

COVID-19: The View from Historical Crises

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Abstract

The COVID-19 pandemic is frequently described as unprecedented. In a sense, this is true—taken together, this public health crisis and its attendant economic downturn appear poised to dwarf the scope, scale, and disruptiveness of most modern pandemics. This fact alone makes it difficult to extrapolate from recent experience—but more to the point, data and timescale limitations mean that even relevant recent experience can do little help us anticipate and respond to COVID-19’s potential long-run impact on individuals and the wider economy. History, however, can offer a solution. Not only do historical crises offer closer analogues to COVID-19 in each of its key dimensions—as a global pandemic, as a global recession—but they also offer the runway necessary to study the life-course and intergenerational outcomes. In this paper, we review the evidence on the long-run effects on health, labor, and human capital of both historical pandemics (with a focus on the 1918 Influenza Pandemic) and historical recessions (with a focus on the Great Depression). We then consider the role of tradeoffs between population health and economic activity, with reference to air pollution. We conclude by discussing how past crises can inform our approach to COVID-19—helping tell us what to look for, what to prepare for, and what data we ought to collect now.

JEL Codes: I1, I3, J1, J6, N1, N3

COVID-19: The View from Historical Crises

Vellore Arthi (UC Irvine) & John Parman (College of William & Mary, NBER)

I. Introduction

The health and economic toll of the COVID-19 pandemic continues to expand throughout the globe, impacting countries both rich and poor. As it does so, the virus exposes the strengths and weaknesses of our healthcare systems, political institutions, media, and our economies themselves.

The current pandemic is frequently described as unprecedented. And while in a sense this is true—together, this public health crisis, and its attendant economic downturn, appear poised to dwarf the scope, scale, and disruptiveness of other recent pandemics, such as Ebola, Zika, or H1N1—in many ways, its immediate effects on health are not altogether anomalous. With cases first appearing in December 2019, the novel coronavirus, the pathogen behind COVID-19, spread throughout the world in a matter of weeks, with deadly consequences. By the end of April 2020, with the pandemic still spreading, worldwide cases had topped 3,000,000 and fatalities exceeded 200,000 (Dong et al., 2020).¹ For context, deaths from H1N1 (swine flu) in 2009-10 were similar in magnitude, with estimates of over 200,000 deaths attributable to the virus (Dawood et al., 2012). The Hong Kong Flu of 1968 and the Asian Flu of 1957 were even deadlier, killing 1 million and 2 million people, respectively. Reaching further back in pandemic history, cholera, typhus, smallpox, measles, and tuberculosis all have had high death tolls, including during the 20th century. Reaching back further still, the Black Death left a devastating imprint on the world, killing a third of Europe's population.²

What, then, sets this pandemic apart from all but the most catastrophic disease outbreaks?³ It is perhaps the presence of an acute public health crisis *alongside* massive and widespread economic disruptions. Not just that—it is the fact that this health crisis has *precipitated* an economic one. To wit, efforts to stop the spread of the virus have manifested in social distancing and varying degrees of stay-at-home orders and travel bans that have contributed to a dramatic slowdown of the global economy, in ways quite different from past pandemics. Consider, for instance, the economic dislocation experienced in the U.S., a country which quickly came to lead the world in both confirmed COVID-19 cases and deaths. In March and April of 2020, roughly 20 percent of the United States' labor force filed unemployment claims. The Dow Jones fell by over 35 percent. For contrast, during 1957 influenza pandemic, responsible for roughly 100,000 deaths in the U.S. (Glezen, 1996; Simonsen et al., 1997), unemployment peaked at 7.4 percent, and the Dow fell 15 percent—certainly a recession, but nothing on the order of what we have already experienced during the COVID-19 outbreak, just a few months in.⁴

¹ It is worth noting that since the COVID-19 pandemic is still unfolding, we may currently underestimate its health toll relative to some “completed” health crises.

² Plague would continue to impact economies into the 20th century, with an outbreak in San Francisco infecting 121 individuals and killing 119 (Echenberg, 2010). The San Francisco outbreak presents interesting parallels to COVID-19. Despite health officials identifying the plague and urging action, California's governor, Henry Gage, denied there was an outbreak, partly out of a desire to prevent business losses from a quarantine. It took the intervention of federal authorities and a new governor to implement proper measures to stop the spread of the plague. California officials reacted quite differently to COVID-19, swiftly imposing stay-at-home orders. A century later, the calculus of weighing an economic slowdown against the spread of disease has changed. Despite a much larger population, and a much more widespread pandemic, COVID-19 has claimed under 100 lives in San Francisco County as of April, 2020.

³ For instance, the AIDS crisis and the Black Death may be some of the only other major pandemics where mass morbidity and mortality were accompanied by dramatic and widespread economic dislocation.

⁴ See the right-hand panel of Figure 1 for a comparison of the GDP fluctuations around each of several past pandemics.

Clearly, this feature of the current pandemic calls for complementary evidence—not just that from past pandemics alone—if we are to understand its potential for long-run harm. Indeed, to continue with our U.S. example, the two-trillion-dollar Coronavirus Aid, Recovery, and Economic Security Act’s closest comparison, is not to be found in past responses to health crises, but rather in the response to past *macroeconomic* crises—e.g., the American Recovery and Reinvestment Act in the case of the Great Recession, and the New Deal in the case of the Great Depression. Studying how individuals emerged from these primarily economic disasters may therefore help us flesh out the perspective we would gain from studying past health shocks alone.

Turning to a *combination* of historical crises, then—past pandemics and recessions, both—allows us to consider events that in many ways more closely mirror current circumstances, and whose contextual differences can themselves be informative of our current situation.⁵ More to the point, the historical nature of past pandemics and recessions offers distinct advantages when trying to understand the potential impacts of COVID-19, and formulate policies for recovery. First, events have had time to fully unfold: the short-, medium-, and long-run consequences of these events can be fully observed. Second, the economic history literature shows how much can be learned with clever analysis of even incomplete or imperfect data. Missing and inaccurate health data is unfortunately directly relevant to assessing the spread of COVID-19, given, for instance, current issues with testing and coordination. Finally, historical events are viewed with a certain level of emotional remove that is difficult to achieve when discussing current circumstances: the devastating human toll of these events and the unsettling tradeoffs between health and economic growth are perhaps easier to grapple with when we ourselves are not the data points. Thus, a historical perspective allows us to use rich data to look at not only the short-term effects of crises like COVID-19 on health, labor, and human capital, but also the long-term and intergenerational impacts along these dimensions for both individuals and the wider economy. In so doing, it can offer us insight on the current crisis—telling us what to look for, what to prepare for, and what data we ought to collect now. Put another way, understanding the lingering health and economic impacts of these past crises offers valuable insight for anticipating and responding to the potential long-term impacts of COVID-19.

To examine how history can inform our view of the coronavirus pandemic and associated policy responses, we begin in Section II by reviewing the features of COVID-19 that will determine its potential health and economic impacts, and provide some context on these metrics with reference to a diverse range of historical analogues, each with a different set of fundamental characteristics. Then, in Sections III and IV, respectively, we narrow our focus to two of the closest analogues to the current pandemic—one, the 1918 influenza pandemic, which speaks to “direct” health-channel effects; and another, the Great Depression, which speaks to “indirect” effects through the labor market and wider economy. There, we review the economic literature on the short- and long-term effects on individuals and cohorts exposed to these massive shocks. In Section V, we consider effects at the intersection of health and economic activity, perhaps best exemplified by the complementarities and tradeoffs between air pollution, economic growth, and pandemic mortality. Finally, in Section VI, we conclude by discussing what economic historians and researchers of COVID-19 can offer each other.

II. Features of COVID-19 in Historical Context

Before we can look to historical evidence on how COVID-19’s effects may unfold in the long run, it is

⁵ For instance, the truly global economy of the 21st century, the ease of domestic and international travel, and the density of modern population centers all give COVID-19 the potential to spread far more rapidly than past pandemics. Working in the opposite direction is the far more developed public health infrastructure and modern communication technology that both speeds the transmission of information and makes remote work possible for a broad range of occupations.

useful to first fix ideas about certain key features of the current crisis—its epidemiology, its demographics, and the policy responses to date. Here, it is also useful to briefly compare these features to those seen in past pandemics, thereby giving us a sense of which historical pandemics might offer the most useful points of reference going forward.

II.a. The Epidemiology of COVID-19

We draw here on the principles outlined by Morens et al. (2009) to categorize pandemics. They point to eight characteristics common to most accepted definitions of a pandemic: 1) wide geographic extension and 2) disease movement, which speak to the disease’s spatial reach; 3) high attack rates and explosiveness, 4) infectiousness, and 5) contagiousness, which speak to how it spreads; 6) severity, which speaks to its potential for population scarring and culling; and 7) minimal population immunity and 8) novelty, which speak to the scope for harm and the speed with which preventive and therapeutic responses can be marshalled. By all measures, COVID-19 presents these hallmark features of a pandemic. Understanding exactly how COVID-19 reflects each dimension is essential for understanding the likely short- and long-run consequences of the pandemic—for instance, because these features help to determine the options available to public health officials and policymakers when designing a crisis-response strategy.

II.a.1. Spatial Scope: Geographic Extension and Disease Movement

The widespread nature of pandemics makes their health and economic impacts particularly devastating: with impacts felt everywhere, it becomes increasingly difficult to shift economic activity to, or medical resources from, unaffected areas. While the true extent and timing of COVID-19 cases is yet to be determined, the evidence to date indicates that the spread of the global spread of the virus was incredibly rapid. While the origins of the disease are still being researched, the earliest reported cases appeared in December 2019 in Wuhan, China. That same month, the virus made it to France. By January 2020, there were confirmed cases throughout Asia, Europe, North America, and Africa, and by the end of the month, the number of cases worldwide reached 10,000. In the months that followed, that number rose sharply—first to 85,000 in February, 750,000 in March, and over 3,000,000 by the end of April. As of May 2020, only 12 sovereign states had no confirmed cases, 10 of which are island nations in Oceania.

This feature of COVID-19 surely has much to do with the highly globalized nature of our modern economy. Indeed, we see similar patterns in historical pandemics, reaching as far back as we have had extensive trade routes.⁶ While a lack of systematic mortality records for many (and especially low-income) countries in the past makes it difficult to document exactly how widespread historical pandemics were, consider, for instance, that nearly every country with reliable mortality statistics displayed excess deaths from the 1918 influenza pandemic (Barro et al., 2020). Similarly, the plague pandemic originating in Canton and Hong Kong in 1894 spread to 77 ports across five continents (WHO, 2000), and even the Justinian Plague of 542 reached Asia, Africa, and Europe. Even in a historical era where countries were less tightly integrated than they are today, the only thing that truly spared an area from pandemics was isolation.⁷ With the increase over the last few centuries in both global connectedness and population density, the implications for our current crisis are clear.

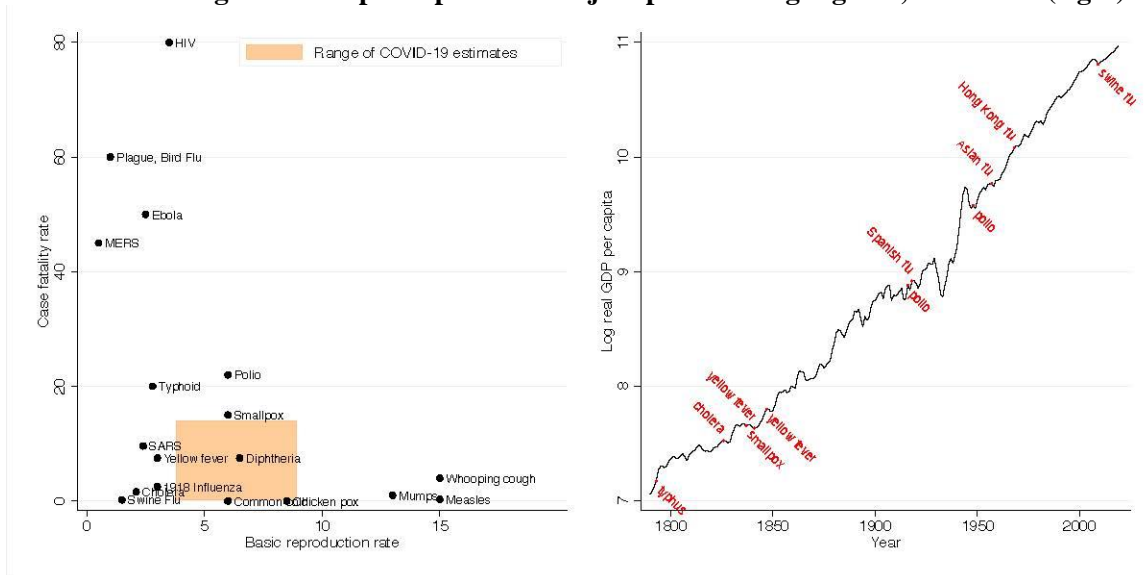
⁶ Even though world economies are substantially more tightly integrated than in the past, even in the preindustrial era, Alfani & Murphy (2017) document that it was common for disease to be transmitted along trade routes or through inter-regional commercial contact. Big trading centers in particular, such as Amsterdam, London, and Venice, frequently faced outbreaks of plague (see Alfani (2013), Biraben (1975), and Curtis (2016) for the underlying studies).

⁷ The opening up of regions to trade, or conquest, has generated a large literature on the role of disease in shaping economies. See in particular the literature on the Columbian Exchange (Nunn & Qian, 2010).

