

# Disaster Vulnerability in 3D

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*From the beginning of the coronavirus pandemic, we have been told that different people face different risks from the virus. This laser focus on disaster vulnerability is, given the history of disasters, quite unusual. Usually vulnerability is seen as the “silent killer”—something we notice only after the disaster is over and the body count and other impacts become clear. This focus on vulnerability, along with the scope and timescale of the pandemic, provides a unique vantage point to view disaster vulnerability.*

*This Article leverages this unique vantage point to consider vulnerability in a more nuanced way and illuminate how a data-driven approach to vulnerability could improve disaster policy during the pandemic and other disasters. Drawing on new empirical data, as well as experience in past disasters, we explore three dimensions of vulnerability and their implications for policymakers. First, using statistical analysis and GIS mapping, we develop an empirical tool, a COVID-19 vulnerability index, to look at the geography of vulnerability—the physical distribution of people across the United States who are particularly vulnerable to the novel coronavirus, including the elderly, racial minorities, frontline workers, and those with underlying health conditions.*

*Incorporating insights from our exploration of the geographic dimension of vulnerability and lessons of past disasters, we then explore a second dimension of disaster vulnerability: competing vulnerabilities, or situations where policymakers must navigate choices that require prioritizing one aspect of a group’s vulnerability over another or one vulnerable group over another. To do this we consider two important problems that have faced policymakers during the pandemic: school closures and vaccine distribution.*

*Finally, we explore a third dimension of vulnerability: political vulnerability. These are situations in which addressing or focusing on vulnerability might incidentally or even purposefully lead to political neglect, stigmatization, disenfranchisement, displacement, and other similar patterns of exploitation. Among other examples, we discuss our concern as researchers in Fall 2020 that our geographic data visualization might be used to suppress the votes of vulnerable people in the 2020 general election.*

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## I. INTRODUCTION

Although there is still much we don't know about COVID-19, almost from the first days of the virus's explosion onto the world stage, we have known that its risks are unevenly distributed: older individuals, those with certain underlying health conditions, racial minorities, and the poor all face much more serious risks and have suffered much greater harm.<sup>1</sup> And COVID-19 is by no means the only disaster that poses increased risks to vulnerable populations. Indeed, one of the central findings of close to a half-century of disaster research by sociologists, geographers, historians, and by legal and other academics is that the impacts of disasters almost always fall most heavily on already marginalized and disadvantaged groups, particularly racial minorities and the poor,<sup>2</sup> but also the elderly and people with disabilities and chronic illness.<sup>3</sup> History has demonstrated time and time again, that disasters, like the COVID-19 pandemic, both reveal and exacerbate existing vulnerability and inequity.<sup>4</sup> And it is not just the disaster events themselves

<sup>1</sup> See, e.g., Amber L. Mueller, et al., *Why Does COVID-19 Disproportionately Affect Older People*, 12 AGING 9959, 9959 (2020) (noting that “[a]dvanced age is by far the greatest risk factor for COVID-19 fatality” and discussing underlying health conditions that also increase risk); APM Research Lab Staff, *The Color of Coronavirus: COVID-19 Deaths by Race and Ethnicity in the U.S.*, APM RESEARCH LAB (updated Feb. 4, 2021), [www.apmresearchlab.org/covid/deaths-by-race](http://www.apmresearchlab.org/covid/deaths-by-race) (reporting that “Pacific Islanders, Latino, Black and Indigenous Americans all have a COVID-19 death rate of *double* or more that of White and Asian Americans, who experience the lowest age-adjusted rate”); Monika Batra Kashyap, *U.S. Settler Colonialism, White Supremacy, and the Racially Disparate Impacts of COVID-19*, 11 CAL. L. REV. ONLINE 517, 527-28 (2020) (summarizing the racially disproportionate impacts of COVID-19).

<sup>2</sup> See, e.g., SUSAN L. CUTTER, *THE GEOGRAPHY OF SOCIAL VULNERABILITY: RACE CLASS, AND CATASTROPHE* (2009) (“Disasters are income neutral and color-blind. Their impacts, however, are not.”).

<sup>3</sup> SEE DANIEL A. FARBER ET AL., *DISASTER LAW & POLICY* 260 (2015) (noting that “[w]omen, children, the elderly, persons with disabilities, and immigrants (documented and otherwise) all suffer from disaster in ways that other victims do not). One notable departure from typical patterns of vulnerability in this pandemic is that COVID-19 seems to be somewhat more serious for men than for women (a difference that seems to be biological, not social). See Apoorva Mandavilli, *Why Does the Coronavirus Hit Men Harder?*, N.Y. TIMES (Aug. 27, 2020), <https://www.nytimes.com/2020/08/26/health/coronavirus-men-immune.html>.

<sup>4</sup> See FARBER ET AL., *supra* note 3, at 228 (observing that while natural disasters are “sometimes viewed as ‘great social equalizers,’” in fact “[d]isaster does not so much erase as expose social vulnerability”); see also *id.* at 239 (noting that Hurricane Katrina “exposed longstanding racial, social, and economic inequities”); KATHLEEN TIERNEY, *DISASTERS: A SOCIOLOGICAL APPROACH* 29 (2019) (quoting “disaster scholar Steve Matthewman” for the proposition that disaster “events are merely processes made visible”).

that amplify disparities: even well-intended disaster policy can often backfire, further harming vulnerable communities and deepening and entrenching existing inequity.<sup>5</sup>

What is unusual about the COVID-19 pandemic, however, is that vulnerability has been front and center, not only for academics, but also for the general public. Because we are attuned to the particular risks to vulnerable populations, we celebrate when we hear about a ninety-five-year-old who gets the vaccine and shudder when a seventy-year-old with heart disease gets diagnosed with the virus. Yet, even as we pay attention to vulnerability, we are focused mostly on the vulnerability of individuals, rather than neighborhoods and communities. While we track case-counts in different neighborhoods, counties, and states, we are less attuned to how vulnerability differs across those spatial dimensions.

Yet, understanding geographic patterns of vulnerability—its spatial dimensions—is critical to developing just and effective disaster response policy. Detailed geographic data about vulnerability is essential if we want to know, for example, where to locate COVID-19 testing centers and vaccine clinics. The same information can help us decide where to prioritize regulatory resources, such as spending money educating the public about mask mandates, or where voter accommodations for vulnerable citizens are most needed.

This Article considers new empirical evidence, in tandem with the lessons of past disasters, to explore how a sustained, data-driven, systemic approach to vulnerability can improve disaster decision-making. Our team of legal, public health, and statistics experts answers the call of many disaster scholars, including one of disaster law's founding scholars, to provide policymakers with the “maps and numbers” they need to understand and address vulnerability<sup>6</sup> by developing a county-by-county COVID-19 vulnerability index and then applying it to some of the most important COVID-19 policy decisions.

As we developed and applied this unique empirical tool, we recognized that truly seeing disaster vulnerability in three dimensions requires more than seeing spatial vulnerability; indeed, a single-minded focus on geographic vulnerability can obscure two other important dimensions of vulnerability: conflicting or competing vulnerability and political vulnerability. Conflicting or competing vulnerability requires us to think more carefully and holistically about trade-offs between different aspects of a particular group's vulnerability, as well as trade-offs between different vulnerable groups. Political vulnerability encompasses the various ways that disasters make already vulnerable groups even more vulnerable to certain kinds of harms: political neglect, stigmatization, disenfranchisement, displacement, and other forms of exploitation. Applying the lessons of past disasters and drawing on a second original data set—a 2000-person survey fielded between September 23, 2020 and October 3, 2020—we explore these two additional dimensions of vulnerability and consider the potential and limits of geographic vulnerability indices like ours for addressing and mitigating these other dimensions of vulnerability.

