Disease and Dissent: Epidemics as a Catalyst for Social Unrest

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Abstract

In this article, we identify a set of theoretical mechanisms that link the outbreak and spread of communicable diseases to temporal and spatial patterns of social unrest. While there has been a proliferation of research since 2020 chronicling the social impact of the Covid-19 pandemic, we examine the broader relationship between less severe epidemic outbreaks and their social consequences. Epidemics, as well as the policies that governments implement to tackle them, often generate acute grievances among the public and create new opportunities for collective dissent, the combination of which promotes unrest. We examine this relationship using sub-national data on communicable disease outbreaks and geo-located social unrest events data in 60 African and Latin American countries from 1990 to 2017 and find support for our argument.

Introduction

The global COVID-19 pandemic has created complex sets of public health and political challenges for many countries.[1] In response to the grave threats posed by the rapid spread of the novel coronavirus responsible for COVID-19, many countries have imposed policies that place significant restrictions on citizens' rights and privileges. While governments deem these prescriptions necessary to protect public health, citizens have sometimes challenged their implementation and actively resisted authorities' efforts to enforce them. Indeed, policies intended to contain or mitigate the spread of COVID-19 have prompted public backlash and social unrest in several countries. Efforts by French police to enforce lockdown policies provoked protests and violent clashes between officers and immigrant youths in the Paris outskirts (Bremner 2020). Migrant workers in India clashed with police during protests against the government's lockdown policies (Khanna 2020). And the reintroduction of restrictions intended to counter a second wave of COVID-19 infections prompted demonstration in several Italian cities, some of which resulted in violent altercations between police and protesters (Di Donato and Dewan 2020).

COVID-19-related unrest represents only the most recent example of dissent associated with outbreaks of contagious diseases. In the 19th century, demonstrations, riots, and violent clashes with state authorities routinely occurred during cholera epidemics in Great Britain, the Russian Empire, and the United States (US) (Sahadeo 2005; Cohn 2018). Small pox outbreaks in the US and Canada during the early 20th centuries also occasionally sparked unrest, which lasted for weeks in some cities

[1] *Epidemic* refers to a disease outbreak that spreads within communities and geographic areas at higher rates than expected. *Pandemics* are epidemics that have affected large numbers of people and spread across borders into multiple countries (see Porta 2014). As pandemics are a subset of epidemics, we rely primarily on the term epidemic throughout.

(Cohn 2018, 63-64). Social violence has also accompanied Ebola outbreaks in West and Central African countries in recent years (BBC 2014a; NPR 2014).

Contemporary media reports as well as historical accounts illustrate how unrest can develop and spread during large-scale disease outbreaks. Recent research has explored the role of Covid-19 on political unrest (Neumeyer, Wood et al., 2022), repression (Barcelo, et al., 2022), and armed conflict (Ide 2021; Koehnlein and Koren, 2022). Yet, social scientists have thus far largely overlooked the ways that epidemics and pandemics beyond Covid might influence the likelihood of political upheaval and social conflict in the areas in which they occur. We therefore take this opportunity to conduct an initial investigation of this potential general relationship, and we identify a set of theoretical mechanisms that plausibly link disease epidemics and social unrest. In broad terms, we contend that large-scale communicable disease outbreaks create conditions that are conducive to an increase in social unrest and popular dissent. More specifically, we highlight how epidemics and pandemics contribute to several factors that previous studies suggest explain the onset or incidence of social unrest events. Yet, we also highlight the potentially non-linear nature of this relations. In particular, we contend that beyond a certain threshold of severity, rising disease prevalence can exert divergent influences on citizens' incentives for opposition (e.g., grievances) and their opportunities for engaging in it. Even where rising severity produces increasingly intense grievances, it may simultaneously constrain opportunities mobilization. Thus, we contend that unrest increases in the wake of an epidemic, but the strength of this relationship weakens in the context of a particularly severe epidemic.

We evaluate the empirical validity of our argument by analyzing fine-grained, geo-referenced data on the occurrence of disease epidemics and social unrest (demonstrations and riots) in a sample of first-order administrative units in 60 African and Latin American countries between 1990 and 2017. In order to account for the possible non-random assignment of epidemics across subnational units, we employ matching techniques that pair units that experienced epidemics with highly similar units that did not experience epidemics. Even after accounting for potential selection bias, results from a series of regression models suggest that the frequency of social unrest increases in areas that experience large-scale outbreaks of infectious disease. Furthermore, we also find evidence of a potential curvilinear relationship between epidemic severity and unrest, suggested that unrest is likely when epidemics have low and moderate severity, but as epidemics become very severe, unrest becomes less likely.

Models of Public Discord and Dissent

Social unrest manifests in a variety of ways, ranging from organized acts of civil disobedience and non-violent demonstrations to violent, sometimes deadly intra-communal riots and insurrections. While different forms of unrest possess distinctive qualities, all types of collective dissent reflect situations in which groups of individuals coordinate (to some degree) their actions in order to express collective grievances and seek redress those for grievances by attempting to impose costs on their perceived source (e.g., the government, other societal groups, etc.).[2]

Theories of social unrest often explain its onset and expansion by focusing on either the collective grievances that motivate dissent and violence (e.g., Gurr 1970) or structural and organizational changes within groups and polities that create new opportunities for mobilization (e.g., McAdam, Tarrow and Tilly 2004). While these theoretical frameworks privilege different explanatory factors and identify different mechanism responsible for dissent, they are rarely mutually exclusive. However, the ubiquitous nature of grievances implies that expanding opportunities are often required for the transformation of public dissatisfaction into popular mobilization (Oberschall 1978; Jenkins

[2] While riots are often viewed as spontaneous outbursts of irrational violence, participants often have rational motives, and their actions are purposeful and calculated (Mason 1984; Wilkinson 2009).

1983). As such, the presence of political opportunities likely conditions the role of grievances in motivating collective dissent (Grasso and Giugni 2016). As we discuss in greater detail below, epidemics often produce grievances as well as create opportunities for mobilization, increasing the likelihood of social unrest in affected locales.

Grievance-oriented mobilization theories highlight material factors such as relative economic deprivation, income inequality, and worsening macro-economic conditions. Despite ambiguous empirical support in earlier studies regarding the role of deprivation and structural inequality in driving protest and rebellion, several recent studies indicate that material grievances are important motivators of social unrest. For example, Mueller (2013) finds that contemporary protests in Africa are often driven by economic grievances.Similarly, Kawalerowicz and Biggs (2015) demonstrate that economic deprivation and material grievances were strongly associated with participation in the 2011 London Riots. Other studies likewise suggest that acute financial losses, unexpected labor market contractions, and rising inter-group competition over resources are associated with social unrest (della Porta 2008; Grasso and Giugni 2016; Olzak and Shanahan 1996), while economic growth appears to inhibit some forms of unrest (Bohlken and Sergenti 2010). A related body of research identifies food insecurity and food price volatility, which often generate grievances and exacerbate resource competition, as important catalysts for social unrest and violent conflict (e.g., Bellemare 2014; Hendrix and Haggard 2015). Patterns of civil unrest are also heavily influenced by how authorities respond to public grievances, dissident demands, and prior patterns of dissent (Wilkinson 2009). In particular, state repression is often viewed as a source of collective grievances that motivates dissent (Opp and Roehl 1990; Rasler 1996).

In contrast to grievance-based arguments, political opportunity arguments stress the central role of structural or organizational changes that raise or lower the costs of mobilization or influence the perceived odds of its success. Conceptualizations of political opportunity vary substantially and often include changes in activists' perception of threat, weakened state repressive capacity, diminished state bureaucratic capabilities, and declining government legitimacy (e.g., Boudreau 1996; Brocket 1991; Meyer 2004). The presence or proliferation of these factors encourages dissent among aggrieved members of the community, thus increasing the odds of unrest.

