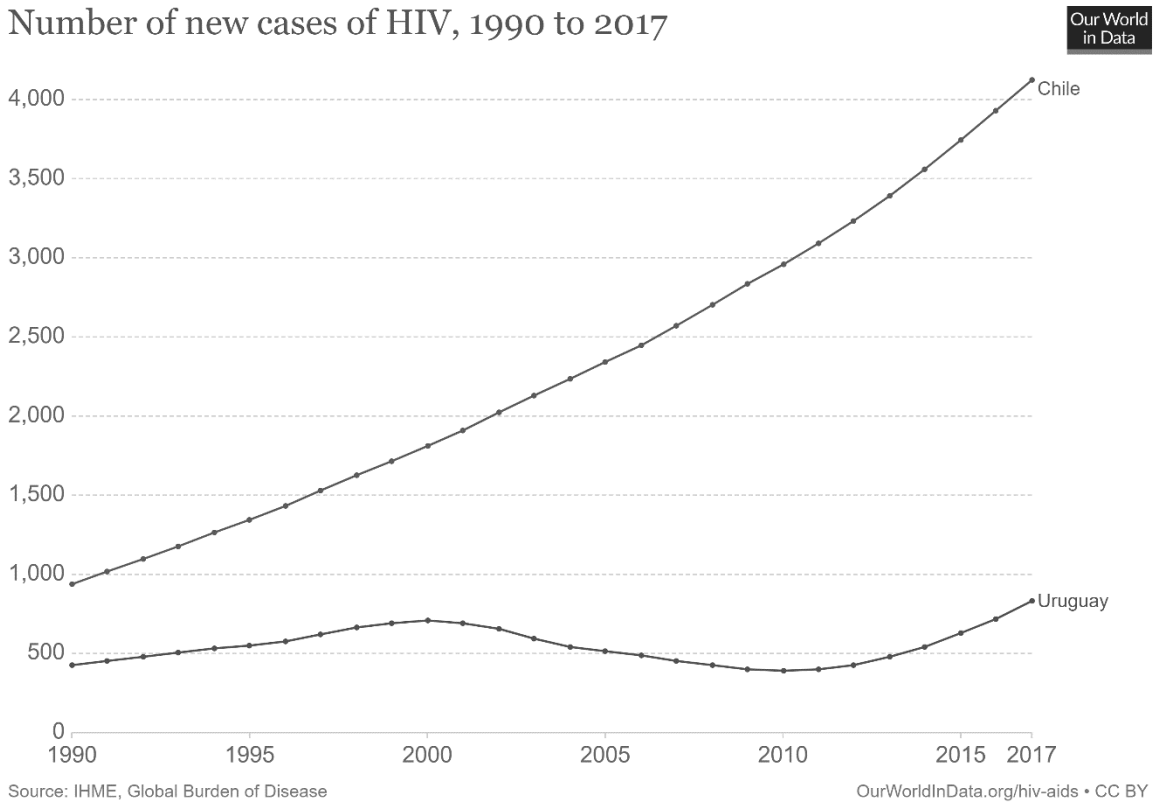
The Chilean Healthcare System: The Chilean healthcare system is structurally universal, though not a national health service. It is characterized by a multiplicity of coverage schemes that combined include the entire population (Aguilera Sanhueza et al. 2019, 42; Frenk & Gómez-Dantés 2018, 82). The two main financing and administrative institutions through which Chileans obtain healthcare coverage are the national health fund (Fonasa) and the pension health institutions (Isapres), which together insure 92% of the population (73). Fonasa caters to all workers as well as to those without capacity to pay. It is also the largest program, covering about

78% of the country's population. Financing for Fonasa is based both on general taxation and a social health insurance structure which takes 7% from each worker's salary (Aguilera Sanhueza et al. 2019, 74-75; Boslaugh 2013, 93). For its part, Isapres is an opt-in alternative to Fonasa that allows members to choose from a variety of coverage packages. It is financed through the same social health insurance as Fonasa with extra plan-specific charges (82). About 14% of the population relies on Isapres (86). The remaining percent of the population is covered by other demographic-specific schemes, chiefly the healthcare system of the armed forces (42).

Healthcare provision in Chile is also mixed public and private, though with a larger public sector (Aguilera Sanhueza et al. 2019, 7). Indeed, although those insured through Fonasa may choose between public and private providers, the vast majority (84.7% of Fonasa users) go with the public option (77). On the other hand, while those covered under Isapres face the same decision, private providers are used almost exclusively (95.4% of Isapres users) (77). Both public and private providers are under the authority and regulation of the Ministry of Health, a result of which is regular interaction between the public and private sectors (7, 37). And despite neoliberal reforms of the 1970s which targeted decentralization of the healthcare system and the growth of private sector provision, the activities of the healthcare system are still considered to be the "non-delegable responsibilities of the Chilean state (Aguilera et al. 2019, 7; my translation). Therefore, based on the categorizations used by this work, the healthcare system of Chile is best defined as structurally universal, though not a national health service.

HIV/AIDS Pandemic outcomes in Chile: Concerning the state of the HIV/AIDS pandemic in Chile, as shown in the graphics above, it has remained relatively stable over the last decade. The country did lead the region in new HIV infections from 2010 to 2016 (UNAIDS 2017). However, Chile displays a consistently lower percentage for share of the population infected with HIV and a lower death rate from AIDS per 100,000 people relative to Uruguay (Ritchie & Roser 2019). On the other hand, very similar policy outcomes are observed for Chile and Uruguay. According to UNAIDS (2020), both countries have national policies requiring education on HIV in secondary schools and national policies connecting HIV testing to further care. Neither have a national policy on HIV self-testing, nor is HIV testing free to everyone. Uruguay does have a national policy on partner notification while Chile does not.

Number of new cases of HIV, 1990 to 2017

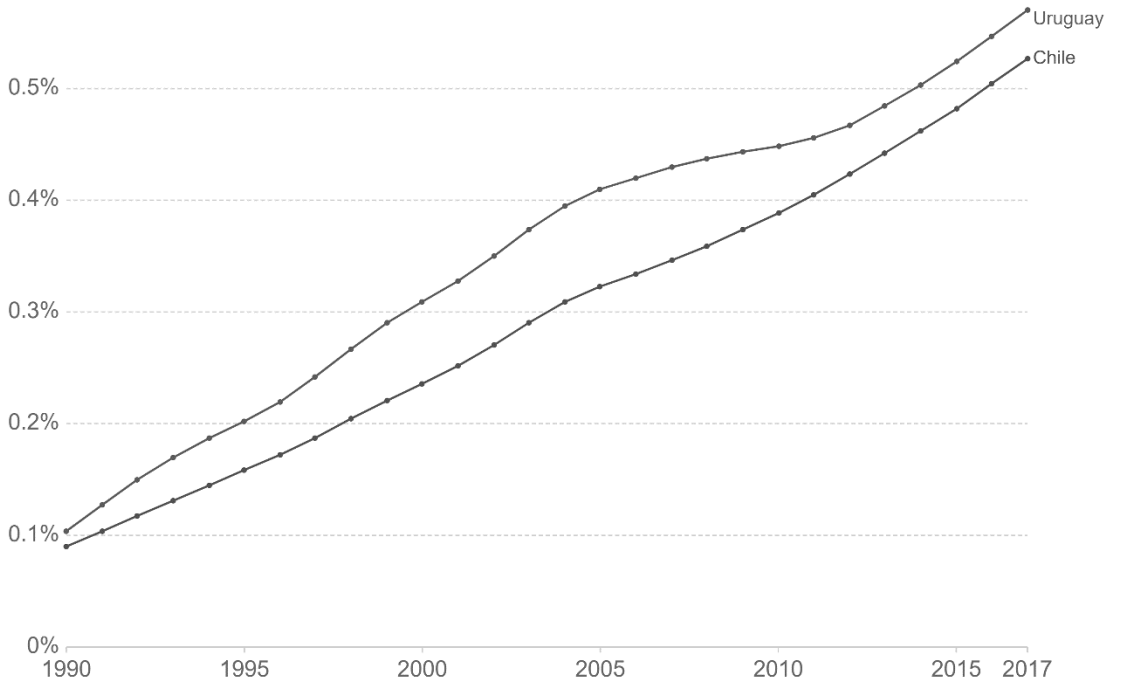


Source: IHME, Global Burden of Disease

OurWorldInData.org/hiv-aids • CC BY

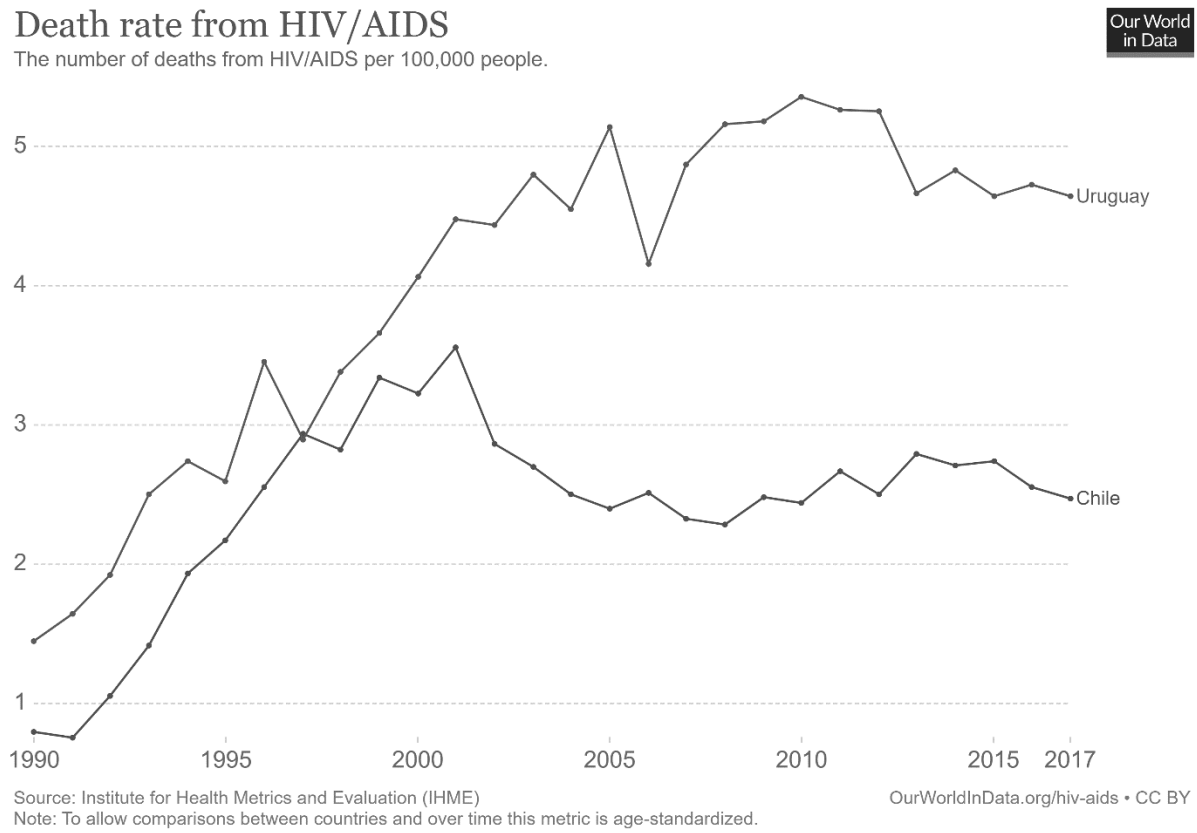
Share of the population infected with HIV

The share of people aged 15 to 49 years old who are infected with HIV.