II.a.2. Rate of Transmission: Attack Rates, Explosiveness, Infectiousness, and Contagiousness

The speed with which a disease spreads directly impacts the difficulty of containing it. Indeed, it is these transmissibility-related features that account for many of the public health measures seen in response to the current crisis—some, such as early international travel restrictions, which tried to contain a disease that in many countries was already being spread locally via community transmission; and some, such as stay-at-home orders, which have been more effective in slowing transmission once it was too late for a containment strategy to be tenable. High attack rates and explosiveness (multiple cases appearing in a short time span) make it hard to stay ahead of a disease. These characteristics are functions of a disease’s infectiousness and contagiousness: its ability to spread from person to person. COVID-19 is primarily spread from person to person, transmitted by respiratory droplets produced when an infected person coughs or sneezes. This has led to COVID-19 having a daunting rate of transmission, with early estimates of a basic reproductive rate of between 4 and 9 (Sanche et al., 2020).⁸ As a point of reference, these transmission numbers are akin to those seen for past SARS, polio, mumps, yellow fever, and 1918 influenza outbreaks (see Figure 1). The economic history of these pandemics thus may provide a guide for what we might expect from COVID-19. For contrast, the economic history of measles—which presents far higher transmission rates, with estimates of basic reproductive rates greater than 10 (Guerra et al., 2017)—offers some sense of how much worse things could be.

Figure 1: Case fatality rate as a percentage by basic reproduction rate for various diseases (left) and U.S. log real GDP per capita with major epidemics highlighted, 1790-2019 (right)



Notes: Case mortality rates are for untreated patients. For COVID-19, basic reproduction rates are taken from https://wwwnc.cdc.gov/eid/article/26/7/20-0282_article. All other reproduction and fatality rates are taken from <https://docs.google.com/spreadsheets/d/1kHCEWY-d9HXIWrf9jjRQ2xf6WHQlmwyrXel6wjxkW8/edit#gid=0>, the data underlying <https://www.theguardian.com/news/datablog/ng-interactive/2014/oct/15/visualised-how-ebola-compares-to-other-infectious-diseases>.

II.a.3. Pandemic Severity

Like the disease’s ease of transmission, the severity with which it manifests symptoms will also be a crucial determinant of both its consequences for individuals and the wider economy, and the nature and magnitude

⁸ The basic reproductive rate is the number of expected cases directly generated by one case when all individuals in the population are susceptible to infection.

of the government response. For instance, a highly lethal pandemic may generate extensive and indiscriminate mortality; a less lethal pandemic may generate culling (selective mortality related to a specific health threshold); and an even less lethal pandemic may generate very little mortality, but substantial health scarring among survivors. If a disease is so mild that many of those who are infected remain asymptomatic, this can, in the absence of widespread testing, undermine efforts to slow transmission. Likewise, rates of infection, in combination with severity considerations, will help determine whether governments intervene, or merely wait for the disease to “take its course” on the way to achieving herd immunity.

In its April 14, 2020 COVID-19 Strategy Update, the World Health Organization note that 40 percent of those infected experience moderate disease, including pneumonia, and 15 percent experience severe disease. They cite a crude clinical case fatality rate of over three percent that rises to 15 percent or higher in individuals over the age of 80. As shown in the left-hand panel of Figure 1, the crude mortality rate for COVID-19 in its first months is similar to that of the 1918 influenza pandemic and of measles, but far lower than the deadlier recent outbreaks of MERS, Ebola, SARS, and lower still than the truly devastating historical toll of smallpox, which had an average case fatality rate of 30 percent (Ellner, 1998).⁹

This rich historical spectrum of pandemic severity, in turn, demonstrates that both mild and severe diseases impact the economy, albeit in very different ways. For instance, the eradication of hookworm in the U.S. South—a disease which is not fatal, but which primarily causes lethargy and anemia—improved returns to schooling, educational attainment, and incomes in areas with high prior infection rates, but did little to change to overall demographic, economic, or institutional structure (Bleakley, 2007). For contrast, the Black Death and other pre-modern outbreaks of plague, which had extraordinarily high death tolls, fundamentally reshaped the global economy.¹⁰ In this context, COVID-19’s wide scale and relative mildness will surely have a bearing on the scope, magnitude, and timescale of damages. As we will see in later sections, it suggests that we might ultimately expect to see the greatest harm only in the long run, with widespread generational scarring arising from short-run morbidity and economic disruptions.

II.a.4. Population Immunity and Novelty

The novelty of a pandemic virus contributes to its potential for destruction: it takes time to identify a new disease, understand key features of its epidemiology, develop treatments and vaccines, and achieve a degree of population immunity. In the meantime, everyone represents a potential victim. As a novel coronavirus, COVID-19 struck a population with neither natural nor acquired immunity: wherever the virus spread, it had the potential to be devastating. With everyone theoretically at risk of transmitting the disease, and with little immediate means of preventing, testing for, or treating it, the only short-run mitigation strategies available were relatively brute-force ones such as lockdowns and border closures. Consequently, economic shutdowns were widespread, leaving no major economies or populations spared.

Interestingly, because medical technology was limited for much of the past, and societies could only count on some degree of population immunity, even endemic (i.e., non-novel) diseases could have the sort of

⁹ Of course, it is worth noting that the informativeness of these measures for pandemic mitigation efforts will rely on accurate morbidity and mortality figures. These measures in turn depend on testing and data-gathering capacity, which can present challenges under even the best of circumstances—a point we will return to later on.

¹⁰ Voigtländer & Voth (2013a, 2013b) argue that the increased wages due to labor shortages from plague mortality increased demand for urban products, driving a cycle of urbanization and additional disease that moved Europe out of a Malthusian trap into a modern world of permanently higher per capita incomes. Dittmar & Meisenzahl (2017) demonstrate that outbreaks of plague aided the spread of Reformation Laws and the expansion of public goods. For more on the economic history of plagues, see Alfani & Murphy (2017).

destructive potential we only typically see today in *new* disease variants such as the novel coronavirus.¹¹ For instance, in a variety of past pandemics studied by economic historians, cases of an endemic disease would sporadically rise sharply, with substantial consequences for living standards and economic organization. Indeed, a large literature considers the impact of such diseases on the growth trajectories of countries over the long run, often focusing on tropical diseases like malaria, yellow fever, dengue, and others. One strand of studies considers the direct impact of disease on human capital formation (see, for example, Bleakley (2003, 2010) on malaria). Another strand focuses on the impact of these endemic diseases on institutional development, finding that disease environments inhospitable to colonial settlers drove them to rely on extractive institutions that were ultimately harmful to economic growth (Acemoglu et al., 2001). Finally, scholars have considered the way that one society's acquired immunity to an endemic disease devastates the economy of another society lacking that immunity (Diamond, 1999; McGuire & Coelho, 2011; Tang, 2017).

Together, this historical evidence gives us a picture of what our circumstances might look like today if we are unable to adequately ramp up our capacity for disease prevention and treatment and forced to rely on acquired immunity, the nature of which for COVID-19 is still poorly understood.

II.b. Demographics and Distributional Effects

Age has been at the forefront of discussions about the disparate impact of the current crisis, and shutdown efforts have been framed in part around protecting these and other vulnerable populations, such as the immunocompromised, while societies work to expand medical capacity and develop a vaccine. In this respect, COVID-19 is much like many infectious disease outbreaks in the past—the elderly and those with poor baseline health are at greatest risk.

Likewise, despite claims in some quarters that COVID-19 is “the great equalizer,” it is already becoming clear that socioeconomic status will be central to understanding the demographics of this crisis. One of the ways low-income populations will be affected is through differential exposure to pandemic risks.¹² Individuals who continue to do their jobs in person during the pandemic—including service-industry workers with extensive contact with customers, healthcare professionals, and other frontline workers—will bear a disproportionate burden of the pandemic's health impacts. These workers are more likely to be in low-paying jobs, and are more likely to be women and minorities, than their counterparts with jobs allowing them to work from home. Consider, for instance, meat and poultry workers in the U.S. The mean annual wage in the industry is only \$28,000 (BLS, 2018).¹³ Among laborers in the food manufacturing industry, 27 percent are black and 40 percent are Hispanic (EEOC, 2018).¹⁴ Three-quarters of full-time, year-round healthcare workers are female, with that share even higher among the lower paid nursing and health aide occupations, critical occupations with severe risk of exposure to COVID-19.¹⁵ This disproportionate exposure to virus for lower income groups, women, and minorities is exacerbated by differences in these groups' access to healthcare and the quality of

¹¹ That is, it is improved medical knowledge that has allowed us to escape from the sort of flare-ups of endemic disease so frequently observed in the past, and it is relative our lack of knowledge about COVID-19, as a new virus, that makes our current situation in some ways comparable to even past endemic disease outbreaks. Economic historian Joel Mokyr expands on this idea regarding the evolution of knowledge regarding infectious disease outbreaks in a recent op-ed: <https://www.cnn.com/2020/04/23/opinions/struggle-between-people-and-microscopic-pathogens-mokyr/index.html>.

¹² The mirror image of differential exposure is differential transmission risk. This is one reason why some have called for prioritizing the strategic testing of workers at highest risk of spreading the novel coronavirus to others, particularly asymptomatic ones.

¹³ <https://www.bls.gov/oes/2018/may/oes513022.htm>

¹⁴ <https://www.eeoc.gov/statistics/employment/jobpatterns/eeo1/2018/national-naics3/table?naics=311&state=&cbsa=>

¹⁵ Figures are based on the U.S. Census Bureau's calculations using American Community Survey data (<https://www.census.gov/library/stories/2019/08/your-health-care-in-womens-hands.html>).

that health care—factors that affect both vulnerability and resilience to pandemic disease. Membership in more than one of these groups will tend to compound disadvantage even further. Preliminary research suggests that black patients exhibiting COVID-19 symptoms were six times less likely to get treatment or testing than white patients.¹⁶ This is not unique to COVID-19: similar patterns have been observed for other modern pandemics including the H1N1 influenza outbreaks (Quinn et al., 2011).

The outsized impact of pandemics on people of lower socioeconomic status and minority populations has historical precedent.¹⁷ The 1918 influenza pandemic hit the poor first and hardest (Sydenstricker, 1931; Mamelund, 2018), a point we will return to in some depth in Section III. Explanations for this relationship mirror modern ones: poorer populations lived in denser housing units under worse conditions and had occupations that increased exposure to the virus.¹⁸ Moreover, low incomes constrained their ability to avoid exposure and seek treatment.¹⁹ For instance, historical evidence shows that to escape a 19th century outbreak of yellow fever, wealthier residents often left the city—an option unavailable to low-income workers with tenuous job security. This is a pattern that we see as well during outbreaks of plague in earlier centuries. For instance, it is part of Dittmar & Meisenzahl’s (2017) explanation for why the Black Death paved the way for institutional reform: the old elites simply left town (Dinges, 1995; Isenmann, 2014).

This sort of regional flight is of course unlikely to be a central dimension along which COVID-19 has differential impacts across income levels—but it does raise important issues that set the current crisis somewhat apart from other historical pandemics: the spatial distribution of population within and across cities, the degree of interconnection between rural and urban areas, and the extent of urban health penalties. While cities are much healthier today than in the past,²⁰ societies today are also much denser, more urbanized, and better connected²¹—all factors that would tend to make modern pandemics both faster to spread and harder to control than in centuries prior. And indeed, while COVID-19 has hit dense metropolitan areas particularly hard, as in the past, under the current crisis, rural communities have not been spared. This is in part because of the relative ease with which people circulate between communities

¹⁶ <https://www.nytimes.com/2020/05/10/us/coronavirus-african-americans-bias.html>

¹⁷ The relationship between pandemic exposure and socioeconomic status, however, has not always been constant. As Alfani & Murphy (2017) note, studies of the plague in Europe find the Black Death to have been universally deadly. However, plagues of the fifteenth and sixteenth centuries exhibited the negative relationship between socioeconomic status and mortality found in more recent pandemics (see, for example, Slack (1985), Alfani (2013), and Carmichael (2014)). However, the final major plagues of the seventeenth century once again tended to have severe consequences across all classes.

¹⁸ Mamelund (2018) note that in Norway, the impacts of the pandemic were most severe for transport, hotel and industry workers, paralleling the observations above about COVID-19.

¹⁹ These factors also translated into worse outcomes for minorities. As the exception that proves the rule, black Americans fared better than white Americans during the 1918 pandemic (Crosby, 2003; Økland & Mamelund, 2019). Crosby (2003) argues that the black population had disproportionately high exposure to the early, less virulent summer wave of the pandemic due to their worse occupations and living conditions, conferring some degree of immunity to the more deadly later wave. A similar mechanism operated during historical yellow fever outbreaks, albeit resulting in advantages for native-born individuals over immigrants. While yellow fever was responsible for pandemics, it was also endemically present in many societies, meaning that some groups were less susceptible than others in times of outbreak. Individuals exposed to yellow fever at a young age often contracted a mild form of the disease, and then developed immunity. As a consequence, yellow fever took on the moniker “the stranger’s disease,” and adult immigrants were far more likely to die in yellow fever outbreaks in the United States than either native-born whites or blacks (Patterson, 1992). This is a pattern that Saavedra (2017) exploits to demonstrate that early-life yellow fever exposure negatively impacted adult occupational outcomes, with white males born to immigrant mothers during yellow fever pandemics less likely to become professionals than the sons of native-born mothers.

²⁰ This is thanks, for instance, to pollution regulation, improvements in public health and medical technology, and the rise of cities as centers of high-skilled and high-income workers, often with well-resourced healthcare facilities.

²¹ The number of cities is growing, all while cities are getting denser. For instance, roughly 84 percent of Americans live in cities as of 2019, up 20 percentage points from 1950; see <http://css.umich.edu/factsheets/us-cities-factsheet>.

with our modern transportation networks, but also because of the way that the nature of modern work tends to place individuals in close contact with each other, even in less densely populated areas. To wit, major rural clusters of COVID-19 in the United States have been tied to large meat and poultry processing facilities, with workers at these facilities experiencing case rates an order of magnitude higher than the general U.S. population (Dyal et al., 2020).

To respond effectively to pandemics in the moment, and to deal with their long-run fallout, will require an understanding of its distributional effects over time and space. Because these are such central considerations, we explore them in much greater depth in Section III.