Insights from these broad theoretical traditions inform our argument regarding the expected relationship between epidemics and unrest. The brief review of the literature above highlights a set of intermediary factors that we argue link large-scale disease outbreaks and patterns of social unrest. More specifically, we contend that protests, riots, and other forms of unrest emerge as collective responses to the conditions epidemics create in affected communities and the policies governments adopt as they attempt to manage the disease outbreak. In this sense, we view the relationship between epidemics and unrest as similar to the links scholars now commonly draw between exogenous environmental factors such as climate change or natural disasters and sociopolitical conflict. For example, climate change itself has little direct influence on the location or timing of social conflict and dissent. Rather, the droughts, floods, or shorter growing seasons associated with climate change influence resource availability, food prices and supply, migration, and economic growth, which in turn influence the timing and locations of social conflict (e.g., Hendrix and Salehyan 2012; Jones, Mattiacci and Braumoeller 2017; Nördas and Gleditsch 2007; Raleigh 2010). Similarly, natural disasters are linked to political violence, instability, dissent, and repression through largely indirect mechanisms. These include the adverse impact of disasters on resource scarcity, inequality and deprivation, pre-existing social cleavages, and state capacity (Drury and Olson 1998; Quiroz Flores and Smith 2013; Wood and Wright 2016).

As with climate change and natural disasters, epidemics are not the proximate cause of unrest. Instead, large-scale outbreaks of infectious disease often create conditions that are conducive to collective dissent, unrest, and popular resistance to authority. Epidemics induce fear and heighten uncertainty, diminish state capacity, generate acute economic losses, create resource shortages and competition, undermine leaders' legitimacy, and intensify existing iniquities in societies. These factors in turn create opportunities and incentives for members of the public to mobilize—sometimes violently—against the government or against other social groups that participants hold responsible for collective grievances.

Linking Epidemics and Social Unrest

Large-scale disease outbreaks often provoke intense emotional responses among the population in the areas they most acutely affect. Such feelings are particularly common when a pathogen is novel or manifests itself in unexpected ways that undermine the effectiveness of the tools and methods authorities commonly employ to control them (Strong 1990). Fear and anxiety are powerful influencers of political participation and can increase citizens' engagement in the political process, but these emotions also create opportunities for manipulation, scapegoating, and social discord (Albertson and Gadarian 2015). During crises, citizens look to trusted institutions and leaders to provide guidance, certainty, and safety.

Inadequate or inequitable government responses to public health crises can undermine citizens' trust in government and intensify popular grievances (e.g., Blair, Morse and Tsai 2017), thus incentivizing challenges to authority and encouraging violence against vulnerable groups. As with natural disasters, how promptly and how effectively a state responds to an epidemic can serve as a focal point for public evaluations of state capacity and attitudes toward the incumbent government (see Dionne 2011; Wood and Wright 2016). If authorities fail to contain the spread of the disease or causalities remain high for extended period of times, citizens are likely to perceive the government as incompetent or ineffectual. State authorities may therefore become targets of public animosity. As popular grievances increase and faith in government weakens, groups of individuals may spontaneously engage in rioting to express anger and frustration with authorities or may participate in more organized protests intended to draw attention to their concerns and increase pressure on the government to mount a more satisfactory public health response. For instance, Brazilian President Bolsonaro's poor handling of the COVID-19 crisis sparked protests as cases rapidly escalated (Nuyen 2020). The expansion of HIV/AIDS activism through the 1980s and 1990s likewise arose in reaction to tepid responses to the crisis from US health officials and politicians (Piot 2015; Snowden 2020).

While tepid responses to epidemics can generate dissatisfaction and mistrust, heavy-handed mitigation strategies that restrict citizens' freedoms and disrupt their daily lives are likely to produce backlash and unrest, even when they are adopted to protect public health and save lives. For example, following the advice of public health professionals and scientists, government around the world imposed significant restrictions on citizens' freedoms of movement and association during the COVID-19 pandemic in attempt to reduce infections and minimize the public health burden of the pandemic. Yet, in many instances, the curfews, travel prohibitions, school closures, and restrictions on commerce political authorities imposed on their citizens produced opposition, resistance, and social unrest (e.g., Beckett 2020; Walker 2020). Recent systematic analyses of these relationships confirm the positive association between the severity of COVID-19 restrictions and levels of social unrest (Plümper, Neumeyer and Pfaff 2021; Wood et. al. 2022). Owing to the grievances they induce, such policies often require police or military enforcement, which can create further tensions between the population and authorities. Quarantine rules have often provoked public resistance, riots, and violent clashes with authorities (Evans 1988; Hays 2005). For example, Ebola-related quarantine efforts produced social unrest and violence in Liberia's capital in 2014 (BBC 2014b; McNeil 2014). More recently, residents of one German community rioted in response to police efforts to enforce a quarantine order during the COVID-19 pandemic (CNBC 2020). As these examples demonstrate, government restrictions adopted to protect public can produce resentment and instigate unrest.

Overzealous enforcement of mitigation policies by security forces can also incite unrest. Indeed, the reciprocal relationship between state repression and dissent is well established (Carey 2006). For example, hundreds of Kenyans demonstrated against the use of lethal violence by police to enforce COVID-19-related curfews (Sperber 2020). While constraints on civil liberties and pre-emptive repression can successfully deter popular mobilization (Ritter and Conrad 2016), state violence often serves as a catalyst for violent and non-violent behavioral challenges to the state, particularly where the public perceives the coercive response as illegitimate or excessive (Opp and Roehl 1990; Rasler 1996). Thus, even where the population broadly supports government efforts to control the epidemic, violence and repression targeted at individuals and groups that disobey newly imposed regulations may prompt backlash, including demonstrations or riots.

Epidemics have a deleterious effect on macro-economic conditions and can produce acute resource shortages, both of which are linked to public discord and unrest. The 2014 West African Ebola outbreaks are estimated to have resulted in up to $32 billion in lost GDP among affected countries (Huber, Finelli and Stevens 2018). Moreover, in Liberia, the Ebola outbreak was associated with an appreciable decline in household income (Gatiso et al. 2018). Similarly, the costs associated with the 1991 Peruvian cholera epidemic have been estimated at nearly $150 million (~$266 million in 2020 dollars) (Suarez and Bradford 1993). While the total economic impact of the COVID-19 pandemic is still unknown, the Organization for Economic Co-operation and Development (OECD) estimates that many of the world's largest economies will suffer a net fall in GDP of between 6% and 11%, resulting in job losses comparable to those observed during the Great Depression (Inman 2020; Mutikani 2020). Consequently, to the extent that epidemics weaken economies, reduce wages, and increase unemployment, they may also create incentives for popular mobilization or violence.

In a similar manner, disease outbreaks can also create acute resource scarcities, which can exacerbate existing inequalities or underlying social tensions, fuel grievances, and promote challenges to the state. In particular, epidemics (as well as government responses to them) can produce or worsen food insecurity. Epidemic-induced food insecurity occurs when illness among workers produces labor shortages or when mobility restrictions (e.g., travel bans and community quarantines) adversely impact food production and transportation. For instance, quarantine measures introduced to contain the spread of Ebola in Sierra Leone prevented agricultural workers from harvesting crops, which in turn disrupted supply chains and threatened the country's food supply (Kodish et al. 2019). Similarly, Ebola outbreaks reduced crop yields among Liberian farm household and exacerbated food insecurity in some parts of the country (Gatiso et al. 2018). For these reasons, health officials and policymakers have recently expressed concerns about the strain the COVID-19 pandemic has placed on global food supply chains, particularly in the developing world (Gunia 2020; Harvey 2020). Given the established association between food insecurity and unrest (e.g., Bellemare 2014), the risk of social unrest increase where epidemics threaten the food supply, disrupt supply chains, or contribute to the rapid escalation of food prices. Historical and contemporary examples likewise illustrate this relationship. Quarantine measures imposed on French cities during an outbreak of plague in the early 18th century led to food shortages and rising prices, which in turn provoked large-scale urban unrest (Hays 2005, 138-140). During the early months of the COVID-19 pandemic, Lebanese citizens protested against food shortages despite government lockdowns (Mazjoub 2020; Mounzer 2020). Similarly, temporary food shortages created by the government's lockdown measures resulted in protests in Chile (Fuentes 2020).