Source: Institute for Health Metrics and Evaluation (IHME)

OurWorldInData.org/hiv-aids • CC BY



Charts from *Our World in Data* (Roser & Ritchie 2019)

Causes of Chile's pandemic performance: Through the investigation of news articles and domestic research reports, many factors were brought to light that can help explain the state of the HIV/AIDS pandemic in Chile. Of these factors, they were a mix of positives and negatives, some of which were considered in the theory detailed above, some of which were not considered and merit further investigation.

Beginning with the positive factors, those that were found to benefit the Chilean health system, the first, unsurprisingly, is money. Chile is a high-income country according to World Bank metrics, which makes it a standout in the region, and its overall wealth advantages the country over many of its neighbors in fighting against the rising number of infections (Mohor 2017).

According to Ferrer et al. (2009), the government of Chile is also credited with responding rapidly during the start of the pandemic compared to other countries. This effort resulted in the creation of the National AIDS Commission (CONASIDA) in 1990. The

Commission is credited with several important achievements, including launching public health campaigns and winning the addition of free antiretroviral therapies to the country's healthcare benefits package (Ferrer et al. 2009). This points to the successful long-term integration of CONASIDA as an active organization, rather than an attempt at a temporary fix.

Furthermore, as a step towards increased preventative measures, it was recently announced that Chileans would have access to free delivery of pre-exposure prophylaxis (PrEP), a drug that reduces the risk of contracting HIV (Fernandez 2019). This change reflects a major step forward given the general acceptance of the drug's important role in decreasing transmissions. It also points to a serious improvement in access to PrEP as the cost has previously been reported as an economic barrier (Montes 2017).

As for later stage care, Chile is notable for its focus on treatment and has achieved important advances that have decreased the mortality of those infected by the virus (Ferrer 2009). A key piece of this success has been making the antiretroviral drugs free to patients through the public benefits system (Aguilera Sanhueza et al. 2019; Ferrer et al. 2009; Mohor 2017; Stuardo 2017). In fact, the majority of the HIV budget is dedicated to treatment (Ferrer et al. 2009; Stuardo 2017).

Despite these positive factors and the influence that they have had controlling the pandemic outcomes in Chile, several negative factors are identifiable from the source material as well, especially in the fallout of the 2017 UNAIDS report which showed Chile leading Latin America in absolute numbers of new infections. These factors fall roughly into two categories: those related to patient care and prevention and those related to the society more broadly. Both classes of care and social factors give a more well-rounded picture explaining the state of the pandemic in Chile today.

Starting with the care factors, although there have been several public health campaigns in Chile on HIV/AIDS, their efficacy has been highly questionable given the continued increase in new infections (Ferrer et al. 2009). In the work of Ferrer et al. (2009), they attribute this to a lack of evaluation of the successes and failures of previous campaigns as well as a lack of adaptation in messaging to the modern pandemic which encompasses a group of people with increasingly diverse lifestyles. An important piece of this is that the campaigns need to be updated with the younger generation in mind too (Mohor 2017).

Another important negative care factor is the lack of emphasis on the prevention of new infections in the control of HIV/AIDS (Ferrer et al. 2009; Mohor 2017; Montes 2017; Stuardo 2017). As said before, the majority of HIV/AIDS spending is dedicated to treatment, but Stuardo points out that the actual percentage treatment takes from the budget is upwards of 95%, indicating monetarily that prevention is not a priority (2017). She also emphasizes that the Chilean national health plan for 2011-2020, while aiming to reduce HIV/AIDS mortality rates over this decade, lacks any objective related to preventative strategies (Stuardo 2017).

One of the main consequences of underplaying infection prevention is the creation of a populace uneducated on their own risk for contracting the virus. Thus, people are unable to adopt preventative measures for themselves, such as wearing a condom or taking PrEP, as "the presence of ignorance and false beliefs around the disease affects people's self-efficacy in the adoption of preventative strategies" (Ferrer et al. 2009, 11; my translation). This result is closely related to the failure of public health campaigns in providing retainable messaging as well as a lack of basic education on HIV/AIDS and sex in general (Ferrer et al. 2009; Mohor 2017; Montes 2017). The gravity of this issue is highlighted in the research of Ferrer et al. which cites the National Study on the Sexual Behavior of Chileans from 2000 (after several public health campaigns on HIV/AIDS) (2009). The survey found that nearly half of those interviewed agreed that "AIDS could be avoided by only having sex with people that you are in love with," and another 40% affirmed that "the disease can be avoided by not using public restrooms" (CONASIDA & the National AIDS Research Agency, France 2000 as quoted in Ferrer et al. 2009, 11).

Similarly, the lack of focus on early detection and delays in informing people about their status are viewed as other negative factors impacting the HIV/AIDS crisis in Chile. Despite a purported focus on early diagnosis of HIV infection, several barriers have been cited that lead individuals to abandon the diagnosis process or only to enter it at a more advanced stage of infection (Mohor 2017; Montes 2017). It can take up to four visits to the doctor over a period of two weeks to a month to get the test results, a tasking procedure that leads many (especially young) people to continue on with their lives without knowing their status (Ferrer et al. 2009; Montes 2017). The two unfortunate consequences of this are, first, that HIV-positive individuals unknowingly may infect more people and, second, that those who enter the healthcare system in

the later stages of infection are more likely to die from HIV/AIDS, though it is completely treatable with early detection (Montes 2017).

Moving on to the social factors indicated in negatively impacting the HIV/AIDS crisis in Chile, the first is socioeconomic inequalities. That is, people of lower socioeconomic levels are more heavily burdened by the pandemic than people of higher socioeconomic levels. For example, when it comes to sex education, "[i]n public schools only 37 percent of teenagers use a condom during their first time having sex versus 60 percent in private schools" (Mohor 2017, para. 14). Moreover, the research of Alarcón et al. argues that the indigenous Mapuche, who tend to be of lower socioeconomic status and education level than the typical non-Mapuche Chilean, experience notable inequalities in HIV/AIDS health outcomes (2018). The point of the work is the emphasize how, with lower education and socioeconomic levels among the Mapuche, "these social conditions continue to be barriers that affect equity in health opportunities," a classic example of the social determinants of health (Alarcón et al. 2018, 281; my translation). Specifically, individuals of lower socioeconomic status and education level were more likely to be admitted to a center of attention for HIV/AIDS once their disease had already progressed to the stage of AIDS irrespective of ethnicity (Alarcón et al. 2018). However, of the AIDS patients in the rural region of Araucanía that were admitted only after their disease had reached this stage, the majority were ethnic Mapuche (Alarcón et al. 2018).

Another negative factor related to Chilean society more generally is the lack of political prioritization awarded the HIV/AIDS crisis. According to Alejandro Alfani, director of the Center for HIV in the University of Chile Clinical Hospital, "AIDS is not incorporated in the government's agenda of priorities. It does not appear anywhere" (Montes 2017, para. 11; my translation). Moreover, a lack of policies targeted at improving the HIV diagnosis process is also noted, especially when it comes to the incorporation of quick testing, which has faced "reticence at distinct levels associated to government entities" because it is not considered a necessary change (Ferrer et al. 2009, 14; my translation; Mohor 2017).

A third negative factor is conservatism and stigmatization around HIV/AIDS. The taboo surrounding topics of sex and sexuality in Chile lead to normative debates, as well as a lack of willingness to address the issue (Ferrer et al. 2009; Mohor 2017). For example, Ferrer et al. find that value-based messaging has clouded HIV/AIDS public health campaigns for nearly two decades from 1991 to 2007 (2009). Moreover, according to the 29-year-old Chilean Emilio

Urrutia, who is HIV-positive, "I have many friends who won't get tested because they think they're going to lose the support of their families. This is not a physical disease as much as a social one" (Mohor 2017, para. 21).

Lastly, machismo has also been identified as an important social factor negatively impacting the state of the HIV/AIDS pandemic in Chile (Alarcón et al. 2018; Ferrer et al. 2009; Stuardo 2017). In general, gender inequality is one of many discriminatory factors that lead to disparities in access to the benefits of the healthcare system (Alarcón et al. 2018). One way this inequality is particularly relevant to the case of HIV/AIDS is that women demonstrate a lower level of adherence to antiretroviral treatment than men, a finding that directly implicates quality of life and mortality (Stuardo 2017). Another consequence of widespread machismo is a general belief among men that infidelity is an acceptable, if not expected, behavior. The result of this is the tendency to maintain multiple sexual partners, which increases the risk of contracting HIV and further spread (Ferrer et al. 2009).

In summary, the stabilized state of the HIV/AIDS crisis in Chile appears to be in part both the fault of and thanks to a strong focus on treatment. While mortality has in fact declined among HIV-positive individuals, downplaying the importance of other targets, such as increasing preventative measures and improving the HIV diagnosis process, appears to have serious upstream effects that impede significant declines in new infections (Ferrer et al. 2009, Mohor 2017; Montes 2017; Stuardo 2017). However, other important social and health-related factors appear to have meaningfully contributed to the situation as well, such as the rapid government response with CONASIDA to the pandemic in the 1990s, the now-free delivery of PrEP, and ongoing socioeconomic and gender-based discriminations.

Interpreting the evidence: Several of the explanatory factors highlighted above reflect the theory presented in this work. State capacity and socioeconomic inequalities were identified as key control variables in order to focus on the impacts of healthcare system structure, and the influence of both is reaffirmed by this case.

Moreover, the rapid response of the Chilean government to the crisis with the creation of CONASIDA also aligns with the underlying theory of this work, which expects structurally universal systems to adopt policies relevant to the mitigation of a given infectious disease crisis faster than structurally non-universal systems, as described in hypothesis 2a. However, the

relatively similar number of adopted policies according to UNAIDS data add complexity to the long-term policy outcomes of structural universality. That is, the quick creation of CONASIDA to deal with the crisis may have been related to the country's structurally universal healthcare, but modern data on policy adoption does not reflect the same relationship between policy outcomes and structural universality.