II.c. Policy Response

Evaluating the policy response to COVID-19 and how it compares to historical pandemics requires recognizing that information on the disease and how to stop its spread has been limited to date, and is still evolving. This stems in part from COVID-19 being a novel disease—developing treatments and vaccines takes time—but it also stems from issues of state capacity. For instance, policymakers, firms, and individuals have been hamstrung by limited testing capacity and a failure at times to deploy testing in an efficient manner. These constraints are a product of both limitations of medical technology and broader issues of political leadership and coordination. Consequently, the main approach to combatting the disease has been the rather blunt and economically devastating tool of stay-at-home orders—a policy that has been widely adopted within and across countries during the COVID-19 crisis. This policy response, necessitated by inadequate testing and broader uncertainty about key epidemiological parameters—even those as basic as precisely how the disease can be transmitted, and whether it is possible to become re-infected—makes the economic history of pandemics particularly relevant for studying the current crisis.

First, an approach centered on shutdowns is nothing new. In fact, closures and quarantines were really the only tools available to societies prior to the virology advances of the 19th and 20th centuries. Though the shutdown of firms has been more comprehensive under COVID-19 than in many past pandemics,²² the primary measures being taken now, such as quarantining sick individuals, banning public gatherings, and closing schools, were all implemented during the 1918 pandemic (Markel et al., 2007). Likewise, when England was combatting the plague in the 1600s, they quarantined ships from other countries, closed ale houses, and limited the number of lodgers allowed in a house, actions that would sound familiar to cruise ship passengers and restaurant owners during the COVID-19 pandemic (Bell, 1924). Indeed, it is striking—maybe even alarming—how little has changed about our best options for fighting pandemics, despite centuries of advances in medicine, public health, and living standards. Historical pandemics can therefore provide insight into the effectiveness and consequences of these policies.²³

Second, the root of many difficulties we face in developing suitable pandemic-response policies lies in dealing with incomplete and potentially inaccurate data—the economic historian’s forte. With the lack of early COVID-19 tests, it became necessary to fall back on mortality data and focus on excess mortality as a proxy for where outbreaks were occurring. This is the same approach economic historians are often required to take. Morbidity data are rare historically and, when available, likely unrepresentative and inaccurate. Mortality data are both far more prevalent and reliable, even if it is morbidity that is typically

²² The greater use of firm closures as a disease-control strategy today could be due, for instance, to improvements over time both in the safety net and in remote-work capabilities. This more widespread pause on non-essential activities may in turn lead to fairly different effects of COVID-19 relative to past pandemics, e.g., in terms of patterns of disease transmission or total economic impact.

²³ See for example Markel (et al., 2007) on the effectiveness of school closures in combatting the spread of the 1918 influenza pandemic, Meyers and Thomasson (2017) on the effects of polio-related school closures on educational attainment, and Alfani & Murphy (2017) on city-level quarantines during pre-modern plagues.

more relevant to the economic impacts of a pandemic, particularly less lethal ones. For health officials today, the need to assess the spread of COVID-19 through mortality data leads to the frustration of identifying the arrival of cases with a substantial lag. For the economic historian, this lag is irrelevant, but the issue remains that only those places experiencing excess mortality can be identified; diseases leading to widespread morbidity but little mortality may be equally important for the evolution of economies, but far more difficult to identify prior to modern medical records. Again, this suggests that evidence from crises that have run their course can be informative of what to expect going forward.

III. Consequences for Wellbeing through the Health Channel: The 1918 Influenza Pandemic

For thinking about the direct effects of pandemics on the health and wellbeing of individuals in the short- and long-run, the 1918 Influenza Pandemic, the “Spanish Flu,” provides a useful point of reference. As we briefly touched on earlier, the spread of COVID-19 parallels that of the 1918 pandemic in several key ways, including its rate of transmission, global spread, and crude mortality rates. That said, even over 100 years later, much about the origins and epidemiology of the 1918 virus remains either unknown or the subject of considerable debate. What we do know is that it was one of the most acute and widespread natural disasters in modern history. Taubenberger & Morens (2006) estimate that during the pandemic, roughly 500 million individuals, equivalent to roughly a third of the world’s population at the time, were infected and symptomatic. Case fatality rates, at over 2.5 percent, were at least 25 times as high as in other influenza pandemics, making the 1918 virus especially lethal. All told, somewhere between 50 and 100 million individuals perished globally. The death toll in the U.S. alone exceeded that from all American combat deaths over the twentieth century (Almond, 2006).

The pandemic itself was sharp, sudden, and concentrated over the span of little more than a 12-month period. The virus, an H1N1 strain similar to that which caused the 2009 swine flu outbreak, spread roughly simultaneously across Europe, Asia, and North America, in three distinct waves over the year beginning in spring 1918. The first of these waves, appearing in March 1918, was relatively mild. It was followed by a substantially more catastrophic one from September to November 1918, and another in the early months of 1919 (Taubenberger & Morens, 2006). In some parts of the world, particularly in East Asia, a further major wave of pandemic influenza hit as late as 1920 (Lin & Liu, 2014; Ogasawara, 2018).

This sort of timing and spacing was unprecedented among influenza pandemics, as was its distinctive mortality profile. Where influenza death rates by age typically follow a U-shape, with high mortality rates among the very young and the very old (as is also the case with the novel coronavirus), the 1918 strain followed a W-shape, with a sharp peak in mortality risk among young adults as well.²⁴ Indeed, almost half of all influenza-related deaths during the pandemic period accrued to those aged 20-40 (Taubenberger & Morens, 2006).

The age pattern associated with this strain of influenza was in fact so unusual that it has been exploited as a diagnostic tool in recent studies. For instance, while the 1918 influenza pandemic is typically thought to have emerged in full force in Europe around the summer of 1918, and in a milder form somewhere in the central U.S. in spring 1918, detailed age-by-month mortality statistics allow Olson et al. (2005) to uncover evidence that an early “herald” wave of pandemic influenza was actually present in New York City well beforehand, from February to April of 1918. During this period, the age profile of excess influenza mortality had started to shift from the older ages typical of interpandemic seasons to the younger ages that characterize pandemic seasons. This underscores the value of accurate and disaggregated data in tracing

²⁴ Case fatality rates also followed a striking W-shaped pattern, contrary to the typical U-shaped pattern in this metric.

the origins and spatiotemporal spread of pandemics, and the need to strengthen not only rapid-response public health infrastructure, but also that to support ongoing disease surveillance.

Turning to morbidity, those under the age of 35, and particularly, those aged 5-14, had disproportionately high incidence of influenza—however, the latter group had a much lower death rate from influenza and pneumonia than other ages, further sharpening the middle peak in the morbidity-adjusted pandemic mortality curve (Taubenberger & Morens, 2006). Age, however, was not the only major factor that contributed to pandemic mortality risk, and a range of recent studies have emerged cataloging the often interrelated features of countries, cities, and individuals that led to disparities in the immediate mortality burden of the 1918 flu.

III.a. Short-Run Mortality Effects & Mechanisms

On these mechanisms, the evidence is mixed—surely in part because of diverse empirical settings and disciplinary approaches—but certain patterns do emerge. First, baseline health status mattered, with pre-pandemic pneumonia, a bacterial condition with a strong biological interaction with the influenza virus, and infant mortality rates, a proxy for population health, both contributing to higher pandemic flu mortality (Acuna-Soto et al., 2011; Clay et al., 2019). High levels of air pollution, an environmental factor that aggravates respiratory conditions, also raised pandemic mortality (Clay et al., 2019)—a point we will return to in more detail in Section V.

Second, population density and related concerns, such as housing quality and the number and composition of social interactions, were also important factors in pandemic mortality. In Europe as in the U.S., the pandemic came to cities earlier, and was more devastating there, a phenomenon linked to urbanization and residential crowding (Chowell et al., 2008; Mamelund, 2006; Murray et al., 2006). Transmission was localized, and influenza and pneumonia mortality exhibited significant and rather tight (e.g., 200-1,500 m) spatiotemporal clustering (Grantz et al., 2016; Tuckel et al. 2006), though proximity to high-risk population centers like WWI military bases appears to have had little effect (Clay et al., 2019). Although urban centers were associated with higher pandemic mortality, the opposite population gradient prevailed when comparing *among* cities, or *among* rural areas: in both cases, smaller, less dense localities fared worse (Acuna-Soto et al., 2011; Chowell et al., 2008), suggestive perhaps of capacity constraints in the healthcare workforce and medical infrastructure.

Third, factors—such as illiteracy and foreign-born status—that might have prevented individuals from adopting public health recommendations were strong predictors of elevated mortality, often above and beyond their association with poverty. Higher rates of illiteracy were linked to higher rates of influenza mortality during the pandemic, across both cities and neighborhoods (Clay et al., 2019; Grantz et al., 2016). Likewise, foreign-born status not only predicted higher pandemic mortality in Hartford, CT, but the relationship between nativity and mortality persisted even after controlling for socioeconomic status, population density, and neighborhood ethnic composition, indicating perhaps a role for social factors, or language or cultural barriers to the adoption of relevant public health measures (Tuckel et al., 2006). Crucially, the consequences of these barriers were not limited to the foreign-born: holding all else equal, native-born individuals living in areas with a higher share of foreign-born had higher mortality rates than their counterparts living alongside a lower share of foreign-born neighbors. This emphasizes the importance of neighborhood spillovers in infectious disease transmission—and, of course, demonstrates the interrelated nature of individual- and neighborhood-level mechanisms.

When considering these biological, demographic, and socioeconomic factors in quick succession, it is difficult not to see the overarching hand of income in all of these mechanisms—though, to be clear, several of these studies are careful to disentangle these factors from their association with income. In theory, income gradients in pandemic mortality could arise through a number of channels, including many of those hinted

at above: e.g., the tendency of those with higher incomes to have better baseline health status, rendering them biologically less vulnerable and more resilient to infection; higher-quality and lower-density housing, reducing the chances of viral transmission; better public health knowledge, the human capital necessary for individuals to effectively assimilate this knowledge and to adopt life-saving recommendations, and timelier and more robust public health interventions, all slowing the spread of illness; better access to healthcare and medical infrastructure, improving the probability of survival conditional on infection; and a greater capacity for individuals to undertake avoidant, adaptive, and compensatory behaviors, both throughout and following the pandemic. Crucially, these channels can operate at both individual and institutional (e.g., city or country) levels, with both richer people and localities—and certainly, the interaction of these—theoretically better equipped to weather the crisis. The fact that some of these channels are highly correlated, of course, can make it difficult to pinpoint the underlying mechanisms: higher-SES individuals are likelier to be both healthier, protecting them from infection, and more educated, rendering them better able to adopt public health measures; cities tend to be richer in both income and infrastructure, but they are also more heterogeneous and densely populated than rural areas.

Nevertheless, the literature can still shed light on the role of income on net. While some studies explicitly looking at its role in pandemic severity have shown little relationship between pre-1918 economic development and pandemic mortality (Brainerd & Siegler, 2003), a great many indicate that poverty exacerbated mortality risk. For instance, Murray et al. (2006) document tremendous (i.e., over thirty-fold) within- and cross-country variation in excess mortality due to the 1918 pandemic, with nearly half of this variation explained by baseline per capita income. Taking a finer-grained look at these issues, Grantz et al. (2016) explore the socioeconomic determinants of pandemic mortality and transmissibility using detailed data from Chicago. Among the associations they find between health and various poverty proxies are large, statistically significant, and negative associations between census tract-level homeownership rates and mortality. These findings are consistent with the lower baseline health of lower-SES neighborhoods, their poorer access to medical care, and their lower awareness and adoption of public health recommendations. Shanks & Brundage (2017) add that these factors may be proxying other features of low-SES populations, such as a higher risk of sequential infections (e.g., pandemic influenza followed by a secondary bacterial infection such as pneumonia), or the larger number and lower-SES composition of their social interactions. All of these could have contributed to higher cumulative pandemic mortality through faster and more widespread disease transmission, higher incidence of infection, or higher case fatality rates. These results suggest that rather than acting as a democratizing force, the pandemic further entrenched preexisting socioeconomic disparities. The clear implication of studies documenting the immediate health effects of the 1918 outbreak is that the damage from pandemics has, and remains likely to, fall disproportionately on poor communities.

III.b. Demographic Effects

Apart from its effects on health, however, the pandemic also had important consequences for population dynamics. One such effect pertains to temporal and cross-disease mortality spillovers resulting from pandemic-era mortality patterns. Noymer (2011) shows that the 1918 influenza pandemic hastened the decline of tuberculosis in the U.S. through a harvesting mechanism. Specifically, he suggests that independent competing risks may be responsible for this phenomenon, driven by substantial age overlap in the profile of prospective tuberculosis and (pandemic-type) influenza victims. This “passive selection” contrasts with “active selection” based on biological interactions between influenza and tuberculosis. This harvesting, in turn, had long-lived implications for sex differences in post-pandemic mortality rates: because tuberculosis morbidity disproportionately affects men, and because the influenza pandemic reduced the pool of those who might die of tuberculosis in the years following, the pandemic had the effect of eroding women’s longevity advantage over men. Studying Brazil, Guimbeau et al. (2020) likewise find rather larger reductions in sex ratios at birth following the 1918 influenza pandemic, consistent with the greater vulnerability of male fetuses to adverse *in utero* shocks—a phenomenon often seen in the literature

on famines and environmental disasters. Such changes in the sex ratio, or in sex-specific survival, may well have had long-run implications for marriage and labor markets.