This Article focuses on these three dimensions of disaster vulnerability. The first dimension we explore is the geography of vulnerability. Part II begins by providing a brief background on disaster vulnerability, paying special attention to the importance of understanding the geographic dimension of vulnerability. To help visualize the geography of vulnerability to the pandemic, we then introduce our COVID-19 vulnerability index and explore how it (and similar data tools) can be used to improve disaster management. To make this point, we consider how our index could have improved two critical and contentious policy decisions that occupied decision-makers from

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<sup>5</sup> See discussion accompanying notes 40-54, *infra*.

<sup>6</sup> Robert R.M. Verchick, *Disaster Justice: The Geography of Human Capability*, 23 DUKE ENVTL. L. & POL'Y F. 23, 25 (2012).

the onset of the pandemic: mask mandates and accommodations provided to voters in both the 2020 primary and general elections. These examples demonstrate how vulnerability data, such as that provided by our index, can bring needed clarity to complex, big-picture issues, while providing nuance and direction that has frequently been absent in our pandemic responses. At the same time, we acknowledge the shortcomings, implicit judgment calls, and limitations of such an index and how factors such as uncertainty and incomplete data pose challenges to even the most informed decision-maker.

Part III explores the second dimension of vulnerability: competing or conflicting vulnerabilities. We first consider conflicts between different vulnerabilities of a particular group, with particular attention to the conflicting risks to vulnerable students implicated by school-reopening decisions. We then consider the competing vulnerabilities of different vulnerable groups, primarily through the lens of vaccine-distribution priorities.

Part IV explores the third dimension of vulnerability: political vulnerability. Examining a wide range of examples from the COVID-19 pandemic and other disasters, we discuss the ways that addressing and focusing on vulnerability might incidentally or even purposefully lead to political neglect, stigmatization, disenfranchisement, displacement, and other similar patterns of exploitation. Along the way, we consider how vulnerability data may be both an unintended blueprint for exploitation and an important check on disaster inequity.

And finally, in Part V, we conclude by highlighting lessons learned from examining the ongoing COVID-19 pandemic and past disasters through the dimensions of vulnerability, emphasizing those lessons that best ameliorate vulnerability and build resilience in traditionally disadvantaged communities.

## II. FIRST DIMENSION: SPATIAL AND GEOGRAPHIC PATTERNS OF VULNERABILITY

In this Part, we provide some background about disaster vulnerability, with a particular focus on the spatial dimensions and geographic patterns of vulnerability. We begin with an overview of how the disaster law literature and other disaster scholarship has treated the subject of vulnerability and also briefly argue that justice requires that we pay particular attention to vulnerable people and that, from a practical perspective, effective disaster management does, too.

Turning from a broader conversation to a more specific one, this Part then explains how we created a vulnerability index to better understand COVID-19 and how this index helped us better visualize the spatial dimensions of COVID-19 vulnerability. We then provide two examples of how such an index could have been used to improve COVID-19 disaster management—focusing first on voter accommodations for the 2020 general election and then on mask mandates.

We end this part by discussing some of the issues and limitations we confronted as we created the COVID-19 vulnerability index and reflect on the broader lessons of our experience to spatial visualization and analysis of data for disaster planning.

### *A. Understanding Disaster Vulnerability*

Vulnerability to disasters, like vulnerability to more everyday stressors, has multiple dimensions. While there are many different ways to categorize vulnerability, at its most basic level, disaster vulnerability is traditionally conceived as the cumulative effect of three different factors: exposure vulnerability, physical vulnerability, and social vulnerability. All of these forms of

vulnerability manifest geographically and vary across space—from street to street, neighborhood to neighborhood, county to county, state to state, and country to country.

As an initial matter, individuals and communities may be particularly vulnerable to disaster because they have increased *exposure* to hazards.<sup>7</sup> That exposure increases the likelihood that they will experience a disaster event. This “exposure vulnerability” has an important spatial component<sup>8</sup> because most natural hazards, such as wildfire, earthquake, and floods, also have a strong spatial element.<sup>9</sup> In the COVID-19 pandemic, this increased exposure takes a different spatial form: jobs that don’t easily permit social distancing or working from home, reliance on public transit (that puts people in close proximity) rather than private automobile, and crowded intergenerational housing. Because many of these exposure factors are, in turn, correlated with race and class<sup>10</sup> and most U.S. cities continue to be segregated residentially, the most exposed individuals will often be concentrated in particular neighborhoods and communities. Homeless people, incarcerated individuals, and those living in other group settings (including nursing homes, care centers, and mental health facilities) also have heightened exposure; these populations, too, tend to be concentrated in certain geographic areas.

Another reason that individuals and communities may be particularly susceptible to disaster is that, due to a variety of socioeconomic factors, they lack adequate capacity or resources (including money and social capital) to respond and adapt when disaster strikes.<sup>11</sup> Disaster literature typically uses the term “social vulnerability” to capture these socioeconomic forces that make it difficult for people to absorb and adapt to disaster shocks.<sup>12</sup> So understood, social vulnerability might be viewed—at least in part—as the absence of resilience, which is usually defined in disaster literature as the capacity to absorb, respond, and adapt to shocks like disaster events.<sup>13</sup> In many respects, social vulnerability and resilience are two sides of the same coin. Like exposure vulnerability, social vulnerability can be mapped, and data tools like the CDC’s Social Vulnerability Index illustrate how these socioeconomic factors vary across space.<sup>14</sup>

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<sup>7</sup> Verchick, *supra* note 6, at 38 (describing this exposure vulnerability as “physical vulnerability” when it results from “a community’s physical exposure to a place based risk”).

<sup>8</sup> *See id.*

<sup>9</sup> TIERNEY, *supra* note 4, at 121 (describing how exposure to hazards differs across place because “particular geographic areas are simply more prone than others to events that arise from hazards”).

<sup>10</sup> *See, e.g., CDC, The Advisory Committee on Immunization Practices’ Updated Interim Recommendation for Allocation of COVID-19 Vaccine—United States, Dec. 2020*, [https://www.cdc.gov/mmwr/volumes/69/wr/mm695152e2.htm?s\\_cid=mm695152e2\\_w](https://www.cdc.gov/mmwr/volumes/69/wr/mm695152e2.htm?s_cid=mm695152e2_w). (reporting that the “overall proportion of persons aged ≥75 who live in a multigenerational household is 6%; the proportion among non-Hispanic White persons is 4% and the proportion among racial or ethnic minority groups is higher (non-Hispanic Black persons, 10%; Hispanic or Latino persons, 18%; non-Hispanic persons of other races, 20%)”).

<sup>11</sup> *See, e.g., Susan Cutter, Bryan J. Boruff & W. Lynn Shirley, Social Vulnerability to Environmental Hazards*, 84 SOC. SCI. Q. 242 (2003) (noting that “[s]ocial vulnerability is partially a product of social inequalities—those social factors and forces that create the susceptibility of various groups to harm, and in turn affect their ability respond, and bounce back (resilience) after the disaster”).

<sup>12</sup> Some definitions of social vulnerability also include exposure vulnerability in the “social vulnerability” umbrella, rather than treating exposure as a separate dimension of vulnerability. Indeed, there is considerable inconsistency/variation (and even contradiction) in the way the terms “social vulnerability” and “resilience” are used in the social sciences literature and about how the relationship between the two should be conceptualized. *See Susan L. Cutter et al., A Place-Based Model for Understanding Community Resilience to Natural Disasters*, 18 GLOBAL ENVTL. CHANGE 598, 599 (2008); Verchick, *supra* note 6, at 39 n. 74 & 76.

<sup>13</sup> *See, e.g., Verchick, supra* note 6, at 39.

<sup>14</sup> *See* ATSDR, CDC Social Vulnerability Index, <https://www.atsdr.cdc.gov/placeandhealth/svi/index.html>.