Two novel explanatory variables from the experience of Chile with HIV/AIDS are conservatism and gender inequality, both of which seem to play meaningful negative roles in controlling the effects of the crisis. Therefore, in the subsequent regression analysis, these variables will also be considered as controls though they were not identified in the initial theory.

II. Course of the HIV/AIDS Pandemic in Uruguay

Shifting perspective now to Uruguay, a similar analysis can be performed considering the healthcare system organization, the state of the HIV/AIDS pandemic within the country, and the factors that appear to positively or negatively impact the ability to mitigate the crisis. Uruguay is representative of a country with structurally non-universal healthcare. It has consistently maintained a higher share of the population HIV-positive compared to Uruguay and has experienced more AIDS deaths per capita as well (Roser & Ritchie 2019). However, in terms of policy outcomes, Uruguay has adopted about as many if not more than Chile (UNAIDS 2017). Results from the case study will allow for evaluation of the theory already presented on factors expected to meaningfully influence infectious disease crisis outcomes, both in terms of one of the key explanatory variables of this work, structural universality, as well as the suggested control variables. This analysis can also be looked at comparatively with the case of Chile detailed above.

The Uruguayan Healthcare System: The Uruguayan healthcare system is structurally non-universal, despite recent advancements towards universal inclusion. Since the adoption of the Integrated National Health System (SNIS) in 2007, "the population that has the right to receive comprehensive benefits by being assigned to a public or private health service independent of who finances the affiliation (formal coverage) rises to 95%" (Sollazzo & Berterretche 2011, 2837). Despite this impressive achievement, according to the definitions of this work, this is not

a structurally universal healthcare system since 5% of the population are left without this entitlement (recall this is regardless of whether or not this percent remaining actually obtain healthcare coverage for themselves or not). Indeed, closely linked to this point, in their research Sollazzo and Berterretche regularly refer to the Uruguayan healthcare system as segmented and fragmented, despite the progressive incorporation of distinct groups of the population into the SNIS (2011).

Coverage through the SNIS is primarily financed through a social health insurance scheme known as the National Health Fund (FONASA) that receives contributions from the state, businesses, and other recipient households. Healthcare provision is a mix between the public and private sectors. However, despite the central authority over the healthcare system given to the Ministry of Public Health, there continues to be difficulties in public-private coordination (Sollazzo & Berterretche 2011).

HIV/AIDS Pandemic Outcomes: Concerning the state of the HIV/AIDS pandemic in Uruguay, as seen in the graphics above, the progress of the crisis has remained relatively stable, similar to patterning observed for Chile. However, despite regularly lower numbers of annual new cases of HIV infection compared to Chile in absolute values, a greater share of the Uruguayan population is HIV-positive. Furthermore, the death rate from HIV/AIDS per 100,000 people is clearly higher in Uruguay than in Chile (Roser & Ritchie 2019). However, as mentioned earlier, Chile and Uruguay have very similar policy profiles, matching on having national policies on secondary school HIV education and connecting HIV testing to treatment, as well as on not having national policies on HIV self-testing and guaranteed free HIV testing for all. However, Uruguay does have a national policy on partner notification while Chile does not (UNAIDS 2017).

Analysis of news reports and research on the HIV/AIDS crisis in Uruguay leads to the diagnosis of several influential factors that have both helped and hindered this country's ability to mitigate the harmful effects of this infectious disease. Many of these factors are reflected in the theory constructed by this work as well as in the experience of Chile with HIV/AIDS.

Explanations for Uruguay's Pandemic Performance: Beginning with the positive factors, those indicated as having helped control the HIV/AIDS crisis in Uruguay, the first, again, is money.

Like Chile, Uruguay is a high-income country according to World Bank metrics, a distinguishing characteristic that predicts better outcomes than those in the kind of poverty experienced in Central America, for instance (Mohor 2017). One example of how Uruguay uses its wealth to curb the HIV/AIDS crisis is the purchase of condoms for free, country-wide distribution. From 2005 to 2009, quantities purchased increased from one million to almost ten million condoms a year (Narancio 2009).

On this note, the free distribution of condoms is itself another advantage awarded to the Uruguayan healthcare system. As said before, the purchase of condoms by the government has been greatly increasing over time with the objective from the Ministry of Public Health to make condom use considered a normal behavior for Uruguayans (Narancio 2009). In fact, all those who are covered by the SNIS receive a monthly coupon for fifteen free condoms (Garrido 2018).

A third positive factor is the increasing accessibility in HIV testing. In 2017, the Ministry of Public Health mandated that all healthcare providers must offer HIV testing, and number of annual tests were up by nearly 200,000 in 2018 versus 2016 (Muñoz 2019). For individuals with insurance through the SNIS, the tests are also covered entirely and require no extra charges (Acle 2020). Moreover, rapid testing has recently been introduced as well (Muñoz 2019).

Uruguay has also reached universal access to antiretroviral treatments (Cabrera et al. 2019; Garrido 2018). This is an especially important achievement because, with the state of modern medicine, no one has to die from AIDS if the HIV infection is caught early enough (Garrido 2018). However, as will be discussed later, irregular adherence to treatment regimes continues to be an issue (Cabrera et al. 2019).

Lastly, the work of Cabrera et al. indicates that neither gender nor provision ownership (public or private) play a significant role in health disparities related to HIV/AIDS (2019). Their work analyzed the death certificates of AIDS patients to determine at what point in the cascade of healthcare intervention the people died (i.e., following the diagnosis of HIV infection, after starting and stopping an antiretroviral regimen, while receiving treatment, etc.). According to their findings, there were no significant differences between the sexes or between those who received assistance in the public sector versus the private sector (Cabrera et al. 2019).

While the above factors were seen to bolster Uruguay against the effects of the HIV/AIDS crisis, several negative factors come to light from the source material as well. These negative factors are offered as explanations of the challenges Uruguay has faced mitigating the

pandemic. As in the case of Chile, they also fall roughly into the same two categories: those related to patient care and prevention and those related to the society more broadly. Taken together, these factors better describe the state of HIV/AIDS in the country today than the positive factors alone.

The first care-related factor to adversely impact the HIV/AIDS crisis in Uruguay is the lack of availability of PrEP (Muñoz 2019). PrEP is one of the most important tools for lowering the risk of HIV infection among at-risk populations. Of the ninety people known to be taking PrEP in Uruguay from 2017 to 2019, there were zero seroconversions (going from HIV-negative to HIV-positive) among the group (Muñoz 2019). However, PrEP "still is not an obligatory benefit for healthcare system providers," which means that interested individuals must purchase it separately (Muñoz 2019, para. 11).

Second, delayed diagnoses of HIV infection are also a problem for the control of the pandemic (Cabrera et al. 2019; Garrido 2018; Medical Union of Uruguay 2019). With late diagnoses, infected individuals do not access care until they are in a more advanced stage of disease progression and they also risk transmitting the virus to others for a longer period of time than those who were diagnosed early (Garrido 2018). Therefore, notable levels of late diagnoses are worrisome both considering new HIV infections and the HIV/AIDS death rate.

Another important care-related factor negatively affecting the HIV/AIDS situation in Uruguay is the sporadic adherence to antiretroviral treatment. From the same study from Cabrera et al. on the medical records and death certificates of AIDS patients, they state that of the approximately 9,000 people diagnosed with HIV (i.e., are aware of their positive status) only 5,300 patients are on an antiretroviral regimen (44% coverage) (2019). Their study also found that individuals who were diagnosed but did not interact further with the healthcare system accounted for nearly half of the total AIDS deaths. Moreover, 82% of those who did return for follow-up care exhibited poor adherence to treatment in their last year of life (Cabrera et al. 2019). The authors conclude that "the lack of contact or irregular contact with the health services (no linkage or no retention) make clear the obstacles to continual access and quality of attention for this population" (Cabrera et al. 2019, 189; my translation).

Moving on to the category of social factors negatively impacting the HIV/AIDS crisis in Uruguay, one challenge is the stigma and discrimination towards those infected with HIV (Garrido 2018; Osimani et al., n.d.). According to the *National Survey on the Attitudes and*

Practices of the Uruguayan Population Facing HIV/AIDS, between 15% and 26% of respondents indicated potentially discriminatory attitudes in giving answers to statements such as "If I knew that someone who worked selling fruits and vegetables has the virus that causes AIDS, I would continue to buy food from them," or "If a member of my family were infected by the virus that causes AIDS, I would keep it a secret" (Osimani et al., n.d., 7; my translation). A large driving force behind the stigma is a lack of education on HIV/AIDS; for example, the same survey found that 17% of respondents did not know that HIV cannot be contracted from sharing a yerba mate with someone (Garrido 2018; Osimani et al., n.d.).

The other major negative social factor influencing HIV/AIDS in Uruguay is socioeconomic inequalities. Returning to the research of Cabrera et al., they find that distinct social vulnerabilities were characteristic of "an important proportion of the deceased," which demonstrates "the need to bring together more tightly the healthcare system with the existing network of social protection in Uruguay" (2019, 189; my translation). Indeed, nearly three quarters of the population represented by the clinical records were discovered to have low levels of formal education, and 72% were found to be unemployed upon admission (Cabrera et al. 2019).

Interpreting the evidence: As seen with Chile, several state capacity and socioeconomic inequalities were identified as key explanations for the health outcomes observed. Fewer social factors seemed to be of importance in the case of Uruguay, but barriers in continued access to antiretroviral treatment appeared to be a significant issue. This finding aligns with expectations for a structurally non-universal system that lacks the same social mechanisms that increase accessibility.

III. The Chilean and Uruguayan Pandemic Responses in Comparative Perspective

Based on these findings, an intriguing initial takeaway is that fewer social critiques could be identified in the case of Uruguay compared to that of Chile. While stigmatization surrounding the disease was mentioned in both contexts, sources on Uruguay notably lacked any reference to conservative values or homophobia. The expected normative conflict was absent. However, other social and care-related factors stood out as negatively impacting the country's ability to control

the effects of the HIV/AIDS crisis, which balanced out the number of positive factors also identified.

In line with the theory of this work, one of the major challenges in the control of HIV/AIDS is the inclusion and retention of HIV-positive individuals in the healthcare system, which points to difficulties in accessibility (Cabrera et al. 2019). In fact, for a period the decentralization of HIV/AIDS care created even larger barriers to accessing treatment, though this particular issue has since been resolved (Muñoz 2019). Structurally non-universal healthcare systems are expected to face greater challenges connecting to at-risk populations because of highly limited prior interactions caused by economic barriers to regular healthcare services. The expected result, then, is worse health outcomes in the structurally non-universal system compared to a universal one. Though causality cannot be determined, this relationship is supported both by the case study on Uruguay and the health outcomes data on Uruguay versus Chile, specifically for AIDS deaths per 100,000 people as it is most relevant to treatment accessibility.