Another major area in which the pandemic affected demographic behavior relates to marriage and fertility. In some cases, this was largely a function of pandemic psychology. Mamelund (2004) shows that a climate of fear and uncertainty in 1918 Norway, alongside social distancing efforts and peculiarities of Norwegian marriage laws (which imposed a one-year waiting period before widows could remarry), led to a drop in births in 1919, as families deferred childbearing. Higher rates of maternal mortality and miscarriage during the pandemic likely also contributed to a drop in birth rates. This pent-up demand for children (alongside “replacement” demand for children lost to the pandemic) was released after the crisis passed, resulting in a baby boom in 1920. Elsewhere, as was the case in nearby Sweden, changes in fertility arose from the way that pandemic mortality affected markets for marriage and labor: Boberg-Fazlić et al. (2017) find evidence of a drop in fertility during the pandemic, followed by a short-lived rebound in post-pandemic fertility. The net effect in the long term, however, was to reduce fertility—due in part to persistent disruptions to marriage markets (particularly in rural areas and poorer cities); the adverse effects on income; as well as to behavioral changes induced by the pandemic, including a rise in female labor supply (and so, an increase in the opportunity cost of childrearing) in regions with high male pandemic mortality rates. Perhaps most noteworthy, the short-run post-pandemic fertility increase was selective in nature: a child born during this boom was more likely born to mothers who were married or who were high-SES city-dwellers. This was largely driven by postponement fertility, and particularly, selective postponement.²⁵ Finally, pandemic-related mortality affected childbearing through its effect on survivors’ incomes. Donaldson and Keniston (2014) show that the high pandemic death toll in some regions of India implied a substantial increase in per capita incomes, as survivors assumed the agricultural land of pandemic victims. In light of this rise in incomes, they find an increase in *both* the quantity and quality (given by literacy and height) of children born following the pandemic in India. Phenomena such as these, which change the sex- and age-composition of the population—not to mention the average health status of successive cohorts—are likely to have long-lived effects on economic development, population health, and individual wellbeing.

III.c. Long-Run Effects

The lethality and peculiar age profile of the 1918 pandemic also give rise to long-run considerations. These may be especially relevant in light of COVID-19, where the vast majority of people who become sick ultimately survive. During the 1918 pandemic, young adults—including prime childbearing-age women—were some of the likeliest to fall ill: in some parts of the U.S., roughly a third of all mothers (relative the about 28 percent of the general population) became infected during the crisis (Almond, 2006). Moreover, despite the unprecedentedly high mortality rates from this pandemic, most of those infected ultimately survived. This left considerable scope for maternal morbidity—and, through the impact of maternal stress and illness on intrauterine hormones, nutritional resources, and other factors—for insults to fetal health.²⁶

In what is perhaps the seminal study of the 1918 influenza pandemic in economics, Almond (2006) finds wide-ranging adverse effects on later-life human capital and labor market outcomes among U.S. cohorts exposed to the pandemic *in utero*. These include substantial reductions in high school completion rates,

²⁵ Across settings, evidence of replacement fertility is rather more limited.

²⁶ Now quite common and influential in economic research, the conceptual framework linking early-life conditions to later-life health and wellbeing is termed the “Barker” or “fetal origins” hypothesis. This hypothesis holds that certain chronic conditions stem from deficits in the fetal environment (Barker, 1992). Based on this initial literature in epidemiology and medicine, which focused on evidence from historical famines, a growing literature in economics has used these ideas to model the technology of human capital formation, and to identify sensitive and critical periods for the development of a range of outcomes contributing to labor market success and general wellbeing, including cognitive and non-cognitive skills, metabolism, and longevity (Heckman, 2007; Almond & Currie, 2011).

wages, and socioeconomic status, alongside large increases in the probability of living in poverty, the receipt of welfare payments, the likelihood of incarceration, and—particularly among men—the probability of physical disability. That these adverse outcomes exist in spite of a pandemic-induced increase in miscarriages, stillbirths, and infant mortality rates (see, e.g., Guimbeau et al., 2020; Mamelund, 2004)—all culling forces which likely resulted in a pool of survivors if anything positively selected on health—is a testament to the catastrophic extent of pandemic scarring.

Almond’s initial study has also since spawned a large and varied literature interrogating the long-run effects of the 1918 pandemic across a range of empirical settings. A first set of studies dig deeper into the U.S. case. One such study shows that 1919 birth cohorts (and in particular, those born in Quarter 2 of 1919, who were *in utero* at the height of the pandemic), are 4 percentage points (or 10 percent) more likely to report fair or poor health than their counterparts born in surrounding years; see a statistically significant 17-35 percent increase in a range of functional limitations, including trouble hearing, speaking, lifting, and walking; and are also likelier to experience diabetes and stroke (Almond & Mazumdar; 2005). Others debate the possibility of pandemic-induced selection into fertility, which could confound estimates of the long-run health effects of early-life pandemic exposure. These studies ultimately conclude that the positive selection of WWI recruits, and the corresponding negative selection of pandemic-era fathers, does not substantially alter the conclusion that fetal exposure to the 1918 pandemic was a major and direct cause of these cohorts’ later-life disadvantage (Brown & Thomas, 2018; Beach et al., 2018).

A newer set of papers, focusing on non-Western, and particularly, lower-income, settings, shows that the evidence on the pandemic’s long-run penalties is robust across a range of empirical contexts, each with different levels of baseline income and health status, different institutional responses to the pandemic, and different degrees of involvement in WWI. For instance, as in the West, in Taiwan there is evidence of permanent scarring: cohorts exposed to the pandemic *in utero* faced penalties with respect to educational attainment, heights, kidney disease, circulatory and respiratory issues, and diabetes (Lin & Liu, 2014). In low-income settings with minimal public health intervention, even higher incomes only did so much to buffer these shocks: in a sample of high-SES children in Japan, Ogasawara (2018) finds that *in utero* exposure to the 1918 influenza pandemic reduced boys’ and girls’ heights by 0.28 cm and 0.14 cm, respectively—magnitudes which in other studies have been associated with substantial increases in the probability of type II diabetes, osteoarthritis, and heart disease. The long-run results seen in Japan, as in Guimbeau et al. (2020) in Brazil, are consistent with sex differences in resilience to adverse health shocks.

The reduction in the health, human capital, and labor market prospects of cohorts exposed *in utero* also appears to have dampened their marriage market prospects in ways that carry intergenerational consequences. While both men’s and women’s own educational attainment was lower among exposed cohorts, only exposed women appear to suffer a marriage market penalty: they marry earlier, to spouses with lower levels of education (Fletcher, 2018). These are factors generally understood to reduce household incomes, female control of household resources, and the budget share allocated to child-centric expenditure. As such, these effects could represent a mechanism—alongside, e.g., epigenetics, or the more direct role of parental education in facilitating children’s access to quality healthcare and schooling—by which we see intergenerational persistence in the consequences of early-life exposure to the influenza pandemic of 1918. Indeed, moderate adverse effects on educational attainment, occupational prestige, and family socioeconomic status have been documented up to the third generation, i.e., the grandchildren of those exposed *in utero* (Cook et al. 2019).

What action, if any, did households take to shield their children from these effects, or to help them recover? While surprisingly little has been written in the context of the 1918 pandemic on questions of avoidance, adaptation, and remediation, Parman (2015) is a noteworthy exception. Drawing on linked microdata from the U.S., he finds evidence of reinforcing investments in response to the 1918 influenza pandemic: that is, families with a child *in utero* during the crisis shifted resources to the child’s older siblings, leading the

latter children to higher educational attainment. Parman explicitly rules out changes in family size, birth spacing, or selectivity in any such changes, underscoring that the effects observed here are directly a function of parents reallocating limited resources away from affected children, and toward the child with a higher human capital endowment at birth. Thus, household responses may have if anything compounded any early-life disadvantage associated with the 1918 shock.

IV. Consequences for Wellbeing through the Economic Disruption: The Great Depression & Other Historical Downturns

Historical pandemics can help us think about potential long-run effects on wellbeing arising directly through the current pandemic's patterns of morbidity and mortality. But what about the impacts resulting from its disruption of daily economic life? One of the central features of the current coronavirus pandemic is the sudden, extreme, and widespread economic disruption it has caused. On this count, it has perhaps less in common with other recent pandemics. Indeed, the immediate economic disruption caused by the 1918 pandemic pales in comparison to that caused by COVID-19.²⁷ So, while this historical pandemic can give us insight into long-run effects on wellbeing through the health channel ("direct" effects), we must look elsewhere to think about the long-run consequences of pandemics through corresponding economic downturns ("indirect" effects).

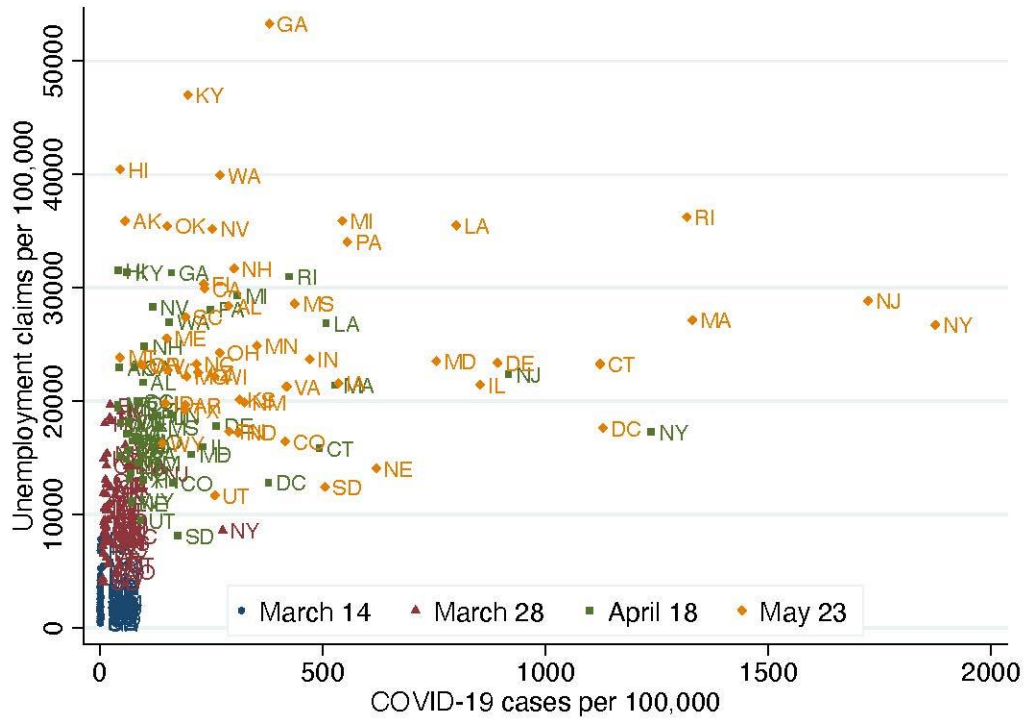
But where to look for a suitable comparison? In some ways, episodes such as the Black Death or the AIDS crisis in Sub-Saharan Africa would seem to present closer analogues than the 1918 influenza pandemic, as health events with massive and lasting economic ramifications.²⁸ The catastrophic loss of life under these pandemics fundamentally reshaped entire societies and economies, with, for instance, the resulting labor scarcity driving up the real wages of survivors, and, in some cases, precipitating other major demographic, economic, social, cultural, and institutional changes (Young, 2005; Alfani & Murphy, 2017).²⁹ Indeed, some point to the former plague as a major contributor to sustained rises in Western European living standards even under a Malthusian regime (Voigtländer & Voth, 2009, 2013a, 2013b), and to the region's rapid economic development and eventual divergence from the rest of the world over the early modern period (Clark, 2007).

²⁷ Until the COVID-19 crisis, there had been relatively little work on the effects of the 1918 pandemic on economic activity; indeed, the precise magnitude and temporal reach of these economic effects are still being debated (see, e.g., Basco et al. (2020), Barro et al. (2020), Correia et al. (2020), Lilley et al. (2020), and Velde (2020)). Moreover, it is worth noting that the 1918-focused studies that have emerged in the wake of COVID-19 tend to conflate the economic effects of the pandemic that arise from within and outside the "direct health-shock" channel. Because it is our aim in this paper is to disentangle these channels wherever possible, and in order to use a shock of comparable magnitude, we focus primarily on the Great Depression when examining the long-run human effects of economic dislocation.

²⁸ See Alfani & Murphy (2017) for an excellent and in-depth review of the literature on pre-industrial plagues, their long-run socioeconomic consequences, and parallels to modern pandemic control efforts.

²⁹ This of course far over-simplifies the countervailing, distributional, and context-specific effects of these pandemics. For a more detailed view, see Young (2005) and Alfani & Murphy (2017), and the sources therein.

Figure 2: Unemployment claims and COVID-19 cases in the U.S. by state over time



Notes: Unemployment claims are the cumulative initial unemployment insurance claims per 100,000 covered workers. COVID-19 cases are relative to the entire state population. Unemployment data were retrieved from <https://oui.doleta.gov/unemploy/claims.asp>. COVID-19 data were retrieved from <https://github.com/nytimes/covid-19-data>.

In each of these pandemics, mass mortality led to rapid and dramatic changes in population density and age structure, which in turn affected factor prices and labor markets. Thankfully, mortality rates under COVID-19 are not on such a scale as to produce the sort of fallout seen with these events.³⁰ Instead, it appears it may be the *disease-control responses*, perhaps more so than the virus’s direct toll on health, that is the source of economic dislocation in this instance.³¹ Indeed, as Figure 2 shows, the severity of the immediate health effects has not been a clear predictor of a locality’s economic downturn. As such, crises of primarily economic origin, such as historical recessions—and in particular, the Great Depression—may make the

³⁰ For instance, even while modern globalization has made disease transmission faster and harder to control, and even while increased efficiency in healthcare systems and global supply chains have complicated efforts to quickly ramp up treatment and control responses, other modern factors have made the current pandemic less dangerous to health than those that came before it—among them, improved medical technology, which has made it easier to manage secondary infections, and higher incomes, which have made human populations both less vulnerable and more resilient to infectious disease.