Pandemics illuminate another type of vulnerability that frequently receives less attention during other types of disasters: physical or health conditions can make people vulnerable to certain kinds of harm. While it is always the case during disasters that certain physical conditions might predispose people to certain kinds of harm,<sup>15</sup> these physical factors are at the heart of COVID-19 vulnerability. Research demonstrates that advanced age is the strongest predictor of COVID-19 mortality risk.<sup>16</sup> Additionally, the CDC has identified a number of medical conditions that increase a person's risk of severe COVID-19 illness or death, including cancer, COPD (chronic obstructive pulmonary disease), pregnancy, heart disease, obesity, severe obesity, and Type 2 diabetes.<sup>17</sup> Smoking likewise increases a person's risk.<sup>18</sup> Other conditions, such as asthma and liver disease, may increase the risk of poor COVID-19 outcomes.<sup>19</sup>

All of these forms of vulnerability are overlapping and mutually reinforcing. Social vulnerability influences physical vulnerability in critical ways: health is a product not just (or even primarily) of genetics and lifestyle choices, but of a wide array of social determinants such as access to healthcare, health insurance coverage, educational access, workplace conditions, community cohesion, poverty, food security, housing stability, neighborhood crime levels, and access to healthy food, air, and water.<sup>20</sup> Historical and current income inequality, structural racism, discrimination, and geographic racial and class segregation mean both that many of these medical conditions are more common (and less well treated) among lower-income and BIPOC individuals and that there are definite geographic patterns to these disparities.<sup>21</sup>

Similarly, social vulnerability and exposure vulnerability to disasters often overlap, coincide, and compound: the most socially vulnerable are often the most exposed to disaster risk.<sup>22</sup> In many areas, poor and minority residents occupy the most marginal, disaster-prone land.<sup>23</sup> In New Orleans, for example, neighborhoods in the lowest-lying areas most subject to flooding are

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<sup>15</sup> For example, evacuation may be more difficult for people who have limited mobility or need supplemental oxygen. During heat waves, physical vulnerability also plays a central role in mortality risk: the people at highest risk of death are the very old or very young, as well as people with certain underlying health conditions like heart disease or Parkinson's disease. See, e.g., National Weather Service, *Who is Most Vulnerable During a Heat Wave*, <https://www.weather.gov/media/lxw/cm/Heat/MostVulnerableHeatIndex.pdf>

<sup>16</sup> Yale School of Medicine, *Yale Researchers Develop Model to Estimate COVID-19 Mortality Risk in Veterans*, Dec. 2, 2020, <https://medicine.yale.edu/news-article/28980/> (“[R]esearchers discovered that age is the strongest predictor of mortality, with risk climbing after age 55. Patients under the age of 50 with COVID-19 have only a 1 percent chance of dying. Those 85 and older have at least a 34 percent chance of dying if they get COVID-19.”).

<sup>17</sup> CDC, *People With Certain Medical Conditions*, updated Dec. 29, 2020, <https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-with-medical-conditions.html>.

<sup>18</sup> See *id.*

<sup>19</sup> See *id.*

<sup>20</sup> CDC, *About Social Determinants of Health*, <https://www.cdc.gov/socialdeterminants/about.html>. The relationship between health inequity and structural racism is explored more fully in our forthcoming paper *COVID-19 and the Voting Rights Act*.

<sup>21</sup> See *id.*

<sup>22</sup> See, e.g., Verchik, *supra* note 6; ERIC KLINENBERG, *HEAT WAVE: A SOCIAL AUTOPSY OF DISASTER IN CHICAGO* 20 (2d ed. 2015) (observing that “the geography of vulnerability during the [1995] Chicago heat wave was hauntingly similar to the everyday ecology of inequality,” with “deaths concentrated in the low-income, elderly, African-American, and violent regions of the metropolis”).

<sup>23</sup> See, e.g., Debra L. Bassett, *The Overlooked Significance of Place in Law and Policy: Lessons from Hurricane Katrina*, in *RACE, PLACE, AND ENVIRONMENTAL JUSTICE AFTER HURRICANE KATRINA* (Robert D. Bullard & Beverly Wright, eds. 2009) 49, 51 (“The people who are more economically and socially vulnerable are the ones shunted into the places that are more geographically vulnerable—including those who are less educated, who are low income, who are elderly, or who are minorities.”).

predominantly Black and lower-income.<sup>24</sup> The consequences of this became tragically clear when these neighborhoods were inundated during Hurricane Katrina. As noted above, the socially vulnerable are also most exposed to COVID-19, as they are overrepresented among frontline essential workers who cannot socially distance, lack adequate PPE at work, and cannot afford to quit their jobs.<sup>25</sup> This dynamic plays out at the neighborhood level as well, as research using cell-phone mobility data demonstrates that residents of lower-income, Black neighborhoods are engaging in less social distancing than richer, white neighborhoods, presumably in large part because their jobs and living conditions often do not allow it.<sup>26</sup> This overlap between social vulnerability and heightened exposure to disaster-risk is, of course, not surprising. Indeed, we would expect that those who are socially vulnerable would also lack the financial resources and political power to minimize their exposure to hazards of various kinds.

Because so many of the same forces—structural racism, wealth inequality, ageism, and ableism—are important drivers of exposure, physical, and social vulnerability, many of the same geographic areas rank high on all these separate indicators of vulnerability. This intersection of vulnerability raises particularly pressing questions of “disaster justice,”<sup>27</sup> just as the disproportionate exposure of the socially vulnerable to environmental risk raises issues of environmental justice.<sup>28</sup> The patterns of COVID-19 vulnerability, in particular, clearly raise questions of disaster justice, as the same individuals and communities often have the most exposure, the most health risk, and the highest levels of social vulnerability to COVID-19’s impacts.

### *B. The Ethical and Practical Case for Focusing on Vulnerability*

As the prior section notes, the intersection of various forms of vulnerability during and after disasters raises important questions of justice, and these questions of justice are central to disaster scholars’ focus on vulnerability.<sup>29</sup> While a full exploration of the moral and ethical case for prioritizing the welfare of vulnerable groups and individuals is beyond the scope of this Article,

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<sup>24</sup> See *id.*

<sup>25</sup> See, e.g., Kashyap, *supra* note 1, at 527-28.

<sup>26</sup> See, e.g., Makahda Henry-Nickle & John Hudak, *Social Distancing in Black and White Neighborhoods in Detroit: A Data-Driven Look at Vulnerable Communities*, May 19, 2020, <https://www.brookings.edu/blog/fixgov/2020/05/19/social-distancing-in-black-and-white-neighborhoods-in-detroit-a-data-driven-look-at-vulnerable-communities/> (finding that, “as the pandemic wore on,” “non-Black and high-income communities began practicing social distancing at a statistically significantly higher rate than their Black and low-income neighborhood peers” and that these “[s]ocial distancing gaps between neighborhoods widened, even as the number of infections soared”).

<sup>27</sup> See Verchick, *supra* note 6, at 23.

<sup>28</sup> See, e.g., Vicki Been, *What’s Fairness Got to Do with It? Environmental Justice and the Siting of Locally Undesirable Land Uses*, 78 CORNELL L. REV. 1001, 1068-84 (1993) (discussing distributive justice in the context of locally undesirable land uses); Robert R. Kuehn, *A Taxonomy of Environmental Justice*, 30 ENVTL. L. REP. 10681, 10683-702 (2000) (analyzing environmental justice through the lens of distributive justice, corrective justice, procedural justice, and social justice). Some scholars have conceptualized disaster justice—particularly questions of disaster vulnerability and “differential effects of disasters”—as a form or subset of environmental justice. TIERNEY, *supra* note 4, at 74-75.