Finally, looking at the results from the Chilean and Uruguayan analyses together, prominent similarities and differences in the positive and negative factors affecting both countries' capacities to confront the HIV/AIDS crisis come to light. First, Chile and Uruguay each struggle with the early diagnosis of HIV infections. This is a serious issue because individuals who are diagnosed later are sicker, arriving at a more advanced stage of infection and risk unknowingly infecting more people (Garrido 2018; Montes 2017).

Second, socioeconomic inequalities were mentioned as important factors leading to worse HIV/AIDS outcomes in both countries. For Chile, this was most clearly exemplified by the disparities in health between the indigenous Mapuche community and the rest of Chilean society (Alarcón et al. 2018). For Uruguay, this problem was highlighted in the large proportion of deceased AIDS patients characterized by little formal education and other economically precarious situations (Carrera et al. 2019).

Third, stigmatization due to lack of education on HIV/AIDS is also pervasive in both countries. Particularly, false beliefs on modes of transmission of the virus seem to be most prevalent (Ferrer et al. 2009; Osimani et al., n.d.). These misunderstandings are then tied to discrimination towards HIV-positive individuals (Garrido 2018).

On the other hand, several key differences exist between the experiences of Chile and Uruguay with HIV/AIDS. First, the source material on Chile seemed to identify far more negative social factors than the material on Uruguay. Chiefly these are the lack of political prioritization, machismo, and conservatism. In fact, research in Uruguay indicated that gender played no significant role in HIV/AIDS-related health disparities (Cabrera et al. 2019). It was specifically surprising to see no mention of social or political conservatism playing a role in Uruguay given the associations between HIV/AIDS and the gay community combined with the general assumption of strong religiosity within Latin American countries.

Second, Uruguay has taken meaningful steps with the introduction of rapid testing (Muñoz 2019). In contrast, the Chilean government has been slow to move on rapid testing (Ferrer et al. 2009; Mohor 2017). While both countries struggle with early diagnoses, this lack of rapid testing is especially salient in Chile, where obtaining test results is a complex and drawn-out process (Ferrer et al. 2009; Mohor 2017; Montes 2017).

Lastly, perhaps the most prominent difference between Chile and Uruguay is their distinct experiences with HIV/AIDS treatment. Chile is known for the high efficacy of its treatment programs, because of which the country has enjoyed the long-term benefit of declining HIV/AIDS mortality (Ferrer et al. 2009). The focus on treatment is so intense that Chile is even critiqued for not concentrating enough effort on upstream targets, such as prevention of new infections in the first place (Ferrer et al. 2009; Mohor 2017; Montes 2017; Stuardo 2017). On the other hand, one of Uruguay's key struggles in mitigating the effects of the crisis is the maintenance of treatment regimens among HIV-positive individuals (Cabrera et al. 2019).

While causal relationships cannot be deduced from this difference, the findings indicate that structural universality may cause significantly different health outcomes in the two countries. This is because AIDS treatment appears to be more accessible in Chile than in Uruguay, which arguably is a function of structurally universal healthcare in Chile and not in Uruguay. Therefore, the observed disparity in AIDS deaths per 100,000 people between Uruguay and Chile may be partially related to Chile's success and Uruguay's challenge with HIV/AIDS treatment.

Whether or not this difference is the result of fundamental organizational differences in the healthcare systems of the two countries is also difficult to know. However, since antiretroviral treatment is universally available in both countries, the question may then become

focused on accessibility to the healthcare system. Social mechanisms predict that structurally universal systems have stronger, more regular interactions with individuals, especially those in at-risk groups. This is expected to lead to a greater sense of comfort accessing the healthcare system in a health crisis, such as being diagnosed HIV-positive. In this sense, it is reasonable to suggest that Chile's structurally universal healthcare system has helped provide better HIV/AIDS health outcomes than Uruguay's structurally non-universal system.

CHAPTER IV: FINDINGS FROM THE REGRESSION ANALYSIS

In this chapter, I take a quantitative approach to examining the relationship between organizational differences in healthcare systems and infectious disease crisis outcomes. This analysis will be performed in the context of two different infectious disease crises: HIV/AIDS and COVID-19. The results presented in the regression tables below describe how well structural universality and the presence or absence of a national health service explain the observed variation in infectious disease crisis outcomes when the influence of other key predictor variables is controlled for. The models were produced using the package *stargazer* in R.

I first use the context of HIV/AIDS to look at the relationships between my central predictor variables, structural universality and the presence or absence of a national health service with the health outcome AIDS deaths per 100,000 people and the two policy outcomes: the existence of a national policy on free HIV testing and the existence of a national policy on HIV self-testing. I then mirror the process in the context of COVID-19. In this second case, the health outcome is COVID-19 deaths per one million people, and the policy outcome is the country's Containment and Health Index score.

The results of this regression analysis offer partial support for my hypotheses and theory. Specifically, strong evidence is found in favor of structurally universal healthcare leading to better health outcomes, especially when these findings are put in conversation with the results of the case study from Chapter III. I find some evidence of the expected relationships between structurally universal healthcare and policy outcomes, and the national health service and both health and policy outcomes. Structurally universal healthcare is associated with better policy outcomes in the context of COVID-19 but not HIV/AIDS. On the other hand, the NHS is associated with better health outcomes in the context of COVID-19 but not HIV/AIDS, and it is associated with better policy outcomes in the context of HIV/AIDS but not COVID-19. These mixed findings on policy outcomes for structural universality and the NHS suggest the existence of important underlying factors not accounted for that warrant further investigation, such as the impact of duration of the infectious disease crisis on the respective influences of structural universality and a NHS. The HIV/AIDS crisis that has been around for decades particularly

contrasts with the duration of the COVID-19 pandemic which has only gone on for a year in comparison.

I. Results on Health Care System and Course of HIV/AIDS Pandemic

In this section, I consider the results of several regression models relating the healthcare system organization variables, structural universality and the presence or absence of a national health service, to the health and policy outcomes from the HIV/AIDS crisis. These are tests of the hypotheses 1a, 2a, 1b, and 2b developed in Chapter 2. The health outcome under study is the number of AIDS deaths per 100,000 people, and the policy outcomes are the existence of a national policy guaranteeing free HIV testing and the existence of a national policy on HIV self-testing. Based on the regression findings, it appears that there is support for hypotheses 1a and 2b. These results imply that in the context of HIV/AIDS, countries with structurally universal healthcare systems experience better health outcomes than those that do not. I also find that countries with a national health service adopt policies more quickly than countries with any other system type.

HIV/AIDS Health Outcome

I first examine hypotheses 1a and 2a which respectively predict that countries with structurally universal healthcare systems will have better health outcomes during an infectious disease crisis than non-universal systems, and that countries with national health services will have better health outcomes than countries with other forms of structurally universal systems. I expect to see that structural universality and the presence or absence of a national health service are significantly related to the health outcome, AIDS deaths per 100,000 people. Second, I expect the regression coefficients of these variables, the slope of the line for a given predictor variable while controlling for all other predictor variables included in the model, to be *negative* and *significant*. Such a result indicates respectively that structurally universal systems or national health services are meaningfully correlated with lower numbers of AIDS deaths. Third, I expect the variable provision ownership to have similar associations as structural universality and the presence or absence of the NHS, but I expect that the regression coefficient for ownership to be *less negative* than it is for the NHS. This result indicates that there are meaningful differences

between healthcare systems with decentralized public ownership of the healthcare system and systems with centralized state-management that allow countries with a NHS to perform better. Finally, I investigate whether these associations hold conditional on other likely determinants of both health care system features and epidemic outcomes.

Tables 1 and 2 are used in this analysis, where table 1 considers the healthcare system organization variables of provision ownership and structural universality and table 2 considers the variables of structural universality and the presence or absence of the NHS. Reading the tables, the regression coefficients of the healthcare system organization variables reflect how switching to the listed condition (public ownership, universal coverage, national health service) from the opposite condition (mixed ownership, non-universal coverage, absence of a national health service) affects the number of AIDS deaths per 100,000 people. For the control variables, the regression coefficients reflect the effect of their increase (e.g., increasing log GDP per capita, increasing Human Development Index score).

Table 1 presents the results of 3 regression models examining the relationship between the healthcare system organization variables of provision ownership and structural universality and the number of AIDS deaths per 100,000 people in a given country. Models 1, 2, and 3 of table 1 are each found to be significant combinations of predictors for explaining the data, as given by their F Statistics. The R^2 value is also seen to increase across the models as control variables are added. Model 1 tests the relationship between the explanatory variables of interest to this study without any controls against the health outcome of AIDS deaths per 100,000 people. Model 2 includes the control variables of GDP per capita, Gini coefficient values, and Human Development Index values. Model 3 builds on Model 2 controls with Gender Inequality Index values, progressivism as measured through tolerance of gay and lesbian individuals in society, income group, geographical region fixed effects, and year fixed effects. The data covers the years from 1990 to 2017.

Table 1

	Dependent variable:		
	log AIDS deaths per 100k		
	(1)	(2)	(3)
Public ownership	1.035***	0.978***	0.991***
	(0.095)	(0.083)	(0.078)
Universal coverage	-1.836***	-0.267***	-0.225***
	(0.078)	(0.076)	(0.079)
log GDP per capita		0.236***	0.148***
		(0.019)	(0.024)
Gini coef.		0.106***	0.036***
		(0.004)	(0.007)
Human Dev Index		-9.402***	-4.187***
		(0.285)	(0.976)
Gender Ineq Index			2.548***
			(0.587)
Progressivism			1.327***
			(0.171)
Constant	1.717***	1.190***	-1.315
	(0.055)	(0.277)	(0.911)
Observations	3,304	2,968	2,324
R^2	0.145	0.536	0.679
Adjusted R^2	0.144	0.536	0.673
Residual Std. Error	2.067 (df = 3301)	1.546 (df = 2962)	1.306 (df = 2280)
F Statistic	279.406*** (df = 2; 3301)	685.548*** (df = 5; 2962)	112.294*** (df = 43; 2280)
Note:			*p<0.1; **p<0.05; ***p<0.01

The first finding from table 1 is that changing from mixed (public and private) healthcare provision ownership to public ownership is both significant and positive across the three models. When all the considered control variables are applied in model 3, countries with public ownership had an average of 99% more AIDS deaths per 100,000 people in any given period. Therefore, government ownership of the sources of healthcare provision is not associated with improved health outcomes as represented by deaths caused by AIDS. This result disagrees with the theory that political incentives will be greater and communication ties will be stronger within a state-owned system, but it must also be compared to the relationship between presence of a national health service and this health outcome.

Turning now to the second finding on structural universality, when shifting from a non-universal system to a universal system, negative and significant coefficients are observed across all three models in table 1. According to the table values moving from a non-structurally universal system to a structurally universal system decreases the predicted number of AIDS deaths per 100,000 by about 23% when the smaller set of controls is included. This finding is similar even with the inclusion of the additional controls and fixed effects in model 3. This result lends support to the central theory of this work that organizational differences within healthcare systems meaningfully influence a country's ability to mitigate the effects of an infectious disease crisis, and, moreover, that guaranteeing universal inclusion in the system leads to better outcomes.