³¹ Emerging evidence, however, complicates the interpretation stay-at-home orders as being primarily responsible for the downturn associated with COVID-19. For instance, Kahn et al. (2020) show that the labor market effects of COVID-19 to date have been broader-based than is typically thought. All U.S. states exhibited a collapse in job vacancies in March 2020, and a corresponding rise in UI claims, irrespective of either the intensity of the virus’s initial spread or the timing of stay-at-home orders. Likewise, these phenomena were seen for the most part across both essential and non-essential sectors, directly- and indirectly-affected sectors, and across occupations with and without work-from-home capabilities. They conclude that “the current damage done to the economy is not solely caused by the stay-at-home orders; it is too large and pervasive.” Clearly, both the current crisis and our understanding of it are still rapidly evolving.

best analogues: while the coronavirus pandemic is a public health crisis, to be sure, it has manifested above all as a massive economic disruption, both in terms of magnitude and reach.³² Accordingly, we might want to think about its health and human capital consequences through this “livelihoods” channel as well. Indeed, it is these effects that are likely to be most relevant to our current situation.

IV.a. Business Cycles and Health

Beginning with short-term effects, we can look to a large literature on business cycles and health. These studies indicate that the net effects of downturns on morbidity and mortality will likely be highly context-dependent. This is because health is multidimensional, there are many countervailing channels through which local economic conditions can affect wellbeing, and because the particulars of the empirical setting—e.g., the size, nature, and origin of the shock; the baseline level of population health; and the strength of social safety nets—will ultimately govern which of these effects dominate (Arthi et al., 2017; Cutler et al., 2016). Recessions have been shown to improve health, for instance, by limiting individuals’ exposure to environmental and work-related hazards, including traffic accidents, on-the-job injuries, and pollution (Muller, 1989; Chay & Greenstone, 2003; Miller et al., 2009); by freeing up time for health-promoting activities such as exercise, childcare, and breastfeeding (Dehejia & Lleras-Muney, 2004; Miller & Urdinola, 2010; Ruhm, 2000); by reducing the income available to sustain unhealthy behaviors such as alcohol, tobacco, and drug abuse (Ruhm & Black, 2002; Ruhm, 2005); and by reallocating high-skilled but displaced healthcare workers toward higher-risk populations (Stevens et al., 2015). Meanwhile, adverse income shocks can compromise access to basic needs such as nutrition, medical care, and housing (Griffith et al., 2013; Painter, 2010); and can cause psychological stress that in turn raises rates of self-harm and risky behaviors (Eliason & Storrie, 2009; Sullivan & von Wachter, 2009).³³ While in theory, the net effect of local economic shocks on health is ambiguous, in practice, the bulk of the evidence drawn from modern and rich-country settings suggests that on net, total mortality rates fall during recessions (Arthi et al., 2017). In addition to setting-specific features like higher baseline health and stronger safety nets, the fact that beneficial channels tend to dominate in these settings may be in part because this evidence comes principally from small fluctuations in local economic conditions: using cross-country evidence over two centuries, Cutler et al. (2016) show that mild downturns lower mortality, while large ones raise it.³⁴ The downturn caused by COVID-19 would surely qualify as the latter.

The evidence is much more mixed in developing-country and historical settings, where levels of baseline income and health are low, where safety nets are weak, and where cutting-edge medical technology is less accessible (see, e.g., Baird et al. (2011) and Ferreira & Schady (2009)). In such settings, even small losses in income can be devastating to health (Costa, 2015; Heckman, 2007), and there is less scope for the sort of offsetting positive spillovers and behavioral changes seen in more modern and affluent settings.³⁵

³² This is certainly true at least in a distributional sense. While adverse effects will certainly be severe through direct morbidity/mortality channels, these will nevertheless be relatively concentrated. For contrast, adverse spillovers from these direct health effects, and from broader disease-control efforts, will be much more diffuse, even if less acute. Consider, for instance, that unlike the health-channel scarring effects of pandemics discussed in Section III, the economy-channel shocks apply to everyone to one extent or another, not just those who survive infection.

³³ See Arthi et al. (2017) for a much more detailed review. Note as well that under COVID-19 stay-at-home orders and supply-chain disruptions, the effects through many of these mechanisms are likely to be much more extreme, since the reduction in economic activity has been much more acute (in some cases, nearly absolute).

³⁴ This is the case even in rich countries, but especially in poor ones. In the latter, as discussed above, even smaller economic fluctuations can raise net mortality.

³⁵ Consequently, we might expect developing countries to face the greatest tension between the desire to limit the direct health costs of COVID-19 on the one hand, and the desire to limit those health costs arising from the corresponding economic contraction on the other. This is especially the case if pandemic-control measures are seen as helping the former objective while harming the latter, though it is worth noting that it is still unclear the extent to which pandemic-control measures are responsible for the contraction caused by COVID-19. We return to this theme

Consequently, this evidence seems to more often indicate countercyclical mortality. For instance, Arthi et al. (2020a) show that even in the presence of adaptive migratory responses, the Cotton Famine, a major 1860s downturn in Britain’s cotton textile-producing regions, substantially raised mortality in cotton regions, particularly amongst the elderly (who were more sensitive to income shocks), amongst cotton households (who faced unemployment and reduced hours), and amongst those working in non-tradeables (whose livelihoods depended on the success of the local cotton industry). Diverse historical evidence such as this can help us think about how the effects of the COVID-19 crisis might play out differently in other economies, particularly in the long run—something we cannot get from modern data, and especially, from modern U.S. data, alone.

Likewise, turning to the Great Depression, a more recent and thus perhaps more comparable setting to today’s, Stuckler et al. (2012) find at best mixed evidence of a beneficial health effect of the downturn: while there was a small reduction in all-cause mortality during this crisis, only those reductions in heart disease (small) and traffic fatalities (rather larger) could plausibly be linked to contemporaneous local economic shocks; other recession-related causes of death identified in the literature, such as suicide, rose substantially. Fishback et al. (2007) similarly find that had New Deal relief spending not intervened, the Great Depression would have created a “demographic disaster,” depressing birth rates and elevating death rates relative to prior trends (particularly among infants, those perhaps most vulnerable to short-run income fluctuations). Their results emphasize the importance of government responses to economic crises that in turn become health crises (and vice-versa): for instance, they note that while all-cause non-infant mortality rates were largely unaffected by relief spending, such income support nevertheless did help reduce rates of certain salient causes of death such as suicide, one of the few causes of adult mortality identified in Stuckler et al. (2012) as seeing a marked increase during the Great Depression.

IV.b. The Long-Run Scarring Effects of Recessions

While current debates around COVID-19 are understandably focused on the immediate impact of pandemic-induced recession conditions, the economic history literature teaches us that we should be equally—perhaps even *more*—concerned about the long-run scarring effects arising from this economic dislocation. Indeed, this channel may be especially relevant in more modern, high-income, and robust-safety net settings where most people survive an adverse shock, only to contend with the long-term and sometimes latent fallout. Some of these scarring effects stem from the immediate impact on household incomes. Depression-era resource deficits have been shown to affect cohorts that were *in utero* at the time well into adulthood, lowering their college completion rates and later-life incomes, and raising their rates of later-life poverty and disability—adverse effects that were only more pronounced in poorer areas, and areas that received less relief spending (Arthi, 2018; Fishback & Thomasson, 2014).³⁶

Meanwhile, other long-run penalties arise from disruptions to labor markets and human capital acquisition. A large contemporary literature studies the phenomenon of labor market scarring, or the idea that economic conditions at the time of labor market entry may have lasting effects on training decisions, occupational choice, career trajectories, and lifetime income.³⁷ This evidence, much of it taken from college graduates

of tradeoffs between economic activity and health, and differences in this tradeoff in wealthier vs less wealthy nations, in Section V.

³⁶ The stress of adverse shocks may also be transmitted intergenerationally through epigenetic channels. See, e.g., Costa et al. (2018). Likewise, there is evidence that both pandemics and recessions—as traumatic and stressful events—can shape the attitudes and preferences of those exposed during formative years in ways that can have lasting political and economic consequences (see, e.g., Campante et al. (2020); Giuliano & Spilimbergo (2015); Malmendier & Nagel (2011); and Schoar & Zuo (2017)).

³⁷ While this literature focuses on adverse shocks at the time of labor market entry, note that compared to other recessions, long-run labor market scarring could even extend to a different and younger range of cohorts in the

around the 2008 Recession, is mixed: some studies suggest that the impact of initial labor market conditions diminishes over the course of an individual's career—often within the first decade—while others find that some penalties associated with early-career shocks can be cumulative and permanent (see Rothstein (2019) for an in-depth review; see also, Kahn (2010)). These effects are often heterogeneous by skill level, and may be driven by mismatch in initial job placement (Faberman & Mazumder 2012, Liu et al. 2016, Oyer 2006, Şahin et al. 2014, van den Berge 2018), lower initial wages (which may be partially related to job mismatch; Oreopoulos et al. (2012)), reduced working time (Cockx & Ghirelli 2016), and delays in finding employment (Genda et al. 2010), among other factors. Moreover, strategic responses to these shocks, such as migration (Feigenbaum 2015), temporary exit from the labor force (Hershbein 2012), and human capital acquisition (Charles et al. 2018, Barr & Turner 2015), may themselves have implications for short- and long-run labor market prospects, as separate from those arising directly from the initial shock.³⁸ These studies thus strongly suggest that downturns may have important “overhang” that may potentially “reduce prosperity for decades to come,” both for directly-affected cohorts and the wider economy (Rothstein 2019, p. 4). Accordingly, very-long-run and even intergenerational evidence on these issues can be especially valuable.

Recent work in economic history has looked to the Great Depression in order to offer precisely this sort of perspective. These studies show substantial and persistent penalties for all workers in severely-hit areas, but especially for new labor market entrants, who faced very different constraints and scope for adaptation than did incumbent workers. Moulton (2017), for instance, finds a substantial earnings penalty amongst less-educated American men just entering the labor market in 1930. While there are large adverse effects for those born in severely-affected states, this age-at-downturn penalty disappears in less-affected states. Likewise, examining evidence on labor force transitions using large-scale linked microdata from the U.S., Arthi et al. (2020b) show that many younger workers during the Depression accepted work that they otherwise might not have considered in better economic times—whether because of their now-dire need, the additional competition from older workers, or some combination of these factors. Moreover, many young people seeking work were locked out of the labor market completely by their older counterparts, who now remained in the labor force (or even re-entered it) at higher rates. Evidence on occupational transitions and socioeconomic mobility also suggest important career-stage gradients in scarring: younger workers were crowded out of the best local job opportunities by their older counterparts, with young workers in more rural areas pushed out of farming by older workers who retained these jobs, and into general laborer and non-occupational positions; and those in more industrial areas being pushed into farming, the less desirable class of occupations in these areas. Importantly, while both of these outcomes represent a short-run penalty for newer labor market entrants, the long-run implications for wellbeing may be very different, given the rapid urbanization and the incipient decline of the agricultural sector that was to come. Indeed, by providing the impetus to leave agriculture (or by prompting higher rates of out-migration—younger labor market cohorts irrespective of sector were also likelier to have moved across state lines or into urban areas during the Depression, perhaps in response to the dearth of local opportunities for inexperienced workers), the Great Depression may have had a small silver lining for young rural workers. However, at least in the short run, it served to hamper upward mobility: Feigenbaum (2015) finds that by 1940, intergenerational mobility had fallen for men growing up in cities severely hit by the Depression. Migration—in particular, the superior destination choices of the sons of richer fathers—was an important mechanism behind these results, again emphasizing the capacity of large adverse shocks to exacerbate rather than level preexisting inequalities.

COVID-19 case, because of widespread school closures. Other COVID-19-related mechanisms, such as the loss of parental income, would tend to compound these effects further.

³⁸ While Charles et al. (2018) and Barr & Turner (2015) discuss how recessions may induce voluntary changes in schooling patterns that in turn have career-long effects, Meyers & Thomasson (2017) consider the long-run consequences of involuntary schooling disruptions due to a similarly disruptive event, the 1916 polio pandemic. They find that children on the cusp of school-leaving age never returned to school following temporary closures implemented to slow the spread of polio, resulting in lower lifetime educational attainment for these cohorts.

V. Interactions Between Population Health and Economic Activity

Up until now, we have considered the so-called “direct” health and “indirect” economic impacts of pandemics separately. However, these two factors are inextricably linked. For instance, in the case of COVID-19, the economic effects we have seen to date appear to be at least in part a direct consequence of disease-management efforts, with pain in one dimension being the cost of gains in another. This underscores the importance of interactions between population health and the economy—be they complementarities or tradeoffs. These interactions are particularly apparent in the context of environmental pollution. We focus here on a discussion of air pollution, as the form of pollution perhaps most relevant during a respiratory health crisis.

Links between air quality and respiratory illness are by now well-established in the medical literature, with air pollution increasing both the susceptibility to and severity of respiratory infections (see, e.g., Cienciewicki & Jaspers, 2007). This is because pollutants and particulate matter can cause inflammation in the respiratory system, as well as elsewhere in the body. In drawing the body’s resources away from normal biological processes in order to fight inflammation and associated infections, pollution can render individuals weaker, less resilient, and more vulnerable to secondary infections, with knock-on effects on a range of related health and human capital outcomes far too numerous to list here. Among others, the direct effects of pollution exposure include increases in infant mortality (Beach & Hanlon, 2017; Clay et al., 2016; Currie & Neidell, 2005) and school absences (Currie et al., 2009b); and reductions in cognitive performance (Ebenstein et al., 2016), stature (Bailey et al., 2018), and work capacity (Chang et al., 2019; Graff Zivin & Neidell, 2012; Hanna & Oliva, 2015).³⁹ There are also a number of “indirect” effects of pollution operating through maternal illness and fetal deprivation. For cohorts exposed *in utero*, this can result in, e.g., lower birthweights and gestation lengths (Currie et al., 2009a) and lower labor force participation and earnings in adulthood (Isen et al., 2017).⁴⁰ Early-life exposure to dust storms, a related air quality phenomenon, have also been linked to rises in infant and child mortality (Adhvaryu et al., 2019), higher rates of meningitis infection in regions where this is endemic (Archibong & Annan, 2020), and higher rates of poverty, lower rates of college completion, and increases in the probability of cognitive and physical disabilities in later life (Arthi 2018). Thus, and across a range of diverse global settings, pollution may have short-run, long-run, and even intergenerational effects on wellbeing. Moreover, there is often a respiratory health mechanism at work in these outcomes.