<sup>29</sup> See Verchick, *supra* note 6; see also Dan Farber, *Navigating the Intersection of Environmental Law and Disaster Law*, 2011 BYU L. REV. 1783, 1785 (2011) (noting disaster law’s emphasis on “issues of unequal risk exposure”).

this section makes a brief case for prioritizing the needs of the most vulnerable during and after disasters.<sup>30</sup>

While there are many competing (and conflicting) understandings of justice, many theories of justice converge around the idea that “justice increases when the benefits and burdens of social cooperation are born equally, except when moral considerations or other values justify greater inequality.”<sup>31</sup> This common ground, or “overlapping consensus,”<sup>32</sup> suggests that justice is disserved when disaster impacts are disproportionately borne by certain groups, particularly those that are already disadvantaged.<sup>33</sup>

One might question whether disaster impacts are, in fact, “burdens of social cooperation” that must be distributed equitably. To take up an example we discuss in the next section, one might argue that policymakers have no obligation to consider vulnerability when designing disaster-time voting rules because the barriers to vulnerable people voting during disasters are caused most directly by the hazards themselves (whether virus, hurricane, earthquake, or some other natural event) and are forces that are arguably outside human control.<sup>34</sup> The rejoinder of many disaster scholars would reference one of the field’s fundamental maxims: “No disaster is truly natural.”<sup>35</sup> The objection to government responsibility ignores the role of government and public policy in making certain hazard events more likely, in increasing public exposure to so-called “natural” hazards, in failing to mitigate disaster risks, and in failing to respond effectively to disasters when they do occur.<sup>36</sup>

From failure to address climate change that is accelerating the emergence of new zoonotic diseases to lack of preparedness for a serious pandemic to dysfunctional government response, the

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<sup>30</sup> The brief case we make here for ensuring that disaster impacts are not disproportionately borne by already disadvantaged groups parallels the case that some of the Article’s authors have previously made for environmental justice. See Brigham Daniels, Michalyn Steele & Lisa Grow Sun, *Just Environmentalism*, 37 YALE & POL’Y REV. 1, 43-45 (2018).

<sup>31</sup> Peter S. Wenz, *Does Environmentalism Promote Injustice for the Poor?*, in ENVIRONMENTAL JUSTICE AND ENVIRONMENTALISM: THE SOCIAL JUSTICE CHALLENGE TO THE ENVIRONMENTAL MOVEMENT 57, 57 (Ronald Sandler & Phaedra C. Pezzullo eds., 2007); see also Jouni Paavola, *Justice in Adaptation to Climate Change in Tanzania*, in Fairness in Adaptation to Climate Change (W. Neil Adger et al., eds.) (2006) 201, 204-05 (arguing that “equality is the best starting point” for considering justice, but that “need and capability”—both implicated by vulnerability—are persuasive reasons for favoring vulnerable groups in climate change adaptation policy).

<sup>32</sup> See generally John Rawls, *The Domain of the Political and Overlapping Consensus*, 64 N.Y.U. L. REV. 233 (1989).

<sup>33</sup> See, e.g., Kirstin Dow et al, *Exploring the Social Justice Implications of Adaptation and Vulnerability*, in FAIRNESS IN ADAPTATION TO CLIMATE CHANGE 79, 81 (“A society is just only if it is arranged in such a way that the position of the last advantaged is optimized.”). Many different approaches to justice support this conclusion. Cf. *id.* at 80 (“Despite the differences and disagreements among different conceptions of justice, many can be used to generate reasons why the most vulnerable to climate change ought to be given special attention.”). For example, Professor Rob Verchick makes the case for prioritizing the vulnerable by building on Amartya Sen’s capability approach (arguing for “equality of *capability*—the real-world means to lead a life that you have a reason to value, free of extreme deprivations”). Verchick, *supra* note 6, at 57-58. Other scholars have arrived at an ethical imperative to prioritize vulnerable populations through relational ethical approaches. See, e.g., David I. Jeffrey, *Relational Ethical Approaches to the COVID-19 Pandemic*, 46 J. MED. ETHICS 495, 495 (2020).

<sup>34</sup> While responsibility (or causal link) is not the only touchstone for evaluating moral and ethical duties, commonly held notions about moral and ethical obligations to mitigate harm to others are often grounded in a sense of collective responsibility for that harm.

<sup>35</sup> FARBER ET AL., *supra* note 3, at 228.

<sup>36</sup> See, e.g., Verchick, *supra* note 6, at 54 (quoting Judith Shklar for the proposition that “[i]t is not the origin of the injury, but the possibility of preventing and reducing costs, that allows us to judge whether there was or was not unjustified passivity in the face of disaster”).

COVID-19 pandemic—particularly as it has played out in the U.S.—confirms the truth of this basic maxim. Government plays an important role in creating disaster impacts and, at least from an ethical perspective, may thus have some obligation to address disaster-related barriers to voting, particularly for the already vulnerable who typically experience the greatest disaster impacts and, consequently, the highest voting costs.

Much the same can also be said of the voting barriers created by underlying, preexisting vulnerability.<sup>37</sup> Indeed, the examples in the prior section and the lessons of other past disasters make clear that “disaster-specific” vulnerability is difficult to disentangle from the preexisting, day-to-day vulnerability of “normal times,” much of which is driven by broader societal forces—magnified by and embedded in government policies—such as structural racism, limited access to health care, ageism, ableism, and growing wealth inequality.<sup>38</sup>

In short, both disasters and vulnerability are, in substantial part, socially constructed, and we bear a collective responsibility for both. Justice thus requires that we act to alleviate the disproportionate burden of disaster impacts on the vulnerable. Moreover, procedural justice also requires that we endeavor to give vulnerable individuals and communities increased voice in disaster policy.<sup>39</sup>

Justice also requires affirmative efforts to prioritize vulnerable people in all aspects of disaster law and policy—and in all stages of disaster management<sup>40</sup>—because the failure to do so inexorably widens the gap between the disadvantaged and the advantaged. Both the history of disaster policy in the U.S. and internationally and the more recent COVID-19 response make clear that “neutral” disaster policies—designed and implemented without particular attention to vulnerability—almost always exacerbate rather than attenuate existing societal inequities. Research confirms that, across every phase of the disaster management cycle, from preparedness and mitigation to response to compensation to recovery, our current system of government disaster aid disproportionately benefits wealthier, whiter communities and individuals and thus deepens disparities rather than mitigating racial and class inequality and inequity.

One jarring study found that the higher the disaster costs in a particular county, “the more wealth white residents tend to accumulate, all else equal,” while Black residents, “on the other hand, tend to lose wealth as local hazard damages increase.”<sup>41</sup> This disparity resulted not just from the disaster itself, but from the government response: when the study specifically examined the amount of FEMA money counties received, the researchers found that “the more FEMA money a county receives, the more whites’ wealth tends to grow and the more blacks’ wealth tends to decline, all else equal. In other words, how federal assistance is currently administered seems to be exacerbating rather than ameliorating wealth inequalities that unfold after costly natural

<sup>37</sup> Kashyap, *supra* note 1, at 525-27.

<sup>38</sup> CUTTER, *supra* note 2 (noting that “social vulnerability is partially a product of social inequalities—those social factors and forces that create the susceptibility of various groups to harm, and in turn affect their ability to respond, and bounce back (resilience) after the disaster” but that it also encompasses “the basic provision of health care, the livability of places, overall indicators of quality of law, and accessibility to lifelines (goods, services, emergency response personnel), capital, and political representation”).

<sup>39</sup> See Daniels et al., *supra* note 30 (discussing procedural justice in the context of environmental justice).

<sup>40</sup> Disaster law, which “encompasses a wide-ranging, interdisciplinary body of research that seeks to inform and improve disaster-related decision-making,” Farber, *supra* note 29, at 1786-87, often focuses on the role of law in the disaster or “risk management cycle”: mitigation, preparedness, compensation, emergency response, and recovery/rebuilding. FARBER ET AL., *supra* note 3, at 4.

<sup>41</sup> Junia Howell & James R. Elliott, *As Disaster Costs Rise, So Does Inequality*, 4 SOCIUS SOCIOLOGICAL RESEARCH FOR A DYNAMIC WORLD, Jan. 2018, available at [https://www.researchgate.net/publication/329405372\\_As\\_Disaster\\_Costs\\_Rise\\_So\\_Does\\_Inequality](https://www.researchgate.net/publication/329405372_As_Disaster_Costs_Rise_So_Does_Inequality).

hazards.”<sup>42</sup> A recent NPR investigation summed it up even more bluntly: “after a disaster, rich people get richer and poor people get poorer. And federal disaster spending appears to exacerbate that wealth inequality.”<sup>43</sup> This entrenchment of inequity happens at both the individual and community level.<sup>44</sup>

The reasons our current system of disaster aid entrenches inequity are myriad. Richer, whiter people and communities tend to receive more federal aid because “[f]ederal aid isn’t necessarily allocated to those who need it most,” but “according to cost-benefit calculations meant to minimize taxpayer risk.”<sup>45</sup> Much federal disaster recovery aid takes the form of loans—available only to those with preexisting banking relationships, good credit scores, and established lending history<sup>46</sup>—and income tax deductions, available only to higher-income taxpayers.