The effects of economic grievances and resource scarcity on social unrest in the context of pandemics is highlighted by recent analyses of protest during the COVID-19 pandemic. For example, disaggregating COVID-19 restriction by type, Wood et al. (2022) found that workplaces closures—which were mostly likely to have a direct adverse impact on the economic well-being of citizens—had the largest substantive impact on the frequency of social unrest. Moreover, both Wood et al. (2022) and Farzanegan and Gholipour (2023) show that the introduction of policies intended to offset the economic grievances associated with pandemic restrictions (e.g., cash transfers to citizens, low-interest loans, financial support for industry, etc.) moderated the influence of restrictions on unrest. Consequently, government that sought to ameliorate the economic burden of COVID-19 restrictions tended to experience lower levels of unrest.

Epidemics may also worsen public mistrust of authorities by exacerbating reinforcing existing social and ethnic cleavages. In particular, where class, religion, or ethnicity separate the authorities from populations in areas where the epidemic takes hold, suspicion and resistance are more common. For example, experimental evidence from Guinea suggests that members of marginalized groups express greater mistrust of the government and are less likely to follow public health advisories on HIV/AIDS prevention when representatives of the national government deliver health recommendations compared to local religious or political leaders (Arriola and Grossman 2020). In addition to decreasing compliance with health recommendations, suspicion and mistrust of authorities during public health crises can also facilitate unrest. Longstanding mistrust of Tsarist (Russian) authorities by the local Central Asian population coupled with resentment toward government efforts to contain an outbreak of cholera in the predominantly Asian parts of the city sparked inter-communal riots (and reciprocal violence) in Tashkent in 1892 (Sahedeo 2005).

In a similar manner, restrictions that contradicted or impeded cultural and religious practices sparked riots during outbreaks of plague in India and Cholera in Europe and the US (Cohn 2018; Evans 1988, 143). Barcelo et. al. (2022) find that states who have a history of being repressive were more likely to adopt restrictive pandemic policies in 2020 (in response to Covid-19) and keep them in place longer. Hillhorst and Mena (2021) qualitatively analyze several countries with long histories of social conflicts and their response to Covid-19. They find that across several cases, that Covid responses were shaped by pre-existing fault lines in social conflict, and though reduced spread of the disease, often exacerbated pre-existing inequalities and made vulnerable groups more vulnerable in other ways. As these examples suggest, epidemics as well as the rules states adopt to quell them often exacerbate social pre-existing cleavages and provoke public resentment, thereby increasing the odds of resistance.

Finally, epidemics can also expand opportunities for collective mobilization by weakening the monitoring and sanctioning capabilities of state authorities. This occurs principally as a result of the detrimental impact of infectious disease on the preparedness, fighting effectiveness, and organizational competencies of security services (Bailey 2013; Enemark 2009; Peterson 2009). For example, during the early years of the American Revolution sporadic outbreaks of smallpox hindered recruitment, increased the rate of desertion, and reduced the fighting capacity of Colonial forces (Becker 2004). Similarly, influenza infection among US troops reportedly contributed to their poor performance in the Meuse-Argonne Offense in 1918 (Byerly 2005; Price-Smith 2008). Because police routinely serve as first responders and interact closely and frequently with the public, infection rates within the police forces are often relatively high (Jennings and Perez 2020; Laufs and Waseem 2020). Rising infection rates among members of the security services reduce the number of officers available to patrol the streets, monitor the actions of dissident groups, or respond to unrest when it occurs. In a similar manner, ensuring compliance with new pandemic restrictions (e.g., quarantines, curfews, travel restrictions, etc.) creates additional pressures on police and can strain their human capital and organizational capacity. Enforcement of these regulations often produces tensions between the police and the community, threatens public trust in the police, and reduces community cooperation with policing efforts (Laufs and Waseem 2020). These factors in turn increase the costs of monitoring and sanctions, thus potentially creating space of public resistance. Because declining repressive capacity represents a key political opportunity factor that facilitates dissent (Brockett 1991), epidemics may create new windows of opportunity for social unrest.

As the previous discussion highlights, several theoretical mechanisms potentially link the occurrence of disease epidemics and the incidence or rate of social unrest. The argument suggests that sustained outbreaks of communicable disease, as well as government responses to them, may incentivize or create conditions conducive to acts of resistance and dissent by the affected communities. We thus derive the following testable hypothesis:

H1: *Disease epidemics are associated with an increase in the prevalence of social unrest in the geographic areas in which they occur.*

While we argue that epidemics generally create both grievances that incentivize dissent and opportunities that facilitate mobilization, we also anticipate that the relationship between the severity of epidemics and the frequency of unrest in non-linear. Specifically, we expect that influence of epidemics on unrest diminishes as the rate of infections and deaths climbs to very high levels. The reasons for this, we argue, relate to the divergent effects of disease prevalence on incentives for opposition (e.g., grievances) and opportunities for collective action and the countervailing influences these factors exert on the likelihood of unrest. This reflects the logic articulated by Wood et al. (2022), which sought show that the effect of a given restriction imposed by authorities during the COVID-19 pandemic on social unrest depended on the way the policy affected both citizens grievances as well their opportunities for mobilization. Their findings suggest that policies that simultaneously created grievances and reduced the barriers to mobilization (e.g., workplace closures) had a stronger influence on unrest than those that created grievances but also restricted opportunities for mobilization (e.g., closing public transport).

In a similar manner, we expect that beyond a certain threshold, increases in the severity of the epidemic will act as a constraint on opportunities for unrest even though rising severity is likely to continue to intensify citizens grievances. Rising rates of infection and death rates increasingly disrupt normal patterns of social and economic interactions, raising frustration, anxiety, anger among the public. Grievances are often further exacerbated by the policies adopted by authorities to slow or halt the spread of disease, which typically become more restrictive as the severity of the epidemic increases. Hence, grievances increase in line with increases in epidemic severity. On the other hand, opportunities for mobilization are likely to decline beyond a certain threshold of severity. Cost perception is a key feature of an individual's decision to engage in collective action. In the case of anti-government protests, scholars often highlight the role of repression as an important deterrent to mobilization—individuals that perceive a high likelihood of sanctions (arrest, police abuse, etc.) are less likely to engage in costly collective action (e.g., Lichbach 1987; Opp and Roehl 1990). It is for this reason that previous scholars highlight how changes in repressive capacity of the state represent key opportunities for mobilization (e.g., Brockett 1991).