Given that influenza is a respiratory illness, then—and one with strong interactions with other potentially fatal respiratory infections such as pneumonia and tuberculosis (Noymer, 2011; Noymer & Garenne, 2000; Taubenberger & Morens, 2006)—it is perhaps unsurprising to see air pollution emerge as an aggravating factor in the human costs of the 1918 pandemic. Clay et al. (2019) examine evidence from a panel of 438 U.S. cities, and find that the air pollution generated by coal-fired electricity plants was a significant contributor to pandemic mortality, with effect sizes roughly half those associated with measures of population health and poverty.⁴¹ Together, they estimate that these factors accounted for approximately half of all cross-city variation in pandemic mortality. In another study, they estimate that both infant and all-age mortality were impacted adversely by the presence of coal-burning plants, with poor air quality responsible for 19-26 percent of total pandemic mortality in high- and medium-pollution cities, a figure equivalent to

³⁹ The rise in school absenteeism observed in Currie (2009b) is attributable to illness, pollution avoidance, or some combination of the two.

⁴⁰ For an in-depth review of the health effects of early-life pollution exposure, see Currie et al. (2014).

⁴¹ It is possible that indoor pollution and seasonality also played a role in air quality-influenza interactions, both during and outside pandemic times. For instance, influenza is generally prevalent in the winter, a time when coal smoke from home heating also tended to peak in this era (Barreca et al., 2014).

some 30,000-42,000 excess deaths beyond those attributable to the pandemic alone (Clay et al., 2018).⁴² There are therefore clear biological complementarities between pollution and respiratory crises.

Economic activity is a major driver of pollution, however—and insofar as pollution acts as a proxy for economic activity, the net relationship between pollution and health may not be so clear. For instance, using data from the modern U.S., a setting with relatively high incomes, high baseline health, and robust medical infrastructure, Chay & Greenstone (2003) show that by reducing concentrations of total suspended particulates (TSPs), the 1981-1982 recession reduced infant mortality rates, driven in particular by reductions in neonatal deaths. However, winding the clock back just 20-50 years earlier, in a somewhat poorer setting with emerging safety nets and little to no environmental regulation, Clay et al. (2016) find evidence of crucial tradeoffs between the income generated through industrial activity on the one hand, and the pollution generated on the other. Specifically, they show that over the 1930s to 1960s in the U.S., the presence of coal-fired power plants led to increases in infant mortality, but only in those localities which were already highly economically developed. In less-developed localities, infant mortality followed a U-shaped pattern with respect to the expansion of coal capacity: first falling as rising incomes and cleaner residential energy sources buoyed infant health, and then rising as subsistence health needs were met and the concentration of pollution grew.⁴³ This suggests that at very low levels of income, the health benefits of economic development may offset—and even justify—the health costs of the corresponding pollution.

Such tradeoffs and constraints are clearly evident in developing-country settings today. Take, for instance, the practice of crop-burning, a means of quickly and effectively clearing residual material from fields. While this practice is prevalent across a range of global settings where agriculture is critical to local livelihoods, it nevertheless imposes huge costs in terms of respiratory-related morbidity and mortality. Chakrabarti et al. (2019) estimate that in India, this practice has caused a spike in fine particulates, raising concentrations to 20 times the World Health Organization's threshold for safe air, and tripling the risk of acute respiratory infections in both burning regions and areas downwind. Despite this, farmers may face poverty traps: if they were richer or had better access to credit, they could afford to generate income without resorting to crop-burning; however, if they want to generate income, they are compelled to burn crops. Thus, where less-polluting alternatives are unaffordable, these farmers may simply accept the health costs as part and parcel of earning a living.

Findings like these of course raise distributional considerations. For instance, evidence from rich countries shows that because air pollution is capitalized into housing values (Chay & Greenstone, 2005), in the neighborhoods surrounding toxic industrial plants, there is a grim tradeoff between lower house prices and higher infant mortality risk (Currie et al., 2015). As in Chakrabarti et al.'s (2019) Indian example, this implies that the poor are disproportionately subject to air quality hazards,⁴⁴ and that the health costs of

⁴² Clay et al.'s (2018) observation that modern levels of pollution in parts of the developing world, including India and China, are on par with those in the early 20th century U.S., sounds an ominous note in light of the current crisis—though the circumstances today (e.g., improved medical technology, the higher share of traffic-related emissions, a fall in pollution due to widespread economic shutdowns) may be just different enough to ameliorate concerns over the lethal interaction between pollution and pandemic influenza.

⁴³ Chay and Greenstone (2003), for instance, show strong nonlinearities in the effect of air quality on infant health.

⁴⁴ To give an example of why this is, consider that individuals who are income-constrained may sort into neighborhoods where pollution has driven rents down to an affordable level. While there, their low incomes may disallow them from adopting avoidant, adaptive, or compensatory behaviors that might allow them to otherwise mitigate the impact of pollution on their health (note that even in wealthy settings, evidence of avoidance behavior in response to pollution shocks is somewhat mixed; see, e.g., Graff Zivin & Neidell (2009) and Moretti & Neidell (2011). Adhvaryu (2019) and Arthi (2018), however, show evidence of compensatory responses and their effectiveness, respectively.). In fact, poverty may induce them to adopt more-polluting, less-healthy practices (see, e.g., Barreca et al. (2014) on the use of coal in home heating, or Hanna et al. (2016) on the use of solid-fuel indoor cook stoves). Even if they were liquid, however, poor individuals might evince a relatively low marginal willingness to pay for health

economic activity are often at least partly externalized. Hsiang et al. (2019) provide a useful framework for thinking about these issues, noting that the uneven and nonrandom distribution of both environmental hazards and population over space can give rise to substantial disparities in the health effects of these hazards.⁴⁵ Accordingly, the distribution of costs and benefits arising from a shock that affects environmental conditions—e.g., a pandemic or policy—will depend on the resulting distribution of environmental goods (in this case, local pollution), and heterogeneity in the costs and benefits of a marginal change in environmental conditions (itself arising from multiple sources, including baseline local exposure, nonlinearities in the damage function, and differences in the damage function across sub-populations) (Hsiang et al., 2019, p. 83). As in Section III, it seems that as independent mechanisms, pandemic risks through pollution channels, like pandemic risks through income channels, will tend to disproportionately fall on low-SES groups and low-income countries.

Complicating predictions is the fact that in the current coronavirus crisis, pandemic influenza has precipitated a fall in economic activity, which has in turn reduced air pollution. That is, pandemic influenza risk, economic activity/income, and pollution have become intertwined: economic activity has been restricted in order to reduce the scope and speed of influenza transmission, but the corresponding loss of incomes may raise pandemic risk in some ways and for some groups; the fall in economic activity has lowered the level of pollution, thus reducing the risk of pandemic mortality and morbidity, even while income losses push in the other direction. A key question, then, from both an aggregate and distributional standpoint, is whether and for whom the losses in health and human capital through the income channel are offset by the gains in health through reducing the spread of influenza, reducing pollution, and the interaction of these factors.

VI. Moving Forward

The history of past pandemics and economic downturns provides sobering guidance for what we might expect from the current COVID-19 crisis. There is a complicated relationship between health and economic productivity that will shape the immediate and latent effects of COVID-19 in both obvious and subtle ways.

First, regardless of the pathology of a disease, its impacts are often a function of economic conditions. While some past pandemics spared no class, many pandemics disproportionately impacted individuals of lower socioeconomic status due to a variety of factors including their occupations, living conditions, and access to healthcare. They are at greater risk of exposure, face greater harms conditional on exposure, and are less able to remediate these harms. We have already seen this taking place with COVID-19, and need to remain aware that the spread of the disease and the severity of its effects will be in part a function of the spatial distribution of residence, economic activity, and environmental harms. Policies to prevent disease spread and ameliorate health impacts will only be efficient by keeping this in mind.

An equally important lesson from economic history is that the economic downturn associated with the COVID-19 shutdowns will have its own complicated impact on health and long-run outcomes. To the extent that the economic downturn limits exposure to environmental and work-related hazards, or reduces spending on unhealthy behaviors, non-coronavirus related dimensions of health may actually improve. However, the modern literature on developing countries and the U.S. experience during the Great

amenities, given their relatively high marginal utility of consumption, versus that from investments in environmental quality. On the other hand, the health returns to neighborhood quality could be high for low-income groups, because of both non-linearities in the health production function, and interactions between income and environmental conditions.

⁴⁵ These considerations matter both within countries and increasingly across countries as the world becomes more globalized as the pollution associated with the production of goods becomes increasingly spatially distant from the consumption of these goods.

Depression suggest that the severe economic downturn may compound health problems in areas with lower baseline incomes and weaker safety nets. Identifying the channels through which income loss and general recession conditions impact health is necessary for properly interpreting any observed changes in population health levels during COVID-19, and for designing effective policies to safeguard health.

Finally, the unique ability of economic history to show us long-run effects reveals several areas that should concern current policymakers. The experience of the 1918 influenza pandemic suggests that disease exposure can impact individuals throughout their lifetimes, both directly through poorer health, and indirectly through reduced investment in human capital and lost job market opportunities. The costs were not limited to those individuals directly exposed; instead, they spilled over within households and across space, sectors and generations. The Great Depression points to other long-term effects that are likely to emerge from the pandemic-related mobility restrictions and slowdown in economic activity: both being born or entering the labor market during the Great Depression led to economic penalties well into adulthood, and constraints on migration had adverse effects on individuals and firms. Researchers and policymakers need to assess the potential for these long-run impacts as weighed against the short-term demands of pandemic control measures, and consider whether policy interventions undertaken now, such as cash relief, could help most efficiently ameliorate them. Turning our attention to the past allows us to explore these tradeoffs in a clear-eyed manner, assessing the *realized* costs and benefits for previous generations, rather than having to start with difficult judgements that weigh the welfare of current individuals against that of future generations.

While economic history provides useful insights for the current pandemic, the way in which the pandemic is unfolding also provides a fresh perspective with which to revisit the past. We are witnessing the actions that individuals and families, workers and firms, citizens and public officials alike take to guard against the pandemic and the damage it has done to the economy. We are witnessing how these responses change as new information on COVID-19 emerges. The current pandemic affords us unprecedentedly rich and disaggregated data that, even while still evolving, can give new insights into which groups might warrant additional study in past pandemics. All of these dimensions of COVID-19 can help us reshape the roadmap for studying the economic history of pandemics.

One of the most important ways the COVID-19 experience can shape the direction of economic history may not be in seeking out the similarities but rather focusing on differences. While the rate of transmission and severity of the effects of COVID-19 have historical analogues, many relevant features of the world are meaningfully different—among them, the global nature of production; flows of people, goods, and information; urbanization; baseline living standards; medical technology; public health infrastructure; and the role of government. These differences can help us understand both past and present pandemics better; moreover, they help us understand how and why things have changed. For example, the shutdowns are more far-reaching, and the corresponding economic downturn more damaging, than we might have predicted from previous pandemics. Can these differences explain the far greater economic costs of COVID-19 relative to similarly lethal pandemics of the 20th century?

This suggests an important direction for future economic history work: identifying why the nature of the response to public health crises differed, and why the resulting economic consequences were often smaller historically. Engaging in this work also allows us to grapple with challenging questions about tradeoffs between population health and economic activity. These tradeoffs are incredibly difficult to tackle head on in the face of an unfolding crisis; they force unfathomable but unavoidable choices on policymakers often working with limited information. Visibility into not just the actions but also the short- and long-run outcomes of governments, firms, and individuals in the past gives us a chance to undertake a more rigorous analysis of these tradeoffs, freer from emotional entanglements, that can guide us to better decisions in this and future crises.

References

- Acemoglu, D., Johnson, S., & Robinson, J. A. 2001. The colonial origins of comparative development: An empirical investigation. *American economic review*, 91(5), 1369-1401.
- Acuna-Soto, Rodolfo, Viboud, Cecile, and Chowell, Gerardo. 2011. "Influenza and Pneumonia Mortality in 66 Large Cities in the United States in Years Surrounding the 1918 Pandemic." *PLOS ONE*, 6(8): e23467.
- Adhvaryu, Achyuta, Bharadwaj, Prashanth, Fenske, James, Nyshadham, Anant, and Stanley, Richard. 2019. "Dust and Death: Evidence from the West African Harmattan." *NBER Working Paper #25937*.
- Archibong, Belinda and Annan, Francis. 2020. "Climate Change, Disease and Gender Gaps in Human Capital Investment." In: Konte M., Tirivayi N. (eds) *Women and Sustainable Human Development*. Palgrave Macmillan: Cham.
- Alfani, Guido. 2013. Plague in seventeenth-century Europe and the decline of Italy: an epidemiological hypothesis. *European Review of Economic History*, 17(4), 408-430.
- Alfani, Guido and Murphy, Tommy. 2017. "Plague and Lethal Epidemics in the Pre-Industrial World." *Journal of Economic History*, 77(1): 314-343.
- Almond, Douglas. 2006. "Is the 1918 Influenza Pandemic Over? Long-Term Effects of *In utero* Influenza Exposure in the Post-1940 U.S. Population." *Journal of Political Economy*, 114(4): 672-712.
- Almond, Douglas and Currie, Janet. 2011. "Human Capital Development Before Age Five." Pages 1315-1486 of: Ashenfelter, Orley and Card, David (eds), *Handbook of Labor Economics, Vol. 4, Part B*. Amsterdam: North-Holland.
- Almond, Douglas and Mazumder, Bhashkar. 2005. "The 1918 Influenza Pandemic and Subsequent Health Outcomes: An Analysis of SIPP Data." *American Economic Review Papers & Proceedings*, 95(2): 258-262.
- Arthi, Vellore. 2018. "'The Dust Was Long in Settling': Human Capital and the Lasting Impact of the American Dust Bowl." *Journal of Economic History*, 78(1): 196-230.
- Arthi, Vellore, Beach, Brian, and Hanlon, W. Walker. 2020. "Recessions, Mortality, and Migration Bias: Evidence from the Lancashire Cotton Famine." *Mimeo*.
- Arthi, Vellore, Beach, Brian, and Hanlon, W. Walker. 2017. "Estimating the Recession-Mortality Relationship When Migration Matters." *NBER Working Paper #23507*.
- Arthi, Vellore, Eriksson, Katherine, and Richardson, Gary. 2020. "Labor Market Scarring in the Very Long Run: Evidence from Large-Scale Longitudinal Microdata." *Mimeo*.
- Bailey, Roy, Hatton, Timothy, and Inwood, Kris. 2018. "Atmospheric Pollution, Health, and Height in Late Nineteenth Century Britain." *Journal of Economic History*, 78(4): 1210-1247.
- Baird, Sarah, Friedman, Jed, & Schady, Norbert. 2011. "Aggregate Income Shocks and Infant Mortality in the Developing World." *Review of Economics and Statistics*, 93(3): 847-856.
- Barker, David, ed. 1992. *Fetal and Infant Origins of Adult Disease: Papers*. London: British Medical Journal.
- Barr, Andrew and Sarah Turner. 2015. "Out of Work and Into School: Labor Market Policies and College Enrollment During the Great Recession." *Journal of Public Economics*, 124: 63-73.
- Barreca, Alan, Clay, Karen, and Tarr, Joel. 2014. "Coal, Smoke, and Death" Bituminous Coal and American Home Heating." *NBER Working Paper #19881*.
- Barro, R. J., Ursúa, J. F., & Weng, J. 2020. *The coronavirus and the great influenza pandemic: Lessons from the "Spanish Flu" for the coronavirus's potential effects on mortality and economic activity* (No. w26866). National Bureau of Economic Research.
- Basco, Sergi, Domènech, Jordi, and Rosés, Joan. 2020. "The Redistributive Effects of Pandemics: Evidence on the Spanish Flu." *Universidad Carlos III de Madrid Working Papers in Economic History #2020-05*.
- Beach, Brian, Ferrie, Joseph, and Saavedra, Martin. 2018. "Fetal Shock or Selection? The 1918 Influenza Pandemic and Human Capital Development." *NBER Working Paper #24725*.