Additionally, because wealthier people can demonstrate higher value disaster losses, they typically receive more federal aid, even though they are more likely to have other sources of funds available. Individual disaster assistance, allocated by FEMA through the Stafford Act, favors wealthier disaster survivors, typically providing more assistance to homeowners than renters, to homeowners in upscale neighborhoods than to homeowners in more depressed areas, and to those who need to fix damaged cars than to those who depend on public transportation, thus replicating existing wealth gaps.<sup>47</sup> Even when they are eligible for the same aid as other survivors, poorer individuals face more obstacles to accessing that aid, including lack of time and help to navigate the often labyrinthine application process.<sup>48</sup>

Our experience thus far with COVID-19 response bears out these patterns, with various forms of government COVID aid less accessible to vulnerable individuals and communities.

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<sup>42</sup> *Id.*

<sup>43</sup> Rebecca Hersher & Robert Benincasa, *How Federal Disaster Money Favors the Rich*, NPR.ORG, March 5, 2019, <https://www.npr.org/2019/03/05/688786177/how-federal-disaster-money-favors-the-rich>.

<sup>44</sup> TIERNEY, *supra* note 4, at 139 (describing disparate post-disaster aid to both individuals and communities, noting that “a hard-hit majority-white community” was likely to receive more aid than “a similarly hard-hit majority-African American community”).

<sup>45</sup> Hershey & Benincasa, *supra* note 43.

<sup>46</sup> TIERNEY, *supra* note 4, at 138-39 (noting that “the major source of federal government [disaster] recovery assistance for households and businesses” are loans made on the basis of credit history and income for repayment).

<sup>47</sup> See, e.g., TIERNEY, *supra* note 4, at 141 (noting, for example, that “African American applicants for Road Home Grants received smaller compensation awards . . . because they were residents in historically segregated neighborhoods with depressed property values”). These inequities are also reflected in private insurance payouts for post-disaster costs. See Bassett, *supra* note 23, at 47 (“[S]tudies conducted after 1992’s Hurricane Andrew in Florida indicated that minorities received inadequate insurance settlements at a rate more than twice that of whites.”).

<sup>48</sup> While the disparity-deepening effect of disaster law and policy is most well-studied in the disaster-response context, it is also manifest in disaster mitigation efforts—which both precede and follow disaster events. Some of this gap is explained by reliance on facially neutral criteria like cost-benefit analysis to determine which hazard mitigation grants to fund. See FEMA, Benefit-Cost Analysis, [https://www.fema.gov/grants/guidance-tools/benefit-cost-analysis#:~:text=Benefit%2DCost%20Analysis%20\(BCA\),BCR%20is%201.0%20or%20greater](https://www.fema.gov/grants/guidance-tools/benefit-cost-analysis#:~:text=Benefit%2DCost%20Analysis%20(BCA),BCR%20is%201.0%20or%20greater). Poor communities also have difficulty accessing hazard mitigation funds. Research shows that federal money for voluntary buyouts of flood-prone property has disproportionately gone to wealthier, whiter communities, perhaps in part because wealthier counties are more likely to have the administrative infrastructure to apply for and administer complicated buyout grants. Rebecca Hersher, *Sweeping Study Raises Questions About Who Benefits from Buyouts of Flood-Prone Homes*, NPR.ORG, Oct. 9, 2019, <https://www.npr.org/2019/10/09/767920427/sweeping-study-raises-questions-about-who-benefits-from-buyouts-of-flood-prone-h>. Additionally, federal hazard mitigation grants—aimed primarily at funding measures that reduce the future disaster risk of public entities like cities and school districts—are contingent on local cost-sharing, which means that communities cannot even compete for these grants if they lack the resources to fund the mandatory local cost-share.

People in low-income, minority neighborhoods have had less access to COVID-19 testing,<sup>49</sup> in part because locating testing facilities at existing medical facilities may simply replicate preexisting inequities in health care access.<sup>50</sup> Early vaccination data from some areas suggest that wealthier ZIP codes have higher vaccination rates than lower-income ZIP codes<sup>51</sup> and that vaccination rates for Black people are lagging.<sup>52</sup>

Black and other minority business owners have also had significantly less access to direct COVID-19 financial aid. One study found that “[c]ompared to all other racial or ethnic groups, Black business owners and entrepreneurs were about 30 times less likely to have received government aid for people or businesses affected by the pandemic.”<sup>53</sup> While the study didn’t investigate the causes of the disparity, the authors suggested that structural barriers—including discrimination in lending, lack of information about the stimulus programs, and lack of preexisting connections with mainstream financial institutions—likely made it more difficult for Black business owners to access aid.<sup>54</sup>

Aside from the ethical justifications for prioritizing the needs of the vulnerable, in the case of the pandemic there is a strong practical case to be made, as well. The virus has no respect for borders: what happens in vulnerable neighborhoods (and vulnerable countries!)<sup>55</sup> ultimately affects everyone. Even if advantaged people, communities, and countries are able to hoard pandemic resources—particularly vaccine doses, failing to address the spread of the pandemic among the vulnerable taxes medical resources (hospitals beds, ICU beds, ventilators) on which everyone relies. Even more pressing, uncontrolled spread in vulnerable areas increases the chance that one or more mutations will emerge that will evade both natural immunity from prior infections and the immunity current vaccines provide, with potentially catastrophic results for everyone.<sup>56</sup>

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<sup>49</sup> Soo Rin Kim et al., *Which Cities Have the Biggest Racial Gaps in COVID-19 Testing Access*, (July 22, 2020), <https://fivethirtyeight.com/features/white-neighborhoods-have-more-access-to-covid-19-testing-sites/> (finding, based on an “extensive review of testing states,” that “sites in communities of color in many major cities face higher demand than sites in whiter or wealthier areas in those same cities,” which means that “Black and Hispanic people are more likely to experience longer wait times and understaffed testing centers”).

<sup>50</sup> See, e.g., *id.* (“Experts say that the disparity [in testing access in San Antonio] can be attributed to a long-standing gap in the health care system and an equal distribution of health care facilities in the San Antonio area, which is one of the most economically segregated cities in the country.”).

<sup>51</sup> See, e.g., Douglas Hanks & Ben Conark, *Miami-Dad’s Wealthiest ZIP Codes Are Also the Most Vaccinated for COVID-19*, *Data Shows*, MIAMIAHERALD.COM (Jan. 23, 2021), <https://www.miamiherald.com/news/coronavirus/article248697820.html> (“New state data on vaccinations by ZIP codes map out a familiar pattern for the coronavirus pandemic. Just as low-income neighborhoods tended to get hit harder by COVID-19 spread, wealthier neighborhoods are getting their shots at a faster rate.”).

<sup>52</sup> See *id.* (noting that demographic data on vaccinations demonstrate “that just 6% of the 138,000 people who received a COVID vaccine in Miami-Dad are Black in a county with a 17% Black population”).

<sup>53</sup> Felix Kabo, Stewart Thornhill & Elizabeth Isele, *Race and Government Aid*, Dec. 28, 2020; see also Michigan News, *Black Business Owners, Entrepreneurs Left Out of Small Business Coronavirus Support*, Jan. 6, 2020, <https://news.umich.edu/black-business-owners-entrepreneurs-left-out-of-small-business-coronavirus-support/> (reporting that “[i]n May 2020, less than one half of 1% of Black business owners reported receiving government benefits for businesses affected by the coronavirus epidemic compared to about 9% of non-Black business owners”).