Moving on to table 2, it contains the results of 3 regression models now examining the relationship between the healthcare system organization variables of structural universality (as before) and the presence of absence of a national health service and the number of AIDS deaths per 100,000 people in a given country. All three models represent significant combinations of predictor variables based on their F statistics, and an increasing R^2 across the models shows that a growing portion of the variance in AIDS deaths is explained as controls are added. As in Table 1, the first model of table 2 examines the relationship between the central explanatory variables without any controls against the health outcome of AIDS deaths per 100,00 people. Model 2 includes the control variables of GDP per capita, Gini coefficient values, and Human Development Index values. Model 3 adds the controls for gender inequality, progressivism, income group, geographical region fixed effects, and year fixed effects. The data covers the years from 1990 to 2017.

Table 2

	Dependent variable:		
	log AIDS deaths per 100k		
	(1)	(2)	(3)
Universal coverage	-1.886***	-0.394***	-0.366***
	(0.078)	(0.076)	(0.079)
National Health Service	1.183***	1.219***	1.276***
	(0.098)	(0.085)	(0.081)
log GDP per capita		0.233***	0.129***
		(0.018)	(0.024)
Gini coef.		0.104***	0.038***
		(0.004)	(0.007)
Human Dev Index		-9.139***	-4.345***
		(0.282)	(0.959)
Gender Ineq Index			2.328***
			(0.576)
Progressivism			1.183***
			(0.168)
Constant	1.734***	1.143***	-0.727
	(0.055)	(0.273)	(0.893)
Observations	3,304	2,968	2,324
R^2	0.151	0.546	0.690
Adjusted R^2	0.151	0.545	0.684
Residual Std. Error	2.059 (df = 3301)	1.530 (df = 2962)	1.284 (df = 2280)
F Statistic	294.101*** (df = 2; 3301)	712.279*** (df = 5; 2962)	117.969*** (df = 43; 2280)
Note:			*p<0.1; **p<0.05; ***p<0.01

The first finding from this table is that structurally universal systems have a significant and negative relationship with AIDS deaths. This result mirrors the observation on structural universality from table 1, except the magnitude of the coefficients are slightly larger. For example, based on the numbers from model 3, countries with structurally universal systems had an average of about 37% fewer AIDS deaths per 100,000 people in any given period versus 23% fewer deaths from table 1. Again, these findings support the theory that structural universality plays an important role in determining health outcomes in an infectious disease crisis and that structurally universal systems see better outcomes than non-universal ones.

The second finding is that the models show no support that changing from the absence of a national health service to the presence of a national health service improves health outcomes, a result upheld across all three models. Intriguingly, just the opposite is observed – the national health service has a significant positive correlation with AIDS deaths not expected from the theory and in contrast to the findings on structural universality. The magnitude of the increase in AIDS deaths is also larger than was observed for public ownership alone, 128% compared to 99% and both associations are positive.

Taken together, the findings from tables 1 and 2 indicate partial support for hypotheses 1a and 2a. The results on structural universality fully back up hypothesis 1a because moving from non-universal to universal appears to improve health outcomes, represented by decreasing AIDS deaths. However, the findings on ownership and the national health service do not support hypothesis 2a, because both state ownership and the presence of the national health service correlate with increased deaths. The coefficient for the national health service was also more positive than public ownership, which suggests that centralized state management plays a detrimental role in overall country health performance.

HIV/AIDS Policy Outcomes

I now move on to analyze hypotheses 1b and 2b which posit that countries with structurally universal healthcare systems will adopt policy interventions more quickly than non-universal healthcare systems and, second, that countries with national health services will lead in passing policy measures overall. The policy outcomes employed concern the national policy on the cost of HIV testing and the presence or absence of a national policy on HIV self-testing. Based on these hypotheses, I expect the models to exhibit overall significance, that these

predictor variables explain the observed policy outcomes better than chance alone. I also expect the regression coefficients of the central explanatory variables – ownership, structural universality, and national health service – to be *positive* and *significant*. This finding suggests that countries with public ownership of the healthcare system, structural universality, or a national health service have adopted free HIV testing and HIV self-testing policy at a higher frequency than those with mixed ownership, structurally non-universal systems, or without national health services, respectively.

Tables 3 and 4 are used in this analysis. Table 3 employs the healthcare system organization variables of provision ownership and structural universality, and table 4 employs the variables of structural universality and the presence or absence of the NHS. The tables 3 and 4 should be read using the same method described for tables 1 and 2. The dependent variable corresponds to a given country possessing the listed policy outcome, a national policy on free HIV testing and a national policy on HIV self-testing.

Table 3 presents the findings from 4 regression models that look at the correlations between the explanatory variables provision ownership and structural universality and the policy outcomes on HIV testing. The first two models focus on the presence of a national policy guaranteeing free HIV testing, and the second two models focus on the presence of a national policy on HIV self-testing. Both model pairs are structured the same way, such that the first model in the pair (models 1 and 3) test the relationship between the healthcare system organization variables and the policy outcome without any controls. The second model in the pair (models 2 and 4) bring in the control variables GDP per capita, Gini coefficient values, Human Development Index values, Gender Inequality Index values, progressivism as measured through tolerance of gay and lesbian individuals in society, income group, and geographical region fixed effects.

Table 3

	Dependent variable:			
	Free HIV testing		HIV testing policy	
	(1)	(2)	(3)	(4)
Public ownership	0.244**	0.335***	-0.134	0.033
	(0.107)	(0.123)	(0.122)	(0.148)
Universal coverage	-0.517***	-0.258**	0.061	0.041
	(0.087)	(0.125)	(0.099)	(0.150)
log GDP per capita		-0.016		0.102**
		(0.038)		(0.045)
Gini coef.		-0.018*		-0.003
		(0.011)		(0.013)
Human Dev Index		1.756		-1.405
		(1.540)		(1.845)
Gender Ineq Index		0.653		-1.046
		(0.928)		(1.112)
Progressivism		0.136		0.383
		(0.272)		(0.326)
Constant	0.791***	-0.670	0.478***	0.364
	(0.060)	(1.430)	(0.068)	(1.713)
Observations	122	85	122	85
R^2	0.230	0.499	0.010	0.285
Adjusted R^2	0.217	0.382	-0.006	0.117
Residual Std. Error	0.441 (df = 119)	0.393 (df = 68)	0.503 (df = 119)	0.471 (df = 68)
F Statistic	17.737*** (df = 2; 119)	4.240*** (df = 16; 68)	0.622 (df = 2; 119)	1.693* (df = 16; 68)
Note:				*p<0.1; **p<0.05; ***p<0.01

Models 1, 2, and 4 are found to be significant combinations of predictor variables, though at different levels of significance (0.01, 0.01, and 0.1 respectively). Model 3 is not significant based on the value of its F statistic. The R^2 value also increases across the model pairs as controls are added, though it takes on a larger size in models 1 and 2 versus models 3 and 4, meaning the first model pair explains more of the variance in presence or absence of national policy on free HIV testing than the second model pair explains for the presence or absence of a national policy on HIV self-testing. The policy data was last actualized based on the WHO policy data 2019 (models 1 and 2) and the UNAIDS National Commitments and Policy Instrument 2019 (models 3 and 4). So, the regression models reflect the state of these policy outcomes in 2019 (or with the otherwise most recent data if data for 2019 was unavailable).

The first finding from table 3 is that public ownership correlates positively and significantly with the existence of a national policy on free HIV testing. According to the coefficient observed in model 2, switching from mixed public/private ownership to public ownership increases the probability for a national policy on free HIV testing by 36% when the controls are considered.

Somewhat similarly, model 4 indicates that public ownership increases the probability for a national policy on HIV self-testing by 3%. However, the coefficient is negative in model 3, and neither model 3 or 4 are significant for the provision ownership variable. In general, these results, especially those from models 1 and 2, show that government ownership of the sources of healthcare provision, even without the full character of a national health service is associated with improved policy outcomes.

Regarding the second finding on structural universality when shifting from a non-universal system to a universal system, negative and significant coefficients indicate that universal systems are less likely to offer free HIV testing to all. According to model 2, which takes into account the influences of the control variables, structurally universal systems decrease the probability of a national policy making HIV testing free by 23%. This result contradicts the expectations for hypothesis 1b which predicts that structurally universal systems will significantly improve the likelihood that this policy exists.

On the other hand, small but positive coefficients are observed in models 3 and 4, indicating that structurally universal systems correlate with an increase in the probability that a given country will have a national HIV self-testing policy. According to model 4, the increase is

4% when the controls are considered. However, as seen in the analysis of public ownership above, neither regression coefficients for structural universality in models 3 nor 4 are significant. This indicates that structural universality does not meaningfully explain the variation in the presence or absence of a national policy on self-testing.

Table 4 presents the results of 4 regression models that characterize the relationships between the healthcare system organization variables structural universality and the presence of absence of a national health service and the same policy outcomes from table 3. Based on the F statistics, models 1, 2, and 4 are found to be significant (though at the differing levels of 0.01, 0.01, and 0.1 respectively) and model 3 is not significant. R^2 also increases with the inclusion of control variables.

Table 4

	Dependent variable:			
	Free HIV testing		HIV testing policy	
	(1)	(2)	(3)	(4)
Universal coverage	-0.527***	-0.276**	0.046	0.007
	(0.087)	(0.128)	(0.100)	(0.153)
National Health Service	0.274**	0.359***	-0.083	0.115
	(0.111)	(0.131)	(0.127)	(0.157)
log GDP per capita		-0.024		0.103**
		(0.037)		(0.045)
Gini coef.		-0.018*		-0.003
		(0.011)		(0.013)
Human Dev Index		1.671		-1.377
		(1.537)		(1.837)
Gender Ineq Index		0.557		-1.029
		(0.925)		(1.105)
Progressivism		0.094		0.371
		(0.272)		(0.325)
Constant	0.795***	-0.440	0.474***	0.349
	(0.059)	(1.422)	(0.068)	(1.699)
Observations	122	85	122	85
R^2	0.235	0.500	0.004	0.290
Adjusted R^2	0.222	0.383	-0.013	0.123
Residual Std. Error	0.440 (df = 119)	0.393 (df = 68)	0.505 (df = 119)	0.469 (df = 68)
F Statistic	18.299*** (df = 2; 119)	4.256*** (df = 16; 68)	0.236 (df = 2; 119)	1.735* (df = 16; 68)
Note:				*p<0.1; **p<0.05; ***p<0.01

The first finding from table 4 is that for the outcome concerning free HIV testing policy, structurally universal systems have a significant and negative correlation. They also have a very small positive correlation with the existence of a national policy on HIV self-testing. These results mirror the findings on structural universality from table 3, meaning that they do not lend support to hypothesis 1b either.