- Beach, Brian and Hanlon, W. Walker. 2017. "Coal Smoke and Mortality in an Early Industrial Economy." *Economic Journal*, 128(615): 2652-2675.
- Bell, W. G. 1924. The Great Plague in London in 1665. *The Great Plague in London in 1665*.
- Biraben, Jean Noël. 1975. *Les Hommes et la Peste en France et dans Le Pays Européens et Méditerranées*. Paris: Mouton.
- Bleakley, H. 2003. Disease and development: Evidence from the American South. *Journal of the European Economic Association*, 1(2-3), 376-386.
- Bleakley, H. 2007. Disease and development: evidence from hookworm eradication in the American South. *The Quarterly Journal of Economics*, 122(1), 73-117.
- Bleakley, H. 2010. Malaria eradication in the Americas: A retrospective analysis of childhood exposure. *American Economic Journal: Applied Economics*, 2(2), 1-45.
- Boberg-Fazlić, Nina, Ivets, Maryna, Karlsson, Martin, and Nilsson, Therese. 2017. "Disease and Fertility: Evidence from the 1918 Influenza Pandemic in Sweden." *IZA Discussion Paper #10834*.
- Brainerd, Elizabeth and Sieglar, Mark. 2003. "The Economic Effects of the 1918 Influenza Epidemic," *CEPR Discussion Paper #3791*.
- Brown, Ryan and Thomas, Duncan. 2018. "On the Long Term Effects of the 1918 U.S. Influenza Pandemic." *Mimeo*.
- Campante, Felipe, Durante, Ruben, and Depetris-Chauvin, Emilio. 2020. "The Virus of Fear: The Political Impact of Ebola in the U.S." *NBER Working Paper No. 26897*.
- Carmichael, A. G. 2014. *Plague and the poor in Renaissance Florence*. Cambridge University Press.
- Chakrabarti, Suman, Khan, Mohammed Tajuddin, Kishore, Avinash, Roy, Devesh, and Scott, Samuel. 2019. "Risk of Acute Respiratory Infection from Crop Burning in India: Estimating Disease Burden and Economic Welfare from Satellite and National Health Survey Data for 250,000 Persons." *International Journal of Epidemiology*, 48(4): 1113-1124.
- Chang, Tom, Graff Zivin, Joshua, Gross, Tal, and Neidell, Matthew. 2014. "The Effect of Pollution on Worker Productivity: Evidence from Call Center Workers in China." *American Economic Journal: Applied Economics*, 11(1): 151-172.
- Charles, Kerwin Kofi, Erik Hurst, and Matthew Notowidigdo. 2018. "Housing Booms and Busts, Labor Market Opportunities, and College Attendance." *American Economic Review*, 108(10): 2947-2994.
- Chay, Kenneth and Greenstone, Michael. 2005. "Does Air Quality Matter? Evidence from the Housing Market." *Journal of Political Economy*, 113(21): 376-424.
- Chay, Kenneth and Greenstone, Michael. 2003. "The Impact of Air Pollution on Infant Mortality: Evidence from Geographic Variation in Pollution Shocks Induced by a Recession." *Quarterly Journal of Economics*, 118(3): 1121-1167.
- Chowell, Gerardo and Viboud, Cecile. 2016. "Pandemic Influenza and Socioeconomic Disparities: Lessons from 1918 Chicago." *Proceedings of the National Academy of Sciences*, 113(48): 13557-13559.
- Chowell Gerardo, Bettencourt, Luis, Johnson, Niall, Alonso, Wladimire, Viboud, and Voboud, Cecile. 2008. "The 1918-1919 Influenza Pandemic in England and Wales: Spatial Patterns in Transmissibility and Mortality Impact." *Proceedings. Biological Sciences*, 275(1634): 501-509.
- Clark, Gregory. 2007. *A Farewell to the Alms: A Brief Economic History of the World*. Princeton: Princeton University Press.
- Clay, Karen, Lewis, Joshua, and Severnini, Edson. 2019. "What Explains Cross-City Variation in Mortality during the 1918 Influenza Pandemic? Evidence from 438 U.S. Cities." *Economics and Human Biology*, 35: 42-50.
- Clay, Karen, Lewis, Joshua, and Severnini, Edson. 2018. "Pollution, Infectious Disease, and Mortality: Evidence from the 1918 Spanish Influenza Pandemic." *Journal of Economic History*, 78(4): 1179-1209.
- Clay, Karen, Lewis, Joshua, and Severnini, Edson. 2016. "Canary in a Coal Mine: Infant Mortality, Property Values, and Tradeoffs Associated with Mid-20th Century Air Pollution." *NBER Working Paper #22155*.
- Ciencewicki, Jonathan and Jaspers, Ilona. 2007. "Air Pollution and Respiratory Viral Infection." *Inhalation Toxicology*, 19:1135-1146.

- Cockx, Bart and Corinna Ghirelli. 2016. "Scars of Recessions in a Rigid Labor Market." *Labour Economics*, 41: 162-176.
- Cook, C. Justin, Fletcher, Jason, and Forgues, Angela. 2019. "Multigenerational Effects of Early-Life Health Shocks." *Demography*, 56: 1855-1874.
- Correia, Sergio, Luck, Stephan, and Verner, Emil. 2020. "Pandemics Depress the Economy, Public Health Interventions Do Not: Evidence from the 1918 Flu." *Mimeo*.
- Costa, Dora. 2015. "Health and the Economy in the United States from 1750 to the Present." *Journal of Economic Literature*, 53(3): 503-570.
- Crosby, A. W. (2003). *America's forgotten pandemic: the influenza of 1918*. Cambridge University Press.
- Currie, Janet, Davis, Lucas, Greenstone, Michael, and Walker, Reed. 2015. "Environmental Health Risks and Housing Values: Evidence from 1,600 Toxic Plant Openings and Closings." *American Economic Review*, 105(2): 678-709.
- Currie, Janet, Graff Zivin, Joshua, Mullins, Jamie, and Neidell, Matthew. 2014. "What Do We Know About the Short- and Long-Term Effects of Early-Life Exposure to Pollution?" *Annual Review of Resource Economics*, 6: 217-247.
- Currie, Janet, Neidell, Matthew, and Schmieder, Johannes. 2009. "Air Pollution and Infant Health: Lessons from New Jersey." *Journal of Health Economics*, 28: 688-703.
- Currie, Janet, Hanushek, Eric, Kahn, Megan, Neidell, Matthew, and Rivkin, Steven. 2009. "Does Pollution Increase School Absences?" *Review of Economics and Statistics*, 91(4): 682-694.
- Currie, Janet and Neidell, Matthew. 2005. "Air Pollution and Infant Health: What Can We Learn from California's Recent Experience?" *Quarterly Journal of Economics*, 120(3): 1003-1030.
- Curtis, Daniel. 2016. "Was Plague an Exclusively Urban Phenomenon? Plague Mortality in the Seventeenth-Century Low Countries." *Journal of Interdisciplinary History*, 47(2): 1-32.
- Cutler, David, Huang, Wei, & Lleras-Muney, Adriana. 2016. "Economic Conditions and Mortality: Evidence from 200 Years of Data." *NBER Working Paper No. 22690*.
- Dawood, F. S., Iuliano, A. D., Reed, C., Meltzer, M. I., Shay, D. K., Cheng, P. Y., ... & Feikin, D. R. (2012). Estimated global mortality associated with the first 12 months of 2009 pandemic influenza A H1N1 virus circulation: a modelling study. *The Lancet infectious diseases*, 12(9), 687-695.
- Dehejia, Rajeev, & Lleras-Muney, Adriana. 2004. "Booms, Busts, and Babies' Health." *Quarterly Journal of Economics*, 119(3): 1091-1130.
- Diamond, J. (1999). *Guns, Germs, and Steel: The Fates of Human Societies*. United Kingdom: W.W. Norton.
- Dinges, M. (1995). Pest und Staat: von der Institutionengeschichte zur sozialen Konstruktion. *Neue Wege in der Seuchengeschichte*, 71-103.
- Dittmar, J., & Meisenzahl, R. R. (2017). State Capacity and Public Goods: Institutional Change, Human Capital, and Growth in Historic Germany.
- Donaldson, Dave and Keniston, Daniel. 2014. "How Positive Was the Positive Check? Investment and Fertility in the Aftermath of the 1918 Influenza in India." *Mimeo*.
- Dong, E., Du, H., & Gardner, L. (2020). An interactive web-based dashboard to track COVID-19 in real time. *The Lancet infectious diseases*.
- Dyal JW, Grant MP, Broadwater K, et al. COVID-19 Among Workers in Meat and Poultry Processing Facilities — 19 States, April 2020. *MMWR Morbidity Mortality Weekly Report* 2020;69:557-561. DOI: <http://dx.doi.org/10.15585/mmwr.mm6918e3>
- Ebenstein, Avraham, Victor Lavy, and Sefi Roth. 2016. "The Long-Run Economic Consequences of High-Stakes Examinations: Evidence from Transitory Variation in Pollution." *American Economic Journal: Applied Economics*, 8 (4): 36-65.
- Echenberg, M. 2010. *Plague ports: the global urban impact of bubonic plague, 1894-1901*. NYU Press.
- Eliason, Marcus, & Storrie, Donald. 2009. "Does Job Loss Shorten Life? *Journal of Human Resources*." 44(2): 277-302.
- Ellner, P. D. 1998. Smallpox: gone but not forgotten. *Infection*, 26(5), 263-269.
- Feigenbaum, James. 2015. "Intergenerational Mobility during the Great Depression." *Mimeo*.

- Ferreira, Francisco, & Schady, Norbert. 2009. "Aggregate Economic Shocks, Child Schooling, and Child Health." *World Bank Research Observer*, 24(2): 147–181.
- Fishback, Price, Haines, Michael, & Kantor, Shawn. 2007. "Births, Deaths, and New Deal Relief during the Great Depression." *Review of Economics and Statistics*, 89(1): 1-14.
- Fishback, Price and Thomasson, Melissa. 2014. "Hard Times in the Land of Plenty: The Effect on Income and Disability Later in Life for People Born during the Great Depression." *Explorations in Economic History*, 54: 64-78.
- Fletcher, Jason. 2018. "The Effects of *In utero* Exposure to the 1918 Influenza Pandemic on Family Formation." *Economics and Human Biology*, 30: 59-68.
- Genda, Yuji, Ayako Kondo, and Souichi Ohta. 2010. "Long-term Effects of a Recession at Labor Market Entry in Japan and the United States." *Journal of Human Resources*, 45(1): 157-196.
- Giuliano, Paola and Spilimbergo, Antonio. 2014. "Growing Up in a Recession." *Review of Economic Studies*, 81(2): 787–817.
- Glezen, W. P. 1996. Emerging infections: pandemic influenza. *Epidemiologic reviews*, 18(1), 64-76.
- Graff Zivin, Joshua and Neidell, Matthew. 2009. "Days of Haze: Environmental Information Disclosure and Intertemporal Avoidance Behavior." *Journal of Environmental Economics and Management*, 58: 119-128.
- Graff Zivin, Joshua and Neidell, Matthew. 2012. "The Impact of Pollution on Worker Productivity." *American Economic Review*, 102(7): 3652-3673.
- Grantz, Kyra, Rane, Madhura, Salje, Henrik, Glass, Gregory, Schachterle, Stephen, and Cummings, Derek. 2016. "Disparities in Influenza Mortality and Transmission Related to Sociodemographic Factors within Chicago in the Pandemic of 1918." *Proceedings of the National Academy of Sciences*, 113(48): 13839-13844.
- Grantz, Kyra, Rane, Madhura, Salje, Henrik, Glass, Gregory, Schachterle, Stephen, and Cummings, Derek. 2016. "Reply to Shanks and Brundage: Many Plausible Mechanisms of Pandemic Mortality Disparities." *Proceedings of the National Academy of Sciences*, 114(18): E3588-E3589.
- Griffith, Rachel, O'Connell, Martin, & Smith, Kate. 2013. "Food Expenditure and Nutritional Quality over the Great Recession." Tech. rept.
- Guerra, F. M., Bolotin, S., Lim, G., Heffernan, J., Deeks, S. L., Li, Y., & Crowcroft, N. S. (2017). The basic reproduction number (R0) of measles: a systematic review. *The Lancet Infectious Diseases*, 17(12), e420-e428.
- Guimbeau, Amanda, Menon, Nidhiya, and Musacchio, Aldo. 2020. "The Brazilian Bombshell? The Long-Term Impact of the 1918 Influenza Pandemic the South American Way." *NBER Working Paper #26929*.
- Hanna, Rema, Duflo, Esther, and Greenstone, Michael. 2016. "Up in Smoke: The Influence of Household Behavior on the Long-Run Impact of Improved Cooking Stoves." *American Economic Journal: Economic Policy*, 8(1): 80-114.
- Hanna, Rema and Oliva, Paulina. 2015. "The Effect of Pollution on Labor Supply: Evidence from a Natural Experiment in Mexico City." *Journal of Public Economics*, 122: 68-79.
- Heckman, James. 2007. "The Economics, Technology, and Neuroscience of Human Capability Formation." *Proceedings of the National Academy of Sciences*, 104(33): 13250-13255.
- Hershbein, Brad. 2012. *B.E. Journal of Economic Analysis & Policy*, 12(1): 1-29.
- Hsiang, Solomon, Oliva, Paulina, and Walker, Reed. 2019. "The Distribution of Environmental Damages." *Review of Environmental Economics and Policy*, 13(1): 83-103.
- Isen, Adam, Rossin-Slater, Maya, and Walker, W. Reed. 2017. "Every Breath You Take—Every Dollar You'll Make: The Long-Term Consequences of the Clean Air Act of 1970." *Journal of Political Economy*, 125(3): 848-902.
- Isenmann, E. (2014). *Die deutsche Stadt im Mittelalter 1150-1550: Stadtgestalt, Recht, Verfassung, Stadtrecht, Kirche, Gesellschaft, Wirtschaft*. Böhlau Verlag Köln Weimar.
- Kahn, Lisa. 2010. "The Long-Term Labor Market Consequences of Graduating from College in a Bad Economy." *Labour Economics*, 17: 303-316.