In the case of pandemics, fears of exposure to a lethal pathogen may exert a similar deterrent effect. In other words, in the context of very high infection and death rates, even aggrieved citizens are less likely to engage in unrest because they perceive a high likelihood of exposure and infection. Indeed, in many European countries protest activity against COVID-19 restrictions tended to increase during periods of relatively low disease prevalence and mortality and decrease as infection rates and deaths spiked (Neumeyer, Pfaff and Plümper 2023). Additionally, more severe epidemics tend to produce more severe restrictions as well as more severe sanctions for violating those restrictions, both of which act as constraints opportunities for mobilization. For example, as in the case of COVID-19, authorities might begin by placing limits on some forms of travel or restricting large group gatherings, which are likely to produce grievances but may not create substantial barriers to mobilization. However, as disease and mortality rates increase, restrictions often become more severe. Compared to many other types of restrictions, stay-at-home orders and quarantines imposed on large geographic areas represent severe constraints on opportunities for collective mobilization, particularly if violations of these orders result in substantial penalties. Consequently, we anticipate:

H2: *Severity of the epidemic exerts a non-linear influence on the frequency of unrest, such that the effect of the magnitude of the epidemic on unrest diminishes in the context of particularly severe epidemics.*

Data and Methods

Data Sources and Measures

We evaluate this hypothesis by analyzing fine-grained, geo-located data on the presence of epidemics and prevalence of social unrest events (demonstrations and riots). We construct our sample by merging information on epidemics from the Center for Research on the Epidemiology of Disasters (CRED) Emergency Events Database (EM-DAT) International Disaster Database (CRED 2020) [3] and events data on social unrest activities from the Social Conflict Analysis Database (SCAD) (Salehyan et al. 2012).[4] Because the information contained in both datasets are geo-referenced, we are able to examine the co-variation in disease outbreaks and dissent at a low level of geographic aggregation.

We organize our data at the level of the first-order administrative unit-year (state, district, commune, etc.). We use the administrative unit as the spatial unit for three reasons. Principally, the socio-political implications of epidemics are often observed at the local level. Additionally, the epidemics included in EM-DAT are tagged with the name of the geographic location (up to and including the first-order administrative level), the type of disease, dates of the epidemic outbreak, and total number of deaths and individuals affected by the epidemic. Finally, we prefer to use administrative units over grid squares because the former allow us to leverage the information inherent in political boundaries while the latter are strictly arbitrary geographic units that ignore important

[3] To our knowledge, EM-DAT is the most reliable source of cross-national, geo-located information on epidemics currently available.

[4] Previously known as the *Social Conflict in Africa Database*.

political, social, cultural, and topographical factors that often explain the way administrative unit boundaries are drawn.

While EM-DAT includes qualitative information on the locations in which disease outbreaks occurred, the geographic reference provided does not always include the name of the first order administrative unit. Rather, EM-DAT often lists the name of the municipality, district, or other subnational unit place name. Consequently, the data require processing in order to aggregate the epidemics to the appropriate unit of analysis. In order to spatially join information on epidemics and social unrest at the first-order administrative level we first geocoded each epidemic in the EM-DAT dataset. This process required parsing the unique locations (e.g., village or cities names) for disease outbreaks in the data from a list of multiple locations and using dictionaries of place names to assign each epidemic to a first-order administrative region. Merging these two distinct datasets results in a pre-matched sample of 27,664 first-order administrative unit-years, representing events in 60 African and Latin American countries between 1990 and 2017.[5] As we discuss below, we also estimate the effect of epidemics on social unrest using a matched subset of 3,778 first-order administrative-year units.

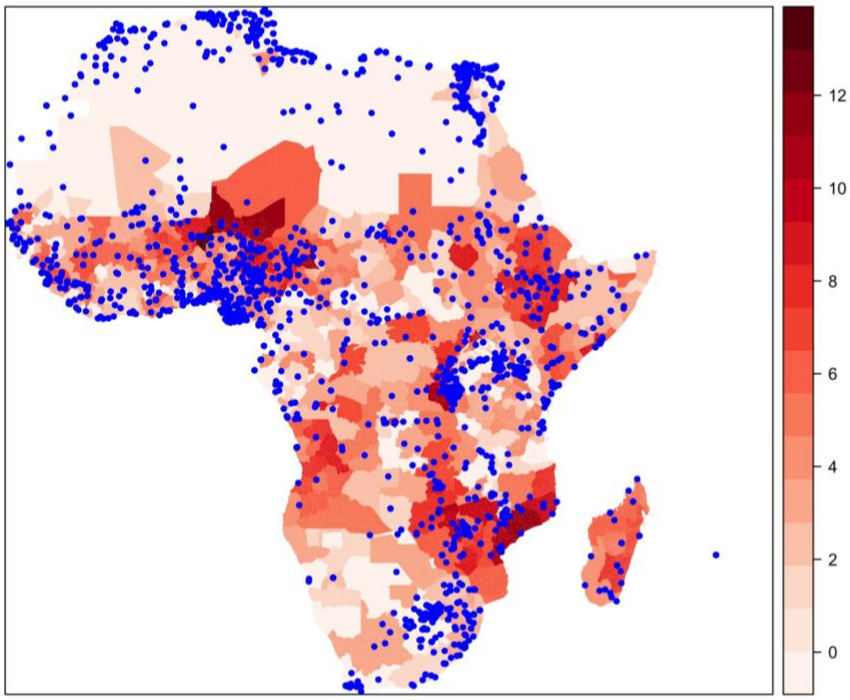
A measure of social unrest constructed from information available in SCAD serves as the dependent variable in our analyses. *Social Unrest* represents a count of the total number of all organized and spontaneous demonstrations or riots that take place within a first-order administrative unit in a given year.[6] We do not include events like strikes, armed attacks or state-based violence in our measure

[5] Currently, *SCAD* coverage of Latin America consists of Mexico, Central America, and the Caribbean for the years in our sample.

[6] Although beyond the scope of this current project, we have conducted some alternative analyses where we modeled demonstrations and riots separately, finding largely similar results. The results for presence of epidemics mirrored our findings below, although the evidence of a curvilinear effect of the severity of the epidemic was not as clear cut for

of social unrest. We exclude events where the sub-national location is unspecified and where a first-order administrative unit cannot be assigned due to missing information.[7]

Figure 1: Spatial Distribution of Social Unrest and Epidemics in Africa, 1990-2017

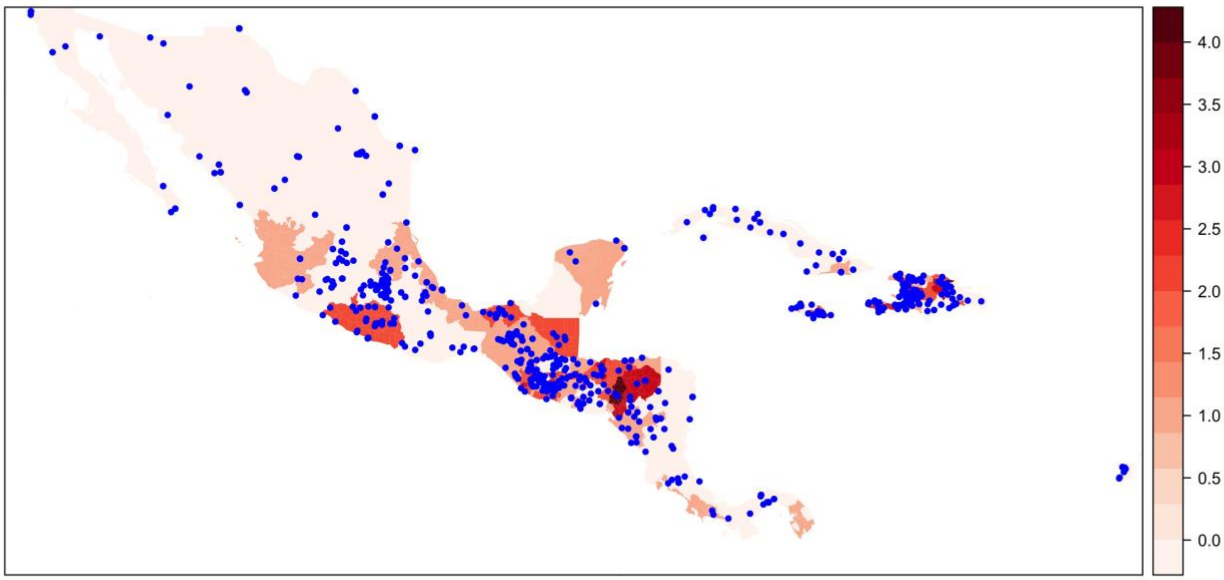


Note: Blue points represent the location of a social unrest event using SCAD. Darker shaded first-order administrative units indicate a greater number of epidemic outbreaks using EM-DAT.

rioting events. A potentially fruitful avenue for future research is to more fully explore the specific pathways for riots and how they differ from demonstrations during epidemics.