<sup>54</sup> See *id.*

<sup>55</sup> While our vulnerability index is a national one and our focus is therefore on U.S. domestic policy, international COVID-19 response raises many of the same issues.

<sup>56</sup> See, e.g., Nurith Aizenman, *‘Everything Broke’: Global Health Leaders on What Went Wrong in the Pandemic*, NPR.ORG, Jan. 25, 2021, <https://www.npr.org/sections/goatsandsoda/2021/01/25/959692787/everything-broke-global-health-leaders-on-what-went-wrong-in-the-pandemic> (arguing that it is immoral and foolhardy for rich countries to get to vaccinate everyone first because new variants are likely to grow up in poor places that may defeat the vaccines’ effectiveness).

There is even some early evidence that COVID-infections in some particularly physically vulnerable people—those who are immunocompromised—might accelerate virus mutation as the infection persists (and the virus mutates) in the patient’s body over long periods of time.<sup>57</sup> At least in the case of serious pandemics, addressing the needs of the most vulnerable during disasters is also necessary to keep essential services, like food supply chains, operating. Ultimately, protecting the most vulnerable among us protects everyone.

### C. Spatial and Geographic Dimension Applied: The COVID-19 Vulnerability Index

As the prior section makes clear, vulnerability data is critical to developing just and effective disaster policies. Data about individuals’ and communities’ pre-disaster vulnerability help policymakers predict where disaster impacts will fall the hardest and to develop strategies in advance to minimize those harms. Gathering data about vulnerable populations during and after the disaster helps assess whether those strategies and more general disaster response measures have been effective in alleviating harm to vulnerable communities or if course correction is necessary to prevent disaster aid from exacerbating pre-existing disparities. Data make visible suffering that is otherwise invisible to many observers and policymakers. Indeed, the history of disasters suggests that the suffering and deaths of vulnerable people are often discounted or undercounted,<sup>58</sup> particularly “quiet” deaths from heat waves or disease.<sup>59</sup>

Spatial data about vulnerability is particularly critical in all kinds of disasters. When planning evacuation routes in advance of hurricanes, for instance, spatial vulnerability data helps identify where public busses will be needed to facilitate evacuation for residents who don’t have private transportation. In the context of COVID-19, vulnerability data can inform decisions like siting of testing and vaccination sites, determining vaccination priorities, ascertaining when and where to implement public health measures, assessing the stakes of school reopenings, and structuring aid packages.

While disaster scholars have often advocated for data tools that allow a richer understanding of disaster vulnerability, few disasters have allowed for the kind of close, real-time examination of disaster vulnerability that the COVID-19 pandemic has. Detailed information about COVID-19 infections, hospitalizations, and fatalities—almost all of it updated daily and much of it tracked by geography, race, age, health risk, and other important demographic

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<sup>57</sup> See Bina Choi et al., Correspondence, *Persistence and Evolution of SARS-CoV-2 in an Immunocompromised Host*, Nov. 11., 2020, NEW ENGLAND J. OF MEDICINE, <https://www.nejm.org/doi/full/10.1056/NEJMc2031364>.

<sup>58</sup> Though the official death count of the Great London Fire of 1666 was only six, some historians believe that thousands or even tens of thousands of poor Londoners may have perished. See NEIL HANSON, *THE DREADFUL JUDGMENT: THE TRUE STORY OF THE GREAT FIRE OF LONDON* 326-33 (2001). On the anniversary of the 1905 San Francisco earthquake, the city revised the death toll from 700 to close to 3500, most of whom were poor immigrants, including many residents of San Francisco’s Chinatown. Bobby C. Calvan, *San Francisco Revises Death Toll for 1906 Earthquake*, BOSTON.COM, Feb. 27, 2005, [http://archive.boston.com/news/nation/articles/2005/02/27/san\\_francisco\\_revises\\_death\\_toll\\_for\\_1906\\_earthquake/](http://archive.boston.com/news/nation/articles/2005/02/27/san_francisco_revises_death_toll_for_1906_earthquake/)

<sup>59</sup> See, e.g., KLINENBERG, *supra* note 22, at 29-31 (discussing how heat wave deaths among older adults and people with disabilities or chronic health conditions during heat waves are often undercounted or discounted because of controversies about how to decide whether deaths are attributable to the heat wave and an incorrect sense that “people who perished in the heat wave were already about to die”); The Covid Tracking Project, *The Pandemic’s Deadly Winter Surge is Rapidly Easing*, ATLANTIC, Feb. 11, 2021, <https://www.theatlantic.com/health/archive/2021/02/the-pandemics-deadly-winter-surge-is-rapidly-easing/618005/> (explaining how New York systematically undercounted the COVID-19 deaths of nursing home residents and was forced by a state audit to include 5,620 additional nursing home deaths to the state’s totals).

characteristics—has made contemporaneous modeling of vulnerability a real possibility. Moreover, whereas most disasters—earthquakes, wildfires, hurricanes—are sudden and short-lived, the official pandemic has already stretched on for close to a year (declared by the World Health Organization on March 11, 2020) and the outbreak was first reported much earlier, in December 2019. Because the pandemic is playing out over such an extended period of time and because so much data is being tracked and publicly reported, COVID-19 presents a unique opportunity to build and refine data tools that help us visualize and understand disaster vulnerability.

## 1. Constructing Our COVID-19 Vulnerability Index

Accordingly, our team of public health, statistics, and legal experts set out to create a tool decision-makers could use to better protect vulnerable communities. We created a county-level COVID-19 vulnerability index to facilitate COVID-19 resource allocation decisions and to allow evaluation of how well past decision-making has accommodated vulnerability. In developing this empirical vulnerability index for COVID-19, we follow in the footsteps of both public health and disaster scholars who have developed indices to quantify and represent vulnerability to other public health and disaster risks.<sup>60</sup>

To construct our vulnerability index, our team drew on a reservoir of publicly available data and employed statistical analysis and spatial analysis using Global Information System (GIS) to help us understand COVID-19's geographic vulnerability across the United States. We relied on three different types of county-level data from a wide range of publicly-available data sets to build our index. The first type of vulnerability data we incorporated into our index related to health of Americans: county-level rates of smoking;<sup>61</sup> obesity;<sup>62</sup> diabetes;<sup>63</sup> and deaths due to heart disease, which we include as a proxy measure for hypertension.<sup>64</sup> Second, we incorporated socioeconomic risk factors: the percent living below the poverty line;<sup>65</sup> uninsured;<sup>66</sup> those employed as essential workers, including in healthcare support, food service and preparation, and other occupations where social presence was necessary (including manufacturing and transportation);<sup>67</sup> and race.<sup>68</sup> Third, because age plays such an important role in determining

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<sup>60</sup> See, e.g., Cutter, et al., *supra* note 12 (developing an index of social vulnerability to environmental hazards);

<sup>61</sup> CENTERS FOR DISEASE CONTROL AND PREVENTION, NATIONAL CENTER FOR CHRONIC DISEASE PREVENTION AND HEALTH PROMOTION, DIVISION OF POPULATION HEALTH. BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (2016), available at [https://www.cdc.gov/brfss/annual\\_data/2016/files/LLCP2016ASC.zip](https://www.cdc.gov/brfss/annual_data/2016/files/LLCP2016ASC.zip).

<sup>62</sup> CENTERS FOR DISEASE CONTROL AND PREVENTION, DIVISION OF DIABETES TRANSLATION. US DIABETES SURVEILLANCE SYSTEM, available at <https://gis.cdc.gov/grasp/diabetes/diabetesatlas.html>.

<sup>63</sup> *Id.*

<sup>64</sup> CENTERS FOR DISEASE CONTROL AND PREVENTION, NATIONAL CENTER FOR HEALTH STATISTICS. INTERACTIVE ATLAS OF HEART DISEASE AND STROKE, 2016–2018 (2019), available at <https://nccd.cdc.gov/DHDSPAtlas/?state=County>.