- Kahn, Lisa, Lange, Fabian, and Wiczer, David. 2020. "Labor Demand in the Time of COVID-19: Evidence from Vacancy Postings and UI Claims." *NBER Working Paper #27061*.
- Lane, J. M. (2011). Remaining questions about clinical variola major. *Emerging infectious diseases*, 17(4), 676.
- Lilley, Andrew, Lilley, Matthew, and Rinaldi, Gianluca. 2020. "Public Health Interventions and Economic Growth: Revisiting the Spanish Flu Evidence." *Mimeo*.
- Lin, Ming-Jen and Liu, Elaine. 2014. "Does *In utero* Exposure to Illness Matter? The 1918 Influenza Epidemic in Taiwan as a Natural Experiment." *Journal of Health Economics*, 37: 152-163.
- Liu, Kai, Kjell Salvanes, and Erik Ø. Sørensen. 2016. "Good Skills in Bad Times: Cyclical Skill Mismatch and the Long-Term Effects of Graduating in a Recession." *European Economic Review*, 84: 3-17.
- Malmendier, Ulrike and Stefan Nagel. 2011. "Depression Babies: Do Macroeconomic Experiences Affect Risk Taking?" *Quarterly Journal of Economics*, 126(1): 373-416.
- Mamelund, Sverre-Erik. 2004. "Can the Spanish Influenza Pandemic of 1918 Explain the baby Boom of 1920 in Neutral Norway?" *Population*, 59: 229-260.
- Mamelund, S. E. 2018. 1918 pandemic morbidity: The first wave hits the poor, the second wave hits the rich. *Influenza and other respiratory viruses*, 12(3), 307-313.
- Mamelund, Sverre-Erik. 2006. "A Socially Neutral Disease? Individual Social Class, Household Wealth and Mortality from Spanish Influenza in Two Socially Contrasting Parishes in Kristiania 1918-19." *Social Science and Medicine*, 62: 923-940.
- Markel, H., Lipman, H. B., Navarro, J. A., Sloan, A., Michalsen, J. R., Stern, A. M., & Cetron, M. S. (2007). Nonpharmaceutical interventions implemented by U.S. cities during the 1918-1919 influenza pandemic. *Jama*, 298(6), 644-654.
- McGuire, R. A., & Coelho, P. R. 2011. *Parasites, pathogens, and progress: diseases and economic development*. MIT Press.
- Meyers, Keith and Thomasson, Melissa. 2017. "Paralyzed by Panic: Measuring the Effect of School Closures during the 1916 Polio Pandemic on Educational Attainment." *NBER Working Paper No. 23890*.
- Miller, Douglas L., Page, Marianne, Stevens, Ann Huff, & Filipowski, Mateusz. 2009. "Why Are Recessions Good for Your Health?" *American Economic Review Papers & Proceedings*, 99(2): 122-127.
- Miller, Grant, & Urdinola, B. Piedad. 2010. "Cyclicality, Mortality, and the Value of Time: The Case of Coffee Price Fluctuations and Child Survival in Colombia." *Journal of Political Economy*, 118(1): 113.
- Morens, D. M., Folkers, G. K., & Fauci, A. S. 2009. What is a pandemic? *Journal of Infectious Diseases*, 200(7), 1018-1021.
- Moretti, Enrico and Neidell, Matthew. 2011. "Pollution, Health, and Avoidance Behavior: Evidence from the Ports of Los Angeles." *Journal of Human Resources*, 46(1): 154-175.
- Moulton, Jeremy. 2017. "The Great Depression of Income: Historical Estimates of the Longer-Run Impact of Entering the Labor Market during a Recession." *B.E. Journal of Economic Analysis & Policy*, 17(4): 1-20.
- Muller, Andreas. 1989. "Business Recession, Alcohol Consumption, Drinking and Driving Laws: Impact on Oklahoma Motor Vehicle Fatalities and Fatal Crashes." *American Journal of Public Health*, 79(10): 1366-1370.
- Murray, Christopher, Lopez, Alan, Chin, Brian, Feehan, Dennis, and Hill, Kenneth. 2006. "Estimation of Potential Global Pandemic Influenza Mortality on the Basis of Vital Registry Data from the 1918-20 Pandemic: A Quantitative Analysis." *Lancet*, 368: 2211-2218.
- Noymer, Andrew and Garenne, Michel. 2000. "The 1918 Influenza Epidemic's Effect on Sex Differentials in Mortality in the United States." *Population and Development Review*, 26(3): 565-581.
- Noymer, Andrew. 2011. "The 1918 Influenza Pandemic Hastened the Decline of Tuberculosis in the United States: An Age, Period, Cohort Analysis." *Vaccine*, 29S: B38-B41.
- Nunn, N., & Qian, N. (2010). The Columbian exchange: A history of disease, food, and ideas. *Journal of Economic Perspectives*, 24(2), 163-88.

- Ogasawara, Kota. 2018. "The Long-Run Effects of Pandemic Influenza on the Development of Children from Elite Backgrounds: Evidence from Industrializing Japan." *Economics and Human Biology*, 31: 125-137.
- Økland, H., & Mamelund, S. E. 2019. Race and 1918 influenza pandemic in the United States: A review of the literature. *International journal of environmental research and public health*, 16(14), 2487.
- Olson, Donald, Simonsen, Lone, Edelson, Paul, and Morse, Stephen. 2005. "Epidemiological Evidence of an Early Wave of the 1918 Influenza Pandemic in New York City." *Proceedings of the National Academy of Sciences*, 102(31): 11059-11063.
- Oreopoulos, Philip, Till von Wachter, and Andrew Heisz. 2012. "The Short- and Long-Term Career Effects of Graduating in a Recession." *American Economic Journal: Applied Economics*, 4(1): 1-29.
- Oyer, Paul. 2008. "The Making of an Investment Banker: Macroeconomic Shocks, Career Choice, and Lifetime Income." *Journal of Finance*, 63: 2601-2628.
- Painter, Gary. 2010. "What Happens to Household Formation in a Recession?" *46th Annual AREUEA Conference Paper*.
- Parman, John. 2015. "Childhood Health and Sibling Outcomes: Nurture Forcing Nature during the 1918 Influenza Pandemic." *Explorations in Economic History*, 58: 22-43.
- Patterson, K. D. 1992. Yellow fever epidemics and mortality in the United States, 1693–1905. *Social science & medicine*, 34(8), 855-865.
- Quinn, S. C., Kumar, S., Freimuth, V. S., Musa, D., Casteneda-Angarita, N., & Kidwell, K. (2011). Racial disparities in exposure, susceptibility, and access to health care in the U.S. H1N1 influenza pandemic. *American journal of public health*, 101(2), 285-293.
- Rothstein, Jesse. 2019. "The Lost Generation? Scarring after the Great Recession." *Mimeo*.
- Ruhm, Christopher. 2000. "Are Recessions Good for Your Health?" *Quarterly Journal of Economics*, 115(2): 617–650.
- Ruhm, Christopher. 2005. "Healthy Living in Hard Times." *Journal of Health Economics*, 24(2): 341–363.
- Ruhm, Christopher, & Black, William. 2002. "Does Drinking Really Decrease in Bad Times?" *Journal of Health Economics*, 21(4): 659–678.
- S&P Dow Jones Indices LLC, Dow Jones Industrial Average [DJIA], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/DJIA>, May 7, 2020.
- Saavedra, M. 2017. Early-life disease exposure and occupational status: The impact of yellow fever during the 19th century. *Explorations in Economic History*, 64, 62-81.
- Şahin, Ayşegül, Joseph Song, Giorgio Topa, and Giovanni Violante. 2014. "Mismatch Unemployment." *American Economic Review*, 104(11): 3529-3564.
- Sanche, S., Lin, Y. T., Xu, C., Romero-Severson, E., Hengartner, N., & Ke, R. 2020. High Contagiousness and Rapid Spread of Severe Acute Respiratory Syndrome Coronavirus 2. *Emerging infectious diseases*, 26(7).
- Schoar, Antoinette and Zuo, Luo. 2017. "Shaped by Booms and Busts: How the Economy Impacts CEO Careers and Management Styles," *The Review of Financial Studies*, 30(5): 1425–1456.
- Shanks, G. Dennis and Brundage, John. 2017. "Variable Mortality during the 1918 Influenza Pandemic in Chicago." *Proceedings of the National Academy of Sciences*, 114(18): E3586-E3587.
- Simonsen, L., Clarke, M. J., Williamson, G. D., Stroup, D. F., Arden, N. H., & Schonberger, L. B. (1997). The impact of influenza epidemics on mortality: introducing a severity index. *American journal of public health*, 87(12), 1944-1950.
- Slack, P. 1985. *The impact of plague in Tudor and Stuart England*. Taylor & Francis.
- Stevens, Ann Huff, Miller, Douglas, Page, Marianne, & Filipowski, Mateusz. 2015. "The Best of Times, the Worst of Times: Understanding Pro-cyclical Mortality." *American Economic Journal: Economic Policy*, 7(4): 279–311.
- Stuckler, David, Meissner, Christopher, Fishback, Price, Basu, Sanjay, & McKee, Martin. 2012. "Banking Crises and Mortality During the Great Depression: Evidence from U.S. Urban Populations, 1929–1937." *Journal of Epidemiology and Community Health*, 66(5): 410–419.

- Sullivan, Daniel, & von Wachter, Till. 2009. "Job Displacement and Mortality: An Analysis Using Administrative Data." *Quarterly Journal of Economics*, 124(3): 1265–1306.
- Sydenstricker, E. 1931. The incidence of influenza among persons of different economic status during the epidemic of 1918. *Public Health Reports (1896-1970)*, 154-170.
- Tang, J. P. 2017. The Engine and the Reaper: Industrialization and mortality in late nineteenth century Japan. *Journal of health economics*, 56, 145-162.
- Taubenberger, Jeffrey and Morens, David. 2006. "1918 Influenza: The Mother of All Pandemics." *Emerging Infectious Diseases*, 12(1): 15-22.
- Tuckel, Peter, Sessler, Sharon, Maisel, Richard, and Leykam, Andrew. 2006. "The Diffusion of the Influenza Pandemic of 1918 in Hartford, Connecticut." *Social Science History*, 30(2): 167-196.
- U.S. Bureau of Labor Statistics, Unemployment Rate [UNRATE], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/UNRATE>, May 8, 2020.
- van den Berge, Wiljan. 2018. "Bad Start, Bad Match? The Early Career Effects of Graduating in a Recession for Vocational and Academic Graduates." *Labour Economics*, 53: 75-96.
- Velde, François. 2020. "What Happened to the US Economy During the 1918 Influenza Pandemic? A View Through High-Frequency Data." *Federal Reserve Bank of Chicago Working Paper #2020-11*.
- Voigtländer, Nico & Voth, Hans-Joachim. 2013. "How the West 'Invented' Fertility Restriction." *American Economic Review*, 103(6): 2227-2264.
- Voigtländer, Nico & Voth, Hans-Joachim. 2009. "Malthusian Dynamism and the Rise of Europe: Make War, Not Love." *American Economic Review Papers & Proceedings*, 99(2): 248-254.
- Voigtländer, Nico & Voth, Hans-Joachim. 2013. "The Three Horsemen of Riches: Plague, War, and Urbanization in Early Modern Europe." *Review of Economic Studies*, 80: 774-811.
- World Health Organization (2000). WHO Report on Global Surveillance of Epidemic-prone Infectious Diseases.
- World Health Organization (2020). COVID-19 Strategy Update. April 14, 2020.
- Young, Alwyn. 2005. "The Gift of the Dying: The Tragedy of AIDS and the Welfare of Future African Generations." *Quarterly Journal of Economics*, 120(2): 423-466.