[7] This includes a total of 2,798 events (12% of observations) consisting of 2,128 nationwide events, 592 events where the sub-national location is unknown, and 78 events where the latitude and longitude coordinates are not recognized by GIS software.

Figure 2: Spatial Distribution of Social Unrest and Epidemics in Latin America, 1990-2017



Note: Blue points represent the location of a social unrest event using SCAD. Darker shaded first-order administrative units indicate a greater number of epidemic outbreaks using EM-DAT.

The epidemics reported in EM-DAT comprise a variety of communicable diseases (e.g., cholera, Ebola, influenza, typhoid, and yellow fever). To be included in the dataset, a disease outbreak must meet at least one of the following conditions: more than 10 people died, more than 100 people were affected, the country's government declared of a state of emergency, or the country made a formal call for international assistance. In our first analysis, we rely on a binary variable that is able to capture subnational variation in the locations in which the epidemic occurred. The variable *Epidemic* is coded "1" if an epidemic took place in the given administrative unit during a year and "0" otherwise.

In our second analysis, we include an estimate of the severity of disease outbreak (e.g., annual count of deaths) as our primary predictor. We divide the epidemic's total death measure into three categories "low", "moderate" and "severe". Epidemics that incurred between 10-99 deaths are assigned to the low category. Epidemics that experienced between 100-999 deaths are assigned to the moderate category. Countries that suffered over 999 deaths are assigned to the severe category. Unfortunately, however, EM-DAT only provides a single, event-level measure of epidemic severity and does not disaggregate the death toll by first-order administrative unit. Therefore, this measure is simply an indication of whether a first-order administrative unit was effected by an epidemic that was recorded as low, moderate, or severe magnitude rather than a true estimate of the severity of the epidemic in that specific the sub-national level. Accordingly, epidemics across multiple units within the same country receive the same severity score. Figure 1 and 2 displays the spatial distribution of all recorded social unrest events from 1990 to 2017, represented by blue points, and the total number of epidemic outbreaks within a first-order administration for the same period, with darker shades indicating a greater number of epidemics in a unit.

We account for a range of unit-specific and national level confounders that might influence the likelihood of social unrest in our models. First, we control for temporal and spatial dependence. To address possible temporal autocorrelation, we include a one-period lag of the dependent variable in all of our models ($\textit{Social Unrest}_{t-1}$). We likewise create a spatially weighted version of our dependent variable, *Spatially Weighted Social Unrest,* using a row-standardized approach that divides each neighbor weight by the sum of all neighbor weights. We also account for state repression against dissident activities within the administrative unit in the prior year because repression and dissent are often reciprocal responses ($\textit{Repression}_{t-1}$). This lagged binary measure is constructed from information in SCAD and indicates that state forces employed coercive violence against at least one dissent event in the previous year.

We control for the *Population Density* of the administrative unit under observation because greater densities of inhabitants facilitate collective action and is also linked to the spread of communicable disease. This log-transformed indicator is taken from the Center for International Earth Science Information Network (CIESIN) Gridded Population of the World dataset (CIESIN

2005). Poor development and poverty are also linked to both the likelihood of social unrest and prevalence of disease outbreaks. We therefore proxy unit-level wealth with the natural logarithm of total *Stable Night Light* for a first-order administrative unit in a given year using the DMSP-OLS Nighttime Lights Time Series dataset from the US Air Force Weather Agency (n.d.).[8] We control for *Conflict Intensity* due to the negative effect that civil conflict has on the security and living conditions within society, which can increase the likelihood of protests and violent riots. This indictor reflects the natural logarithm of the total number of civilian fatalities generated by armed conflict occurring in a first-order administrative unit in a given year using the Uppsala Conflict Data Program's (UCDP) Georeferenced Event Dataset (Ralph and Melander 2013). We also control for whether a politically excluded group resides within a first-order administrative unit within a given year to account for a potential increase in the number of social unrest events due to ethnically based grievances. *Politically Excluded Group* is a binary indicator denoting that at least one identified communal group resident in the unit was considered powerless, discriminated against or self-excluded from executive state power according to the Geo-referencing Ethnic Power Relations (Geo-EPR) dataset (Vogt, Bormann et al. 2015).

Country-year indicators include *Democracy, GDPpc, GDP Growth, Population, Federalism* and *HIV*. For our *Democracy* indicator we use Coppedge et al. (2021) Varieties of Democracy (V-Dem) electoral democracy measure. We control for a country's level of democracy as previous research indicates democratic countries are more likely to experience social unrest and better able to respond to disease outbreaks. Information on *GDP Growth, GDPpc*, and *Population* are taken from World Bank (2021)

[8] We use stable night light data as a proxy for economic development because of the questionable reliability of sub-national GDP data (see Chen and Nordhaus 2011; Sutton et al. 2007). We use linear interpolation to impute missing values for our sub-national measures of *Population Density* and *Stable Night Light* as neither measure is provided on an annual basis from 1990-2017.

World Development Indicators Dataset (WDI). *GDP Growth* indicates the annual percentage of GDP growth. *GDPpc* and *Population* are log-transformed. *Federalism* is a dummy variable indicating whether or not the country has a federal system. We include this measure because of the greater control administrative units have in responding to public health crises in federal systems. We also account for the prevalence of *HIV* in a country because of the substantial burden the disease has inflicted on public health systems in many countries in Sub-Saharan Africa, which arguably impede a state's ability to effectively respond to new epidemics. We use the natural logarithm of the number of HIV-infected persons in a country in a given year using the UNAIDS (2020) dataset. For our *Press Freedom* indicator we use Coppedge et al. (2021) Varieties of Democracy (V-Dem) government censorship measure. We control for a country's press freedom as media attention may affect the likelihood of a social unrest event or epidemic being reported on and being included in our dataset. We include a table of descriptive statics for the pre-matched sample in the appendices (Table A1).

Estimator and Identification Strategy

We employ multi-level Poisson models controlling for random and fixed effect to estimate the count of unrest events in an administrative district in a given year. This method accounts for the hierarchical structure of our data which includes first-order administrative units nested within countries.[9] In order to best approach causal inference, as well as to reduce bias and improve our estimation of the effect of disease outbreaks on social unrest, we employ Mahalanobis Distance Matching to create a matched sample of first-order administrative-year units (see King and Nielsen 2019). Observational studies are limited by their ability to accurately estimate causal effects due to the non-random assignment of observations to the treatment group (epidemic). To overcome this limitation, we create a matched

[9] We follow the approach recommended by Langford, Bentham and McDonald (1998).