The second finding from table 4 is that the presence of a national health service correlates both positively and significantly with free HIV testing and positively with the existence of a national policy on self-testing when controls are accounted for. These results lend support to hypothesis 2b by indicating that a national health service more likely has implemented free testing for all and adopted a national self-testing policy than other types of healthcare systems. Specifically, countries with a national health service increase their probability of having a national policy on free HIV testing by 36%. Likewise, countries with a national health service increase their probability of having a national policy on HIV self-testing by 12%. It also closely aligns with the results on public ownership which saw similar correlation patterning across the 4 models, though the observed values were always more positive for the national health service. This suggests that the unique combination in a national health service of both public ownership and centralized state management is more important than provision ownership alone. For example, a notably large difference between the two variables can be observed in their coefficients related to a national policy on HIV self-testing. A 3% increase in probability for the existence of a self-testing policy is associated with public ownership compared to a 12% increase in probability associated with the national health service.

Looking at the findings of tables 3 and 4, there is no support for hypothesis 1b, but there is support for hypothesis 2b. Structural universality has a significant negative correlation with free HIV testing in both tables, which opposes the predicted positive outcome from hypothesis 1b. Also, although a positive coefficient for a national policy on HIV self-testing was produced when the controls were considered, the lack of significance in models 3 and 4 indicates that structural universality does not play a role. On the other hand, the results on the national health service from both policy outcomes bolster hypothesis 2b since switching from the absence to the presence of a nation health service positively correlates with having a national self-testing policy and a policy for free HIV testing for all, though it should be noted that the association with having a national self-testing policy is not significant. Very similar patterns in coefficient values

for both provision ownership and the presence or absence of the national health service are observed. However, the national health service variable coefficients were slightly more in line with expectations based on the hypotheses, which points to centralized state management being a key dimension influencing the impact of that national health service on infectious disease crisis outcomes.

Summary of findings on HIV/AIDS

Based on the findings from the HIV/AIDS quantitative analysis, I find partial support for my theory on the importance of organizational differences in healthcare systems for the control of the health and policy impacts of an infectious disease crisis. Countries with structurally universal healthcare systems appear to have better health outcomes on average than those with non-universal healthcare systems. In this case, this meant that countries with structurally universal systems had on average fewer AIDS deaths in any given period. This result suggests that there is validity in my argument that structurally universal systems have particular social, communicative, and economic advantages over their counterparts that aid in the mitigation of the population health impacts of an infectious disease crisis. Likely, these advantages look like a greater accessibility to health services for at-risk groups, a strong existing relationship between the healthcare system and the government, and a decreased fear of healthcare costs among individuals.

Furthermore, countries with national health services appear to have better policy outcomes on average than all other system types. Specifically, countries with a NHS had a higher probability of guaranteeing free HIV testing through policy mandate and a higher probability of possessing a national policy on HIV self-testing than countries without a NHS. This result backs up my theory that governments overseeing a NHS will have particular political incentives to support the healthcare system in an infectious disease crisis, leading to faster policy adoption aimed at controlling the crisis.

While I did not find support for my theory concerning the role of the national health service in controlling the health outcomes of an infectious disease crisis or the influence of structural universality on policy outcomes, there may be a few explanations for this result. For example, the national health service might not have been as meaningful for health outcomes in such a drawn-out pandemic, where long-term accessibility issues are more controlled by

structural universality than political incentives to encourage more people to access healthcare services. Similarly, structurally universal healthcare may not be as relevant for policy outcomes in a long-term crisis as it is in generating immediate policy responses. Lastly, by the nature of a large-N regression study, there may be other confounding variables or spatial and temporal influences not accounted for in this study that impact the results.

II. Results on Health Care System and the COVID-19 Pandemic

In this section, I similarly analyze my hypotheses 1a, 2a, 1b, and 2b through the results of various regressions relating the healthcare system organization variables structural universality and the presence or absence of a national health service in the context of COVID-19. The health outcome in this case is the number of COVID-19 deaths per one million people, and the policy outcome is the score on the Containment and Health Index. Based on the results of the regression analysis, I find partial support for hypothesis 1a and full support for hypotheses 2a and 1b. In the context of COVID-19, these results first suggest that structurally universal healthcare may be an important factor for mitigating the health impacts of an infectious disease crisis. Second, they also suggest that structurally universal healthcare leads to stronger policy responses from the government. Lastly, these findings suggest that the national health service system type is the best at mitigating the health impacts of an infectious disease crisis.

COVID-19 Health Outcome

To begin, I analyze the hypotheses 1a and 2a through the results presented in tables 5 and 6. These hypotheses state, first, that countries with structurally universal healthcare systems will have better health outcomes during an infectious disease crisis than non-universal systems and, second, that countries with national health services will have better health outcomes than countries with other forms of structurally universal systems. Considering the tables with these hypotheses in mind, I expect the models to demonstrate overall significant relationships with the health outcome COVID-19 deaths per one million people, when the predictor variables are considered together. I also expect the regression coefficients of the central predictors of this study – structural universality and the presence or absence of a national health service – to be *negative* and *significant*. Note that this is the same expectation from table 1 because switching to

a structurally universal system or a national health service should correlate with a decrease in disease-related deaths. Third, I expect the variable provision ownership to demonstrate correlations similar to structural universality and the presence or absence of the NHS, but I expect that the regression coefficient for ownership to be *less negative* than it is for the NHS. This result indicates that centralized state-management plays a key part in the influence of the NHS on health outcomes. Finally, I investigate whether these associations hold conditional on other likely determinants of both health care system features and epidemic outcomes.

Tables 5 and 6 are used to examine hypotheses 1a and 2a in the context of COVID-19, where table 5 considers the healthcare system organization variables of provision ownership and structural universality and table 6 considers the variables of structural universality and the presence or absence of the NHS. The tables should be read the same way as tables 1 and 2; the regression coefficients of the healthcare system organization variables reflect how switching to the listed condition (public ownership, universal coverage, national health service) from the opposite condition (mixed ownership, non-universal coverage, absence of a national health service) affects the number of COVID-19 deaths per 1 million people. For the control variables, the regression coefficients reflect the effect of their increase (e.g., increasing log GDP per capita, increasing Human Development Index score).

Table 5 contains the results of 3 regression models examining the relationship between the healthcare system organization variables of provision ownership and structural universality and the number of COVID-19 deaths per 1 million people in a given country. Models 1, 2, and 3 of table 5 are each found to be significant combinations of predictors for explaining the data, based on their F Statistics. Model 1 tests the relationship between the explanatory variables of interest to this study without any controls against the health outcome of COVID-19 deaths per 1 million people. Model 2 includes the control variables the smaller set of controls and Model 3 includes the complete set of controls. The data ranges over the eighth week of 2020 to the fourth week of 2021 roughly the end of February through January of the following year).

Table 5

	Dependent variable:		
	log COVID-19 deaths per 1M		
	(1)	(2)	(3)
Public ownership	-0.765***	-0.113	-0.466***
	(0.123)	(0.124)	(0.116)
Universal coverage	0.902***	-0.252**	-0.021
	(0.099)	(0.112)	(0.119)
log GDP per capita		0.056*	0.515***
		(0.030)	(0.036)
Gini coef.		0.060***	0.063***
		(0.006)	(0.010)
Human Dev Index		9.004***	5.070***
		(0.413)	(1.456)
Gender Ineq Index			0.041
			(0.871)
Progressivism			-0.547**
			(0.255)
Constant	-0.592***	-9.447***	-17.016***
	(0.069)	(0.421)	(1.345)
Observations	5,254	4,665	3,809
R^2	0.017	0.155	0.364
Adjusted R^2	0.017	0.154	0.361
Residual Std. Error	3.321 (df = 5251)	2.870 (df = 4659)	2.496 (df = 3791)
F Statistic	46.764*** (df = 2; 5251)	171.350*** (df = 5; 4659)	127.791*** (df = 17; 3791)
Note:			*p<0.1; **p<0.05; ***p<0.01

Beginning with public ownership, the first finding from table 5 is that changing from mixed public and private ownership to public ownership of healthcare provision correlates to a decrease in COVID-19 deaths, though the calculated regression coefficient is only significant in models 1 and 3. This indicates that ownership does play a meaningful role in mitigating health impacts of an infectious disease crisis, including when the influences of the other predictor variables are accounted for. For example, when all the control variables are added in model 3, publicly owned healthcare systems show an average of 47% fewer COVID-19 deaths in any given period. This result lends support to the theory behind hypothesis 2a which posits that increased government involvement in the healthcare system will better the health outcomes in an infectious disease crisis because of increased political incentives to maintain the healthcare system and a precedent history of collaboration and communication between the healthcare system and government.

The second finding from table 5 is a partially developed pattern relating to structural universality and decreasing COVID-19 deaths. While a large, positive, and significant coefficient is observed in model 1, the sign switches to become negative when control variables are added in models 2 and 3. That is, when the controls are taken into account, structurally universal systems are associated with a smaller number of COVID-19 deaths. Specifically, based on the output from model 3, moving from a structurally non-universal system to a structurally universal system decreases the average number of COVID-19 deaths by 2% in any given period. However, the coefficient is not significant in model 3. Therefore, though not found to be a significant association, the negative sign of the correlation matches the expected result for structural universality. Taken together, there appears to be partial support for hypothesis 1a which predicts that structurally universal systems should meaningfully decrease the number of COVID-19 deaths.

Moving on to table 6, it presents the results of 3 regression models that now examine the relationship between the healthcare system organization variables of structural universality and the presence of absence of a national health service and the number COVID-19 deaths per 1 million people. Structural universality does not appear to influence COVID-19 deaths either positively or negatively based on this output. The regression coefficient is positive and significant in model 1 and negative and significant in model 2. However, according to model 3, when all the controls are considered, switching from a structurally non-universal healthcare

system to a universal one does not appear to change the number of COVID-19 deaths in any given period with a regression coefficient corresponding to a change of 0%. This coefficient, though, was not significant. The presence of a national health service correlates negatively with COVID-19 deaths per 1 million people and significantly in models 1 and 3. These results mean that switching from the absence of a national health service to its presence is associated with better health outcomes. This result fulfills the expectations from hypothesis 2a which posits that countries with state owned and managed healthcare systems will experience the best health outcomes over any other system type. Of note, the magnitude of the decrease in COVID-19 deaths is greater for the national health service than for public ownership alone. Based on the model 3 output in tables 5 and 6, this is a difference of 3% (50% - 47%), which suggests that the dimension of centralized management plays a meaningful role alongside public ownership in the impact of the national health service on infectious disease health outcomes.