<sup>65</sup> U.S. CENSUS BUREAU, AMERICAN COMMUNITY SURVEY. 2014–2018 AMERICAN COMMUNITY SURVEY 5-YEAR ESTIMATES (2018), available at [data.census.gov](https://data.census.gov).

<sup>66</sup> U.S. CENSUS BUREAU, SMALL AREAS ESTIMATES BRANCH. MODEL-BASED SAHIE ESTIMATES FOR COUNTIES AND STATES: 2018 (2019), available at <https://www.census.gov/data/datasets/time-series/demo/sahie/estimates-acs.html>.

<sup>67</sup> See U.S. CENSUS BUREAU, *supra* note 65.

<sup>68</sup> *Id.*

vulnerability to COVID-19, we used census data focused on age, specifically the percent of a county that is 65 or older.<sup>69</sup>

We then weighted each risk factor and aggregated them into a single “vulnerability index” to identify which counties are particularly vulnerable to a deadly COVID-19 outbreak given their underlying populations. We initially built the index in the summer of 2020, several months after the coronavirus had been declared a global pandemic, and used this early history as a guide for assigning weights to our risk factor variables. We used a multivariate regression to match up COVID-19 case counts and case-fatality rates across the country with the various risk factors for which we had data. Case counts and deaths between May 1, 2020, and November 3, 2020, were aggregated for each county.<sup>70</sup> We used a zero-inflated negative binomial regression of COVID-19 deaths with all the risk-factor subcategorization variables plus population density as explanatory variables and case counts as offset. From this we obtained the posterior predictive distribution for each county’s mortality rate from COVID-19. The COVID-19 Vulnerability Index was then obtained by dividing the counties into deciles of risk based on the posterior predicted mortality rates.

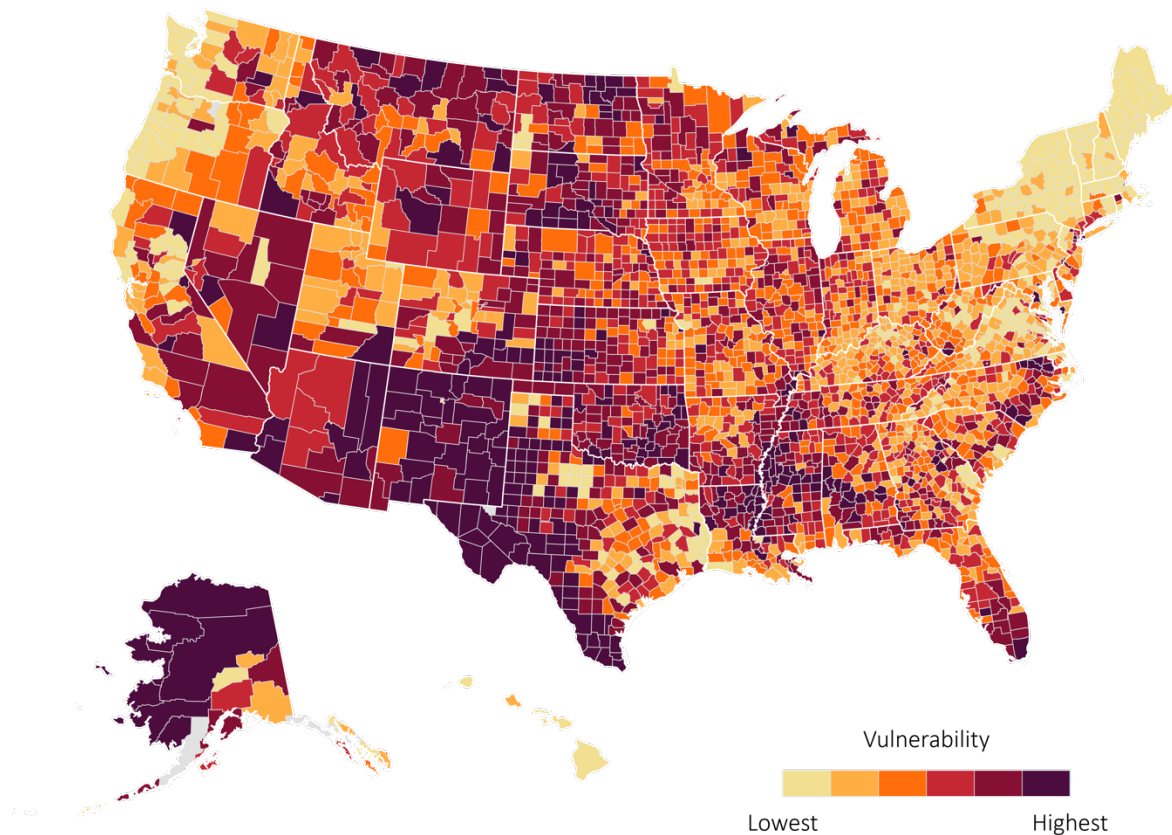
Figure 1 provides a data visualization of the results created by our county-level COVID-19 Vulnerability Index for the United States. The model provides variables for all 3,142 U.S. counties and for the 308 counties in the highest decile of the vulnerability index. Counties with high vulnerability have, on average, more residents of minority race (53% versus 23.5%), more residents who are uninsured (15.6% versus 10%), higher death rates due to heart disease (48.9 per 1000 versus 34.3 per 1000), and greater population densities (694 people per square mile versus 267.54).<sup>71</sup>

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<sup>69</sup> U.S. CENSUS BUREAU, POPULATION DIVISION. ANNUAL COUNTY RESIDENT POPULATION ESTIMATES BY AGE, SEX, RACE, AND HISPANIC ORIGIN, APRIL 1, 2010 TO JULY 1, 2019 (2019) available at <https://www2.census.gov/programs-surveys/popest/datasets/2010-2019/counties/asrh/cc-est2019-alldata.csv>.

<sup>70</sup> Coronavirus (Covid-19) Data in the United States, N.Y. TIMES (2021), <https://raw.githubusercontent.com/nytimes/covid-19-data/master/us-counties.csv>.

<sup>71</sup> A more detailed summary data of our model’s output can be found in Appendix Table 1.



*Figure 1: County-level Output of the COVID-19 Vulnerability Index.*

Originally, we considered the index as a useful contrast to the way COVID-19 risk is often quantified and portrayed: raw case counts. Whereas the vulnerability index illustrates latent vulnerability of areas if they were to face a serious outbreak of COVID-19, the case-count mapping highlights the prevalence of the outbreak in different areas, which is a high-level way to think about exposure vulnerability of a particular area. The primary advantage of our index as opposed to case counts is that latent vulnerability is unlikely to change significantly over the course of the pandemic, whereas case counts change a lot as COVID-19 hotspots come and go from one place to another over time. Thus, the vulnerability index provides valuable information for long-term planning, while current case count data may be a very poor predictor of risk over even quite short time horizons.

To illustrate how knowledge of geographic vulnerability can assist decision-makers, we now present two applications of our vulnerability index, the first focusing on 2020 voter accommodations designed to minimize COVID-19 risks and the second focused on mask mandates.

Because these examples are just two of many ways that our COVID-19 Vulnerability Index could be deployed to improve pandemic decision-making—and to assess policy choices after-the-fact, we created an online dashboard to make these data available and easily accessible to

policymakers and other researchers. The dashboard allows the user to visualize a detailed breakdown of the sorts of vulnerabilities counties face across the country. It allows users to create different maps focused on different types of vulnerability. The dashboard can be found online at <https://arcg.is/0rXrvG>.