sample of 3,778 first-order administrative unit-year units from our initial sample of 27,664 administrative unit-years that have similar distributions in the treatment and control group on observable confounders that are most likely to predict whether a first-order administrative unit experiences an epidemic in a given year. This preprocessing step ensures that those units in the treatment group (presence of epidemic) are more comparable to those units in the counterfactual control group (absence of epidemic). In light of previous findings that link disease outbreaks to units with larger populations, lower economic development, prevalence of conflict, and level of democracy we match cases based on *Population Density, Stable Night Light, Conflict Intensity (log), Democracy, Population (log) and GDPpc (log)*. We also include the variable *Physicians per 1000* in the matching stage because epidemics are influenced by the strength of a state's health infrastructure. This indicator reflects the estimated number of physicians per 1000 people for each country in a given year and comes from WDI (World Bank 2021). We include imbalance statistics for the pre- and post-matched sample in the appendices in Table A2. The overall multivariate imbalance L1 decreases from 0.96 to 0.80 post-matching. To avoid post-treatment bias and ensure that matched observations have the same covariate history and are independent from one another, we match each treated unit to a control unit in the same time period using the average values for each matching variable three years prior to the treatment year. As a robustness test, we use a negative binomial model to account for potential overdispersion in the data in Table A3 and Table A4. The results are similar regardless of the distributional assumptions we make.[10]

Results

[10] Here we follow the recommendations of Imai et al. (2020)

Models 1-4 display the results for analyses of the relationship between epidemics and the aggregate number of *Social Unrest* events. We test *H1* in Table 1 using our Epidemic dummy variable and *H2* in Table 2 using our categorical Epidemic Severity measure. Models 1 and 2 display results using the pre-matched sample. Model 3 and 4 display results for the post-matched sample. Models 1 and 3 represent baseline models that include only the independent variable and key administrative-level control variables. Model 2 and 4 constitute the full models and include our independent variable and all the control variables. The results provide support for our hypothesis. As shown in Table 1, Models 1-4, the coefficient for *Epidemic* is positive and statistically significant. In Table 2, the coefficients for the *Epidemic Severity* are positive and statistically significant for low and moderate epidemics but negative and non-significant for severe epidemics. Together these findings provide empirical support for *H1 and H2*.

Table 1: Multi-level Poisson Regression Results, Epidemic Binary Variable

	Model 1	**Model 2**	**Model 3**	**Model 4**
	Social Unrest		*Social Unrest*	
	Pre-matched Sample		*Post-matched Sample*	
Administrative unit-level Variables				
Epidemic	0.10***	0.06**	0.11**	0.18***
	(0.03)	(0.04)	(0.06)	(0.06)
Population Density‡	0.31***	0.19***	0.20***	0.14***
	(0.03)	(0.03)	(0.04)	(0.04)
Stable Night Lights‡	0.51***	0.33***	0.50***	0.56***
	(0.02)	(0.03)	(0.05)	(0.05)
Conflict Intensity‡	0.21***	0.17***	0.22***	0.17***
	(0.01)	(0.01)	(0.02)	(0.02)
Politically Excluded Group	0.00	0.09	-0.18	-0.11
	(0.11)	(0.13)	(0.18)	(0.18)
Spatially Weighted Lag Social Unrest		0.23***		0.35***
		(0.01)		(0.04)
Social $Unrest_{(t-1)}$		0.01***		0.03***
		(0.00)		(0.01)
$Repression_{(t-1)}$		0.28***		0.36***
		(0.03)		(0.07)
Country-level Variables				

Democracy		-0.56***		-1.14***
		(0.18)		(0.45)
GDPpc‡		-0.11*		-0.43***
		(0.07)		(0.12)
GDP Growth		0.01***		-0.02***
		(0.00)		(0.01)
Population‡		0.14*		-0.18*
		(0.08)		(0.12)
Federalism		-0.40		0.52*
		(0.53)		(0.40)
HIV Cases‡		0.24***		-0.04
		(0.03)		(0.06)
Press Freedom		0.25***		0.17**
		(0.03)		(0.08)
Constant	-8.91***	-10.69***	-7.83***	-1.25
	(0.28)	(1.16)	(0.46)	(1.80)
Observations	26880	23498	3778	3742
Log Likelihood	-14406.883	-11805.365	-2485.717	-2310.89
AIC	28829.766	23646.73	4987.434	4657.779
BIC	28895.359	23791.894	5037.33	4769.872

Notes: Coefficients with standard errors in parentheses (two-tailed test). ****p*<0.01, ***p*<0.05, **p*<0.1 ‡=natural log.

Table 2: Multi-level Poisson Regression Results, Epidemic Severity Variable

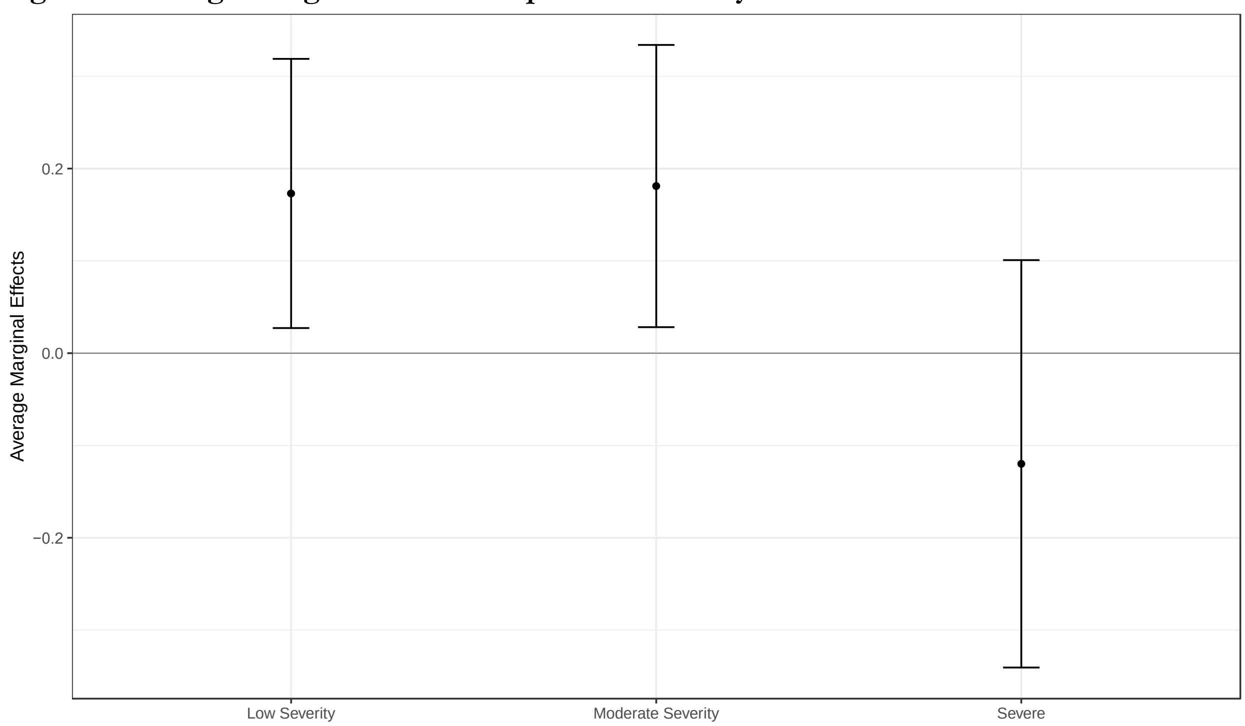
	Model 1	**Model 2**	**Model 3**	**Model 4**
	Social Unrest		*Social Unrest*	
	Pre-matched Sample		*Post-matched Sample*	
Administrative unit-level Variables				
Low (10-99 deaths)	0.14***	0.09**	0.16**	0.17***
	(0.05)	(0.05)	(0.07)	(0.07)
Moderate (100-999 deaths)	0.25***	0.16***	0.23***	0.18**
	(0.06)	(0.06)	(0.08)	(0.08)
Severe (>999 deaths)	-0.04	-0.07	-0.08	-0.12
	(0.09)	(0.09)	(0.11)	(0.11)
Population Density‡	0.31***	0.19***	0.20***	0.14***
	(0.03)	(0.03)	(0.04)	(0.04)
Stable Night Lights‡	0.52***	0.33***	0.50***	0.57***
	(0.02)	(0.03)	(0.05)	(0.05)
Conflict Intensity‡	0.21***	0.17***	0.22***	0.17***
	(0.01)	(0.01)	(0.02)	(0.02)
Politically Excluded Group	0.01	0.09	-0.19	-0.12
	(0.11)	(0.13)	(0.18)	(0.18)
Spatially Weighted Lag Social Unrest		0.23***		0.34***
		(0.01)		(0.04)