Table 6

	Dependent variable:		
	log COVID-19 deaths per 1M		
	(1)	(2)	(3)
Universal coverage	0.823***	-0.268**	0.003
	(0.100)	(0.114)	(0.121)
National Health Service	-0.481***	-0.066	-0.501***
	(0.129)	(0.129)	(0.123)
log GDP per capita		0.061**	0.527***
		(0.029)	(0.036)
Gini coef.		0.060***	0.062***
		(0.006)	(0.010)
Human Dev Index		8.982***	5.172***
		(0.413)	(1.455)
Gender Ineq Index			0.168
			(0.870)
Progressivism			-0.489*
			(0.255)
Constant	-0.611***	-9.489***	-17.334***
	(0.069)	(0.419)	(1.339)
Observations	5,254	4,665	3,809
R^2	0.013	0.155	0.364
Adjusted R^2	0.013	0.154	0.362
Residual Std. Error	3.329 (df = 5251)	2.871 (df = 4659)	2.496 (df = 3791)
F Statistic	34.410*** (df = 2; 5251)	171.215*** (df = 5; 4659)	127.834*** (df = 17; 3791)
Note:			*p<0.1; **p<0.05; ***p<0.01

As a whole, the findings from tables 5 and 6 show partial support for hypothesis 1a and full support for hypothesis 2a. Structural universality correlates negatively with COVID-19 deaths per 1 million people in table 5 when control variables are added, although the results of model 3 are not significant. While output from table 6 indicates that structural universality did not impact the number of deaths, the formerly mentioned findings partially support the hypothesis that countries with structurally universal healthcare systems experience better health outcomes in an infectious disease crisis.

Hypothesis 2a is also supported since correlations between the national health service and COVID-19 deaths are negative and significant, as seen in table 6. Therefore, the findings indicate that countries with a national health service have better health outcomes than those that do not, meeting the hypothesized expectations. Moreover, public ownership also had negative and significant correlations with disease deaths, but since the magnitude of the decrease was greater for the national health service, it appears that centralized state management of the healthcare system is a meaningful dimension of the national health service besides public ownership.

COVID-19 Policy Outcome

I now turn to my analysis of hypotheses 1b and 2b in the context of COVID-19. These two hypotheses respectively predict that countries with structurally universal healthcare systems will adopt policy measures faster during an infectious disease crisis than non-universal systems, and that countries with national health services will lead in passing policy measures overall. The policy outcome variable used in this study is the Containment and Health Index, a measure of severity over thirteen policy areas related to COVID-19. The index scores range from zero to one hundred, with larger numbers indicating a stricter policy response (Hale et al. 2020). I expect the regression coefficients for the explanatory variables, structural universality and presence or absence of a national health service, to be *positive* and *significant*. Such values would indicate that these predictor variables meaningfully correlate with policy creation and increasing policy strictness. I also expect to observe correlations for the variable provision ownership similar to those of structural universality and the presence or absence of the NHS, but I expect that the regression coefficient for ownership to be *less positive* than it is for the NHS. This would indicate that the dimension of state ownership in the NHS alone does not account for this system

type's influence on infectious disease crisis policy outcomes and that centralized state management matters as well.

Tables 7 and 8 are used in this analysis. Table 7 employs the healthcare system organization variables of provision ownership and structural universality, and table 8 employs the variables of structural universality and the presence or absence of the national health service. The tables 7 and 8 should be read using the same method described for tables 5 and 6. However, the dependent variable in this case is measured by index scores that range from zero to one hundred, increasing with policy creation and policy severity. Therefore, I note that "better" policy outcomes as understood in this work correspond to larger index values, and thus positive coefficients.

Table 7 presents the results of 3 regression models examining the relationship between the healthcare system organization variables of provision ownership and structural universality and the Containment and Health Index score in a given country. As bove, the data ranges over the eighth week of 2020 to the fourth week of 2021 roughly the end of February through January of the following year).

Table 7

	Dependent variable:		
	Containment and Health Index Score		
	(1)	(2)	(3)
Public ownership	-1.763***	-0.857	-1.162
	(0.634)	(0.705)	(0.754)
Universal coverage	0.984**	1.700***	1.627**
	(0.500)	(0.636)	(0.764)
log GDP per capita		1.246***	1.654***
		(0.168)	(0.228)
Gini coef.		0.249***	0.156**
		(0.036)	(0.066)
Human Dev Index		-10.220***	15.848*
		(2.369)	(9.422)
Gender Ineq Index			31.886***
			(5.679)
Progressivism			1.793
			(1.647)
Constant	55.017***	38.236***	0.480
	(0.345)	(2.374)	(8.745)
Observations	5,802	5,194	4,185
R^2	0.001	0.027	0.090
Adjusted R^2	0.001	0.026	0.087
Residual Std. Error	17.471 (df = 5799)	17.205 (df = 5188)	16.897 (df = 4167)
F Statistic	4.342** (df = 2; 5799)	29.141*** (df = 5; 5188)	24.353*** (df = 17; 4167)
Note:			*p<0.1; **p<0.05; ***p<0.01

Beginning with the switch from more mixed or private healthcare provision ownership to public ownership, the first finding from table 7 is that this change appears to decrease Containment and Health Index scores, though the significance of the correlations disappears as control variables are taken into consideration. That is, although countries with publicly owned healthcare systems had an average of 1 less point on the Containment and Health Index in any given period, this finding is not significant. These results suggest that public ownership of healthcare provision does not meaningfully impact infectious disease crisis policy outcomes. While this does not contradict the expectations for hypothesis 2b, it does not lend support to it either.

Second from table 7, switching from a structurally non-universal system to a universal system correlates positively and significantly with Containment and Health Index scores across all three models. According to model 3, in which the influences of the control variables are accounted for, countries with structurally universal systems had an average Containment and Health Index score 2 points higher than countries with structurally non-universal systems in any given period. This result aligns with the expectations from hypothesis 1b and suggests that structurally universal healthcare systems lead to more and/or stronger relevant policy responses in an infectious disease crisis.

Turning to table 8, Model 1 tests the relationship between the explanatory variables of structural universality and the presence or absence of a national health service without any controls against Containment and Health Index values. The first finding is that structurally universal systems correlate with an increase in Containment and Health Index scores over all 3 models, and the association is significant in models 2 and 3. These results mirror the output on structural universality in table 7 and support hypothesis 1b. Specifically, countries with structurally universal healthcare systems score an average of 1 point higher on the Containment and Health Index in any given period, which suggests that countries with structurally universal systems experience better policy outcomes than those that do not.

Table 8

	Dependent variable:		
	Containment and Health Index Score		
	(1)	(2)	(3)
Universal coverage	0.451	1.463**	1.499*
	(0.498)	(0.649)	(0.780)
National Health Service	-0.007	-0.196	-0.762
	(0.644)	(0.736)	(0.800)
log GDP per capita		1.299***	1.693***
		(0.165)	(0.226)
Gini coef.		0.248***	0.156**
		(0.036)	(0.066)
Human Dev Index		-10.396***	16.208*
		(2.366)	(9.419)
Gender Ineq Index			32.330***
			(5.669)
Progressivism			1.931
			(1.646)
Constant	54.980***	37.761***	-0.435
	(0.345)	(2.362)	(8.718)
Observations	5,802	5,194	4,185
R^2	0.0002	0.027	0.090
Adjusted R^2	-0.0002	0.026	0.086
Residual Std. Error	17.482 (df = 5799)	17.207 (df = 5188)	16.900 (df = 4167)
F Statistic	0.473 (df = 2; 5799)	28.852*** (df = 5; 5188)	24.259*** (df = 17; 4167)
Note:			*p<0.1; **p<0.05; ***p<0.01

The second finding from table 8 is that the presence of a national health service has a negative association with Containment and Health Index scores, as is seen across all three models. When the control variables are considered in model 3, the coefficient shows that countries with a national health service had an average of 1 less point on the Containment and Health Index in any given period than countries with other system types. However, none of the coefficients are significant. Reflecting the findings on public ownership from table 7, these results suggest that the national health service does not meaningfully impact infectious disease crisis policy outcomes. Again, though this does not contradict the expectations for hypothesis 2b, it does not lend support to it either. However, while the coefficients for both public ownership and the presence of a national health service are negative, the observed values are more negative (that is, less positive, as expected) for public ownership. This suggests that the dimension of centralized state management in the national health service plays an important role in improving policy outcomes.

Taken together, the findings from tables 7 and 8 fully support hypothesis 1b, and they do not support hypothesis 2b. Structurally universal healthcare has a significant and positive correlation with Containment and Health Index scores. This association is seen both in tables 7 and 8. It also indicates that countries with structurally universal healthcare systems will respond quicker and more forcefully in policy to an infectious disease crisis, reflecting the expectations from hypothesis 1b.

On the other hand, negative coefficients lacking significance were observed for the presence of a national health service. This finding does not match the expectations for hypothesis 2b which predicts that countries with a national health service will have the strongest policy response on any healthcare system type. However, it should be noted that comparison of the coefficients for public ownership and the national health service show that the association with Containment and Health Index values was less negative for the national health service. This difference indicates that centralized state ownership, in fact, is related to better policy outcomes while the other dimension of the national health service, public ownership, is not.

Summary of findings on COVID-19

Similar to my findings on HIV/AIDS, I find partial support for my theory on the importance of organizational differences in healthcare systems for the control of the health and

policy impacts of an infectious disease crisis from the COVID-19 regression analysis. Structurally universal healthcare again seems to be associated with better health outcomes, meaning fewer COVID-19 deaths versus structurally non-universal healthcare. This result backs up the argument contained in my theory that structurally universal healthcare systems have certain specific advantages that allow them to perform better than their counterparts in controlling the health effects of an infectious disease crisis.

Like structurally universal healthcare, the national health service is associated with better health outcomes, too. This finding supports my argument that the dimensions of public ownership and centralized state management present in the NHS especially incentivizes the government to first ensure that health services are accessible for all people and second to protect the healthcare system in times of crisis.

Also, structurally universal healthcare systems are associated with better policy outcomes on average that their counterparts. In the case of COVID-19, this means that the Containment and Health Index scores for countries with structurally universal healthcare systems were higher than those with non-structurally universal systems in any given period. This result appears to validate my argument that government responses come more swiftly and strongly when the healthcare system is structurally universal because of stronger communication channels between the government and the healthcare system. The demand for policy creation toward the end of controlling the infectious disease crisis can be clearly transmitted by the healthcare system in this case.

Particularly surprising was not finding support for my theory concerning the role of the national health service in controlling the policy outcomes of an infectious disease crisis, though there may be a few explanations for this result. It is possible that the national health service is a stronger driver of policy outcomes in the long-term rather than the short-term, which would not be observed in this study since the COVID-19 crisis is ongoing. Furthermore, by the nature of a large-N regression study, there may be other confounding variables or spatial and temporal influences not accounted for in this study that impact the results. Of note, one of these may be the fact that data collection ended with January 2021, which may give a non-representative view of the state of the pandemic since different regions of the world experienced waves at different times.