Social Unrest$_{(t-1)}$		0.01***		0.03***
		(0.00)		(0.01)
Repression$_{(t-1)}$		0.28***		0.34***
		(0.03)		(0.07)
Country-level Variables				
Democracy		-0.55***		-1.00**
		(0.18)		(0.46)
GDPpc‡		-0.11*		-0.43***
		(0.07)		(0.12)
GDP Growth		0.01***		-0.03***
		(0.00)		(0.01)
Population‡		0.14**		-0.16*
		(0.08)		(0.12)
Federalism		-0.42		0.48
		(0.53)		(0.41)
HIV Cases‡		0.24***		-0.05
		(0.03)		(0.06)
Press Freedom		0.25***		0.17**
		(0.03)		(0.08)
Constant	-8.94***	-10.76***	-7.91***	-1.59
	(0.28)	(1.16)	(0.46)	(1.85)
Observations	26880	23498	3778	3742
Log Likelihood	-14399.392	-11801.895	-2481.015	-2309.403
AIC	28818.783	23643.79	4982.03	4658.805
BIC	28900.775	23805.084	5044.4	4783.353

Notes: Coefficients with standard errors in parentheses (two-tailed test). ****p*<0.01, ***p*<0.05, **p*<0.1 ‡=natural log.

In order to evaluate the substantive effects of our findings, we examine the marginal effects of our *Epidemic* and *Epidemic Severity* variables on the probability of observing social unrest events. The marginal effects are calculated as a change from the baseline value of no epidemic, while holding all control variables at their mean. We limit the discussion of the marginal effects using the full model in our post-matched sample because these are the outcomes for which our results are most robust. For our *Epidemic* binary variable, the probability of observing a social unrest event increases by 17% when a first-order administrative unit experiences an epidemic outbreak. For our *Epidemic Severity* variable, we present the marginal effects in Figure 3. Because social unrest is a relatively rare event, the marginal effect of the *Epidemic Severity* variable on the predicted probability of observing any social unrest in a given unit-year is quite small; however, the *change* in the marginal effects for those units without an epidemic compared to those with low and moderate severity is substantively large. Based on the marginal effects presented in Figure 3, the probability of observing of observing a single *Social Unrest* event is expected to increase by 17% when a first-order administrative unit experiences an epidemic outbreak of low severity and 18% when it experiences an epidemic of moderate severity. However, as expected the relationship between an epidemic's severity is non-linear with the probability of a social unrest event decreasing by 12% when a severe epidemic outbreak takes place in a first-order administrative unit. As these results illustrate, the substantive effect of epidemics on unrest is non-trivial**.**

Figure 3: Average Marginal Effect of Epidemic Severity Variable



Note: Average marginal effect of the *Epidemic Severity* variable on the probability of social unrest events respectively in first-order administrative units with 95% confidence intervals. Based on results from Table 2, Model 4. Marginal effects are calculated as change from the baseline value of no epidemic.

Discussion and Conclusion

Disease outbreaks can produce intense feelings of fear, anger, resentment, and alienation among the populations they effect. Anecdotal evidence from historical cases and contemporary media reports of the COVID-19 pandemic further suggest that epidemics may create conditions conducive to social unrest. We have therefore sought to identity the theoretical linkages between disease and dissent and to systematically evaluate the potential empirical relationship between the two events. We described several mechanisms through which unrest potentially emerges as a societal response to how governments tackle the spread of infectious diseases. First, anger and mistrust of the state's response to the epidemic may induce backlash and spur dissent. These responses occur because a state's mitigation efforts are lackluster or because the public perceives the policies as an intrusive overreach by local or national authorities. Unrest may also emerge from more indirect pathways, such as from grievances related to increased economic hardship, resource scarcity or scapegoating of specific groups. In either scenario, the odds of popular mobilization or acts of violent dissent are expected to increase. Our empirical results are consistent with these expectations.

Our argument and results are both timely and relevant to scholars of international politics, global health researchers, and policies makers. The advent and rapid global diffusion of the novel coronavirus responsible for the COVID-19 pandemic has not only created a global public health crisis but also produced political and social turmoil in many states. As many of the examples in this article illustrate, the socio-political implications of the COVID-19 outbreak are often observed at the local level and in some circumstances include protests, demonstrations, riots, and state repression. Yet, as our results demonstrate, the relationship between epidemics and unrest is not unique to the contemporary COVID-19 pandemic. Given the high likelihood of witnessing future pandemics (Fan, Jameson and Summers 2018), our findings should serve as the basis for additional research in this area of inquiry. Most importantly, understanding the manner in which populations respond to disease outbreaks as well as how groups and individuals perceive the legitimacy and necessity of government efforts to control the disease are crucial factors in determining the success of pandemic responses. Where individuals remain suspicious of public health and political authorities, successful interventions are at greater risk of failure (Dionne 2018; Arriola and Grossman 2020). Moreover, where the disease or government responses exacerbate these sentiments, dissent and unrest are more likely. Such actions, even when undertaken in response to unfair, uneven, or illegitimate state policies, risk worsening the epidemic by increasing transmission and weakening already strained public health infrastructure.

Our findings suggest several areas for future research. First, scholars investigating this topic should explicitly explore and evaluate the influences of the specific mechanics we describe. For example, it is possible that community level fear and anxiety produced by a disease outbreak are sufficient conditions to provoke unrest. If this is the case, epidemics might be directly causally linked to riots and demonstrations. Yet, there is little reason to believe that fear alone lowers the barriers to collective action or facilitates mobilization. Rather, it is more likely that specific actions undertaken by government authorities serve as focal points for popular actions. In this sense, containment strategies and government policies intended to arrest the spread of the diseases are more likely to drive unrest. At the least, these strategies should serve to moderate or condition the underlying fears or tensions created by the disease. Scholars should therefore consider the effects of the specific policies adopted by governments during an epidemic on the probability or frequency of dissent activities. For example, rapid deliveries of medical supplies and expansions of the public health infrastructure may reassure the public and minimize dissent, while the imposition of quarantines or economic lockdowns are more likely to spur unrest.

Scholars should also more thoroughly map the complex casual sequences that potentially link epidemics and unrest. For instance, epidemics result in the adoption of specific public health policies. Such mitigation strategies might, in turn, contribute to economic upheaval and disruption (Sly 2020), which then acts as the proximate stimulus of unrest. Indeed, much of the economic cost resulting from the COVID-19 pandemic stems from lockdowns and stay-at-home orders rather than the disease itself. As such, the mechanisms we identify herein may interact to influence the likelihood of social unrest rather than representing independent causal factors. Some of these potential relationships include how epidemics and the economy interact with pre-existing social fault lines, which could exacerbate long-standing grievances within society. In particular, as the contemporary reporting on the COVID-19 pandemic suggest, the adverse consequences of epidemics are often most acute among populations that already suffer from poverty, exclusion, and marginalization. Disease outbreaks are likely to intensify these conditions, and thus the combination of rising mortality and morbidity among a distinct population, worsening economic conditions, and (often) uneven discriminatory government responses may jointly produce severe social discord and violent unrest.

In line with future work that examines the impact of specific types of epidemic response policies and how those interact with economic and social conditions, a fruitful direction of future inquiry would also be to examine the role of both national and sub-national political and economic institutions. While our models above controlled for whether states were democratic, national economic development levels, and whether the regions' states had federal institutional arrangements, there is room in future work for exploring potential conditional relationships. Future work can and should more deeply examine the role that democratic and autocratic governance plays in epidemic responses, public health delivery, and their responses to grievances that emerge.

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Appendices

Table A1: Descriptive Statistics of Independent and Control Variables

	N	Mean	SD	Min	Max
Administrative-level Variables					
Epidemic Binary	27664	0.076	0.265	0	1
Epidemic Severity	27664	0.112	0.458	0	3
Population Density‡	26880	6.742	3.041	0	22.387
Stable Night Lights‡	27664	7.538	2.937	0	13.331
Conflict Intensity‡	27664	0.232	0.907	0	12.696
Politically Excluded Group	27664	0.58	0.494	0	1
Spatially Weighted Lag Social Unrest	27664	0.304	0.936	0	30.833
Social Unrest$_{(t-1)}$	26676	0.34	2.128	0	167
Repression$_{(t-1)}$	26676	0.088	0.283	0	1
Country-level Variables					
Democracy	27298	0.407	0.195	0.067	0.912
GDPPC‡	26452	7.339	1.035	5.102	9.745
GDP Growth	26417	3.854	6.166	-62.076	123.14
Population‡	27516	16.398	1.204	13.764	19.067
Federalism	27664	0.108	0.311	0	1
HIV Cases‡	26404	11.147	2.309	4.605	15.803
Press Freedom	27454	0.299	1.076	-2.639	2.678

‡=natural log.

Table A2: Imbalance Statistics, Pre-matched and Post-matched Sample

Matching Variables	**Mean Difference**		**L1**	
	Pre-matched sample	*Post-matched sample*	*Pre-matched Sample*	*Post-matched Sample*
Population Density‡	-0.481	-0.115	0.113	0.05
Stable Night Lights‡	0.004	-0.129	0.05	0.03
Conflict Intensity‡	-0.148	-0.004	0.04	0.007
Democracy	-0.001	0	0	0
GDPPC‡	0.522	0.038	0.054	0.028
Population‡	-0.394	-0.055	0.051	0.056
Physicians per 1000	0.436	0.046	0.296	0.026

Note: Mean difference of matching variables between treatment and control group before and after Mahalanobis Distance Matching. Overall L1 multivariate imbalance measure decreases from 0.96 for the pre-matched sample to 0.80 for the post-matched sample. ‡=natural log.

Table A3: Multi-level Negative Binomial Regression Results, Epidemic Binary Variable

	Model 1	**Model 2**	**Model 3**	**Model 4**
	Social Unrest		*Social Unrest*	
	Pre-matched Sample		*Post-matched Sample*	
Administrative unit-level Variables				
Epidemic	0.20***	0.12***	0.17**	0.21***
	(0.05)	(0.05)	(0.07)	(0.07)
Population Density‡	0.22***	0.16***	0.18***	0.13***
	(0.02)	(0.02)	(0.03)	(0.03)
Stable Night Lights‡	0.45***	0.38***	0.52***	0.56***
	(0.03)	(0.03)	(0.05)	(0.05)
Conflict Intensity‡	0.21***	0.18***	0.23***	0.18***
	(0.01)	(0.01)	(0.03)	(0.03)
Politically Excluded Group	-0.02	0.02	-0.22*	-0.17
	(0.10)	(0.11)	(0.16)	(0.15)
Spatially Weighted Lag Social Unrest		0.17***		0.27***
		(0.01)		(0.05)
Social Unrest$_{(t-1)}$		0.01***		0.05***
		(0.00)		(0.01)
Repression$_{(t-1)}$		0.35***		0.46***
		(0.04)		(0.09)
Country-level Variables				
Democracy		-0.33*		-1.24***
		(0.25)		(0.53)
GDPpc‡		-0.28***		-0.46***
		(0.08)		(0.12)
GDP Growth		0.01**		-0.02***
		(0.00)		(0.01)
Population‡		0.02		-0.25**
		(0.09)		(0.11)
Federalism		-0.31		0.41
		(0.46)		(0.37)
HIV Cases‡		0.20***		-0.02
		(0.03)		(0.06)
Press Freedom		0.18***		0.16**
		(0.04)		(0.09)
Constant	-7.32***	-7.01***	-7.60***	0.42
	(0.27)	(1.33)	(0.48)	(1.85)
Observations	26880	23498	3778	3742
Log Likelihood	-12493.798	-10711.897	-2361.052	-2230.554
AIC	25005.595	21461.795	4740.104	4499.107
BIC	25079.388	21615.023	4796.237	4617.427

Notes: Coefficients with standard errors in parentheses (one-tailed test). ****p*<0.01, ***p*<0.05, **p*<0.1 ‡=natural log.

Table A4: Multi-level Negative Binomial Regression Results, Epidemic Severity Variable

	Model 1	Model 2	Model 3	Model 4
	Social Unrest		*Social Unrest*	
	Pre-matched Sample		*Post-matched Sample*	
Administrative unit-level Variables				
Low (10-99 deaths)	0.28^{***}	0.18^{***}	0.24^{***}	0.22^{***}
	(0.07)	(0.07)	(0.09)	(0.09)
Moderate (100-99 deaths)	0.21^{***}	0.12^{*}	0.20^{**}	0.17^{**}
	(0.08)	(0.08)	(0.10)	(0.10)
Severe (>999 deaths)	0.16^{*}	0.06	0.03	-0.01
	(0.12)	(0.12)	(0.14)	(0.14)
Population Density‡	0.22^{***}	0.16^{***}	0.18^{***}	0.13^{***}
	(0.02)	(0.02)	(0.03)	(0.03)
Stable Night Lights‡	0.45^{***}	0.38^{***}	0.53^{***}	0.56^{***}
	(0.03)	(0.03)	(0.05)	(0.05)
Conflict Intensity‡	0.21^{***}	0.18^{***}	0.23^{***}	0.18^{***}
	(0.01)	(0.01)	(0.03)	(0.03)
Politically Excluded Group	-0.02	0.02	-0.23^{*}	-0.18
	(0.10)	(0.11)	(0.17)	(0.15)
Spatially Weighted Lag Social Unrest		0.17^{***}		0.26^{***}
		(0.01)		(0.05)
Social Unrest$_{(t-1)}$		0.01^{***}		0.05^{***}
		(0.00)		(0.01)
Repression$_{(t-1)}$		0.35^{***}		0.46^{***}
		(0.04)		(0.09)
Country-level Variables				
Democracy		-0.31		-1.11^{**}
		(0.25)		(0.53)
GDPpc‡		-0.28^{***}		-0.47^{***}
		(0.08)		(0.12)
GDP Growth		0.01^{**}		-0.02^{***}
		(0.00)		(0.01)
Population‡		0.02		-0.25^{**}
		(0.09)		(0.12)
Federalism		-0.32		0.41
		(0.46)		(0.38)
HIV Cases‡		0.20^{***}		-0.02
		(0.03)		(0.06)
Press Freedom		0.17^{***}		0.15^{**}
		(0.04)		(0.09)
Constant	-7.33^{***}	-7.04^{***}	-7.62^{***}	0.39
	(0.27)	(1.33)	(0.48)	(1.89)
Observations	26880	23498	3778	3742

Log Likelihood	-12491.462	-10711.003	-2359.684	-2231.024
AIC	25004.924	21464.006	4741.369	4504.048
BIC	25095.115	21633.364	4809.975	4634.822

Notes: Coefficients with standard errors in parentheses (one-tailed test). ***p<0.01, **p<0.05, *p<0.1 ‡=natural log.