III. Evaluating the Findings Overall

In looking at the regression analysis results overall, I find partial support for my theory. I see across both disease contexts, HIV/AIDS and COVID-19, an apparent pattern between structurally universal healthcare and better health outcomes. Specifically, this system type was associated with fewer infectious disease related deaths in both cases. This finding is buttressed by the results of my case comparison between Chile and Uruguay which indicates that Chile's structurally universal system contributed to fewer AIDS deaths, specifically because of higher retention rates with continuing antiretroviral treatment. Therefore, there appears to be strong and consistent support for a relationship between structural universality and infectious disease crisis health outcomes.

I also find partial support for the role of the national health service in improving infectious disease crisis health and policy outcomes. In the case of COVID-19 the NHS was associated with better health outcomes, and in the case of HIV/AIDS it was associated with better policy outcomes. However, the inverse relationships were also observed: the NHS was associated with lower Containment and Health Index scores for COVID-19 (though lacking significance) and more deaths in the context of HIV/AIDS. Therefore, there appears to be a more complex relationship between the NHS and these outcomes than initially hypothesized.

Similarly, I also find partial support for the influence of structural universality on infectious disease crisis policy outcomes. Specifically, structurally universal healthcare was associated with higher Containment and Health Index scores in the COVID-19 analysis but also with negative and insignificant relationships with the existence of a policy for free HIV testing and a policy on HIV self-testing respectively in the context of HIV/AIDS. Again, it seems like the influence of structural universality is complicated and dependent on many other factors likely not investigated in this study.

Based on these results, I find my overarching theory between organizational differences and healthcare systems to be partially supported. As mentioned, structurally universal healthcare appears to have a recognizable relationship with better health outcomes, an influence likely caused by specific social, economic, communicative, and political advantages of this system type over its counterpart. Indeed, the importance of regular access to health services highlighted in the case comparison between Chile and Uruguay suggests that social mechanisms that allow a

structurally universal system to interact more regularly with at-risk groups is one of structurally universal healthcare's central advantages.

The mixed results relating structural universality to policy outcomes and the national health service to both health and policy outcomes indicate the existence of certain gaps in the theory about the particular contexts in which these organizational differences work to mitigate the effects of an infectious disease crisis. Specifically, short-term versus long-term policy creation may be an important facet missing from the theory on infectious disease crisis policy outcomes.

An interesting finding from the regression analysis is that in every outcome analyzed above, with the lone exception of the HIV/AIDS health outcome, the national health service was associated with better outcomes than public ownership. That is, the correlations for the NHS were more in line with my hypothesized expectations than the correlations for public ownership. This result indicates that centralized government management is an important dimension of the NHS that influences how the system responds to an infectious disease crisis.

Another puzzle that merits further research is the potential impacts of timeframe on policy outcomes. That is, the national health service was observed to be related with better policy outcomes in the decades-long HIV/AIDS crisis but not in the rapidly evolving (and presumably shorter duration) COVID-19 crisis. The opposite pattern was observed for the relationship between structural universality and policy outcomes. These results imply that the advantages of structural universality in the realm of policy may be better suited for the short-term management of crises, while the advantages of the NHS are better suited for their long-term management.

Lastly, further research should be done to continue to characterize the relationship between structural universality and infectious disease crisis health outcomes. This work finds that structurally universal healthcare systems may likely cause better health outcomes in an infectious disease crisis chiefly because of a decrease in social barriers to the access of health services as well as other social, political, and communicative factors. Subsequent investigation would be valuable to expand on this understanding of the mechanisms behind the potential causal relationship between these two variables.

CONCLUSION

In order to explain the global variation in infectious disease crisis outcomes, organizational differences in the healthcare system must be taken into consideration. Structural universality especially and the identity of the owner and manager of the sources of healthcare provision are two key dimensions of the system that help control the health and policy impacts of the disease. The importance of structurally universal healthcare and public ownership and management of healthcare provision merit the serious recognition in the health policy sphere aiming to diminish the impacts of infectious disease crises.

Observed differences in the health and policy outcomes of HIV/AIDS and COVID-19 are representative of variations in infectious disease crisis outcomes. While previous health policy and crisis management research has elucidated some causal factors linked to this variation, these explanations still incompletely characterize the observed disparities in health and policy infectious disease crisis outcomes.

In this work, I examine structural universality and ownership and management of healthcare provision as original explanations for infectious disease crisis variation. Structural universality centers on the healthcare coverage plans in a given country guarantee accessibility to all legal residents. A specific type of structurally universal system characterized by public ownership and management of healthcare provision is the national health service, and its distinctly close ties to the national government are theorized to uniquely separate this system type from other forms of structurally universal healthcare.

Study of existing literature on the impacts of universal healthcare systems and the national health service reveals potential economic, social, communicative, and political mechanisms that advantage structurally universal healthcare systems and NHSs. Based on this theory, I generated four hypotheses that predict a causal relationship between organizational differences in healthcare systems and infectious disease crisis outcomes. First, I hypothesize that structurally universal healthcare systems will have better health outcomes during infectious disease crises than non-universal healthcare systems. Similarly, NHSs will experience better health outcomes than countries with other forms of structurally universal systems. Third, I also hypothesize that structurally universal systems will adopt more policy interventions than

structurally non-universal systems during an infectious disease crisis and, fourth, that NHSs will likewise adopt more policy interventions than other forms of structurally universal systems.

I undertake a mixed-methods approach to examine these hypotheses. I begin with a case comparison between Chile and Uruguay. Though otherwise similar, Chile possesses a structurally universal healthcare system while Uruguay does not. Analysis of the two countries' experiences with HIV/AIDS brought to light many alternative explanations but also indicated that Chile's better per capita health performance than Uruguay is a function of the country's structurally universal healthcare system. Specifically, while one of Uruguay's most pronounced struggles controlling the crisis is retaining HIV-positive individuals on antiretroviral treatment, Chile maintains a notably advanced focus on post-infection care. These findings suggest lower barriers to accessing health services in Chile versus Uruguay, which supports a theorized social mechanism that advantages structurally universal healthcare over its counterpart.

I follow the case comparison with a linear regression analysis that studies the relationship between the explanatory variables structural universality and the presence or absence of a NHS with health and policy outcomes in the contexts of HIV/AIDS and COVID-19. My findings here buttress the results of the case comparison on structural universality. Structurally universal healthcare systems are associated with better health outcomes in both disease contexts, which indicates the importance of this healthcare system feature in mitigating the health impacts of an infectious disease crisis.

I found partial support for my remaining hypotheses linking structural universality to policy outcomes and the presence or absence of the national health service to health and policy outcomes. Concerning policy outcomes, the mixed results appear to suggest that the NHS may be a more favorable and dominating factor in infectious disease crises of longer duration, whereas structurally universal healthcare may be more important for policy in the short-term of infectious disease crises. This potential pattern is based on the NHS's association with better policy outcomes in the context of HIV/AIDS but not COVID-19 and structurally universal healthcare's association with better policy outcomes in the context of COVIID-19 but not HIV/AIDS.

In sum, this work has found evidence that there is likely a causal relationship between structural universality and infectious disease crisis health outcomes. That is, structurally universal healthcare systems experience meaningfully better health outcomes in an epidemic or pandemic than their non-universal counterparts. Also, while the presence of an NHS may not

offer a unique advantage towards mitigating the health impacts of an infectious disease crisis, these systems may confer long-term policy benefits absent in other forms of structurally universal healthcare.

It will be valuable moving forward from this work to consider the influence of country-level changes in the organization of healthcare systems as well as the spatial and temporal dependence in the data which likely corrupt the findings of the large-N regression analysis to an extent. Moreover, it was often challenging to define the healthcare systems of countries around the world into the binary of structurally universal or structurally non-universal given the complexity of healthcare systems and coverage plans used in each context. Therefore, future conversion of the concept from a binary to a gradient of individuals guaranteed coverage could be a practical step to increase the accuracy and viability of classifications on a large scale.

Two key future directions are encouraged by the findings presented here. First, the potential causal relationship between structural universality and infectious disease crisis health outcomes warrants further investigation that builds on the evidence found by this work in support of this relationship. While the case comparison implicated social mechanisms as the main driver behind the perceived advantages of the Chilean healthcare system, future work should focus on fully characterizing with empirical evidence why structurally universal healthcare creates health advantages in an infectious disease crisis. Second, the potential effect of infectious disease crisis duration on the influence of structurally universal healthcare and the NHS deserves further attention. Further evidencing the apparent pattern in which structurally universal healthcare matters more for policy outcomes in the short-term of an infectious disease crisis and the NHS matters more in the long-term would offer important implications for our understanding on how health policy decisions are made.

The central finding on structural universality and health outcomes from this work suggests serious changes in the organization of healthcare systems all over the world. The health benefits of structurally universal healthcare implicate a major redesign aimed at ensuring that all individuals have guaranteed access to healthcare coverage. In the wake of the COVID-19 pandemic and in anticipation of the next crisis, policy change in favor of structurally universal healthcare is expected to preserve population health when confronted with a new outbreak.

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APPENDIX

Table A

Country	**Source**
Afghanistan	Cook, 2007
Australia	Australian Government Department of Health, 2019
Austria	Bachner et al., 2018
Albania	Memia, 2015; Tobini et al., 2012
Bosnia and Herzegovina	Bredenkamp et al., 2010; Slipicevic & Malicbegovic, 2012
Cambodia	Asante et al., 2019
China	Yip et al., 2019
Denmark	Olejaz et al., 2012
Djibouti	Ollivier et al., 2011
Egypt	Rashad & Sharaf, 2015
Equatorial Guinea	Naseef & Reuter, 2013
Ethiopia	Teklehaimanot & Teklehaimanot, 2013
Germany	Busse & Blümel, 2014
India	Reddy et al., 2011
Indonesia	Agustina et al., 2019
Ireland	Burke et al., 2015; Connolly & Wren, 2019
Kyrgyzstan	Ibraimova et al., 2011
Mexico	Frenk & Gómez-Dantés, 2018; Knaul et al., 2012
The Philippines	Asia Pacific Observatory on Health Systems and Policies, 2018
Poland	Sagan et al., 2011
Portugal	European Observatory on Health Systems and Policies, 2015; Simões et al., 2017

Russia	Popovich et al., 2011
Saudi Arabia	Almalki et al., 2011
Slovakia	Smatana et al., 2016
South Korea	Lee, 2003
Spain	Bernal-Delgado et al., 2018
Sweden	Anell et al., 2012
Cuba, Costa Rica, Colombia, Chile, Peru and Brazil	Frenk & Gómez-Dantés, 2018
Belgium, Estonia, France, Greece, Latvia, Lithuania, and the Netherlands	European Observatory on Health Systems and Policies, 2015