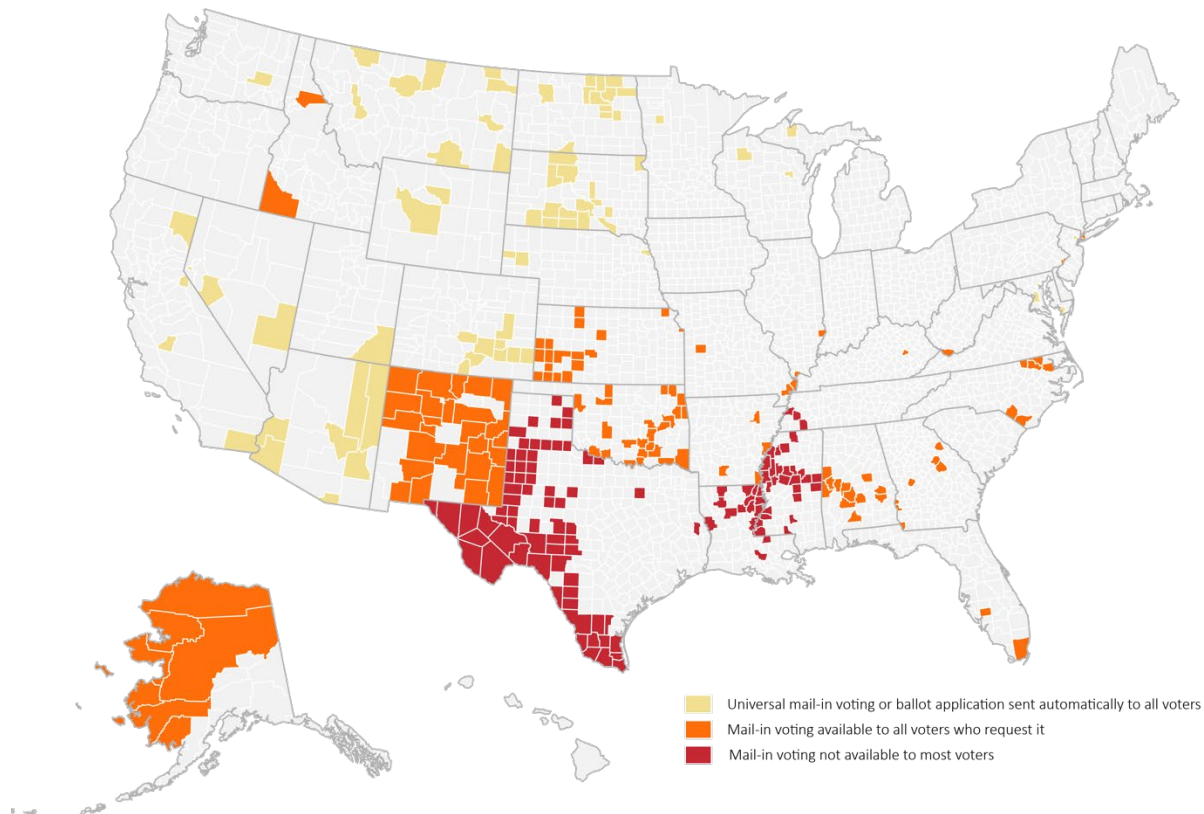
## 2. Applying Our Vulnerability Risk Index to Voter Accommodations

As the pandemic spread to the United States, the country was in the middle of a presidential primary season. States made a wide range of decisions during the primary season about how to accommodate (or not) concerns about keeping voters safe from COVID-19 while voting. As the primary season came to a close, it became apparent that the November presidential election would still face risks due to COVID-19.

Just as not every voter would face the same risk from the pandemic, neither would each location. To evaluate how voting risk varied across jurisdictions, we overlaid our vulnerability data with voting rules for counties in the top decile of COVID-19 vulnerability. We divided county-voting rules into three categories: the most accommodating (counties with universal mail-in voting or counties that provided for mail-in voting for every voter and also mailed ballot applications to every voter); the middle group (counties where mail-in-ballots were available to any voter who requested one but that failed to send applications to every voter); and the least accommodating (counties where mail-in balloting was unavailable to most voters because fear of contracting COVID-19 did not count as a valid excuse).

When we compared our county COVID-19 Vulnerability Index to state voting rules, we found that many of the most vulnerable people in the most vulnerable communities would have to choose between risking their health to vote in-person or not voting at all.

The map below, in Figure 2, shows voting rules in counties that ranked in the top 10% of vulnerable counties based on our data. Yellow counties have the safest rules, orange the next-safest and red the least safe.



*Figure 2. Mail-in Ballot Access for the 2020 General Election among Those Counties Most Vulnerable to the Risks Posed by COVID-19.*

Combining the COVID-19 Vulnerability Index with the voting rules demonstrates that the overwhelming majority of the most at-risk counties are in states where in-person voting is the default (or only) option for most voters.<sup>72</sup> Forty percent of the highest-risk counties are in states where voting rules allow any voter to request an absentee ballot, either for no reason or based on COVID-19 fears, but where vulnerable voters also had to take the initiative and navigate complex systems to request and submit absentee ballots. Disaster experience has shown time and time again that when vulnerable people are required to clear hurdles to access relief, many are simply unable to do so.

Even more concerning, however, was that one hundred-and-thirteen (or thirty-seven percent) of our most vulnerable counties were in the handful of states that did very little to expand access to mail-in ballots. Nearly five and a half million people in Texas, Louisiana, Mississippi and Tennessee were forced either to risk their health to vote in-person or to relinquish their right to vote.

<sup>72</sup> For a fuller analysis, see results summarized in Appendix Table 2.

Only twenty-four percent of the most at-risk counties were in the twenty-five states that took major steps to ensure all voters could vote safely, either by adopting universal mail-in-voting or by mailing every voter an absentee-ballot application.

Earlier attention to these patterns of vulnerability might have persuaded some particularly vulnerable jurisdictions to make additional accommodations for vulnerable voters before the November 2020 election. Even once it was too late to make major changes in voting laws, policymakers and public health officials could still have used this kind of data to target the most vulnerable areas for additional resources to mitigate in-person voting risk. For example, election officials could have triaged extra poll workers, personal protection equipment, and plexiglass to polling places in the most vulnerable areas. Polling places could have expanded their physical space (by, for example, using individual offices in addition to multi-purpose rooms in public buildings) and worked to improve compliance with CDC guidance about ventilation, line management, and disinfection. Jurisdictions with high levels of vulnerability could also have mandated that poll workers wear masks and provided masks for voters themselves.<sup>73</sup>

### 3. Applying Our Vulnerability Index to Mask Mandates

Our vulnerability index could also potentially be used to help states decide where and when to mandate public health measures like mask-wearing, closing certain businesses, and limiting gatherings. For illustrative purposes we consider here how our vulnerability data might inform decisions about state and county mask mandates.

Because masks are such a low-cost and effective public health measure,<sup>74</sup> our view is that every county in the U.S. should have a mask mandate. However, because mask-wearing has become so politicized, many state governments have declined to issue state-wide mask mandates<sup>75</sup> and, if they are imposing mandates at all, base the timing, length, and geographic coverage of those mandates primarily on current (and recent) COVID-19 case counts.<sup>76</sup>

While case-counts might seem like a straightforward, neutral metric for assessing which areas in a state most need mask mandates at any given time, when analyzed through a vulnerability lens, this metric misses something important. Case counts may reflect some of an area's vulnerability because communities with high vulnerability may have high case counts, although cases may well be undercounted in poor, minority areas because of disparities in access to testing.<sup>77</sup> In any event, case counts cannot fully capture a community's vulnerability because they say nothing about how serious those cases are or how likely they are to result in fatalities. Also, case counts are often tallied with a time lag of at least a few days. Thus, it is hard to be anything but reactive from a policy standpoint when focusing on case counts alone. SARS-CoV-2 has an incubation period of 2-4 days. Consequently, using case counts as the primary metric for action

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<sup>73</sup> Stanford-MIT Healthy Elections Project, *Mask Rules for In-Person Voting*, Oct. 25, 2020, available at [https://healthyelections.org/sites/default/files/2020-10/Mask\\_Rules.pdf](https://healthyelections.org/sites/default/files/2020-10/Mask_Rules.pdf).

<sup>74</sup> See Benjamin W. Abbott et al., *Making Sense of the Research on COVID-19 and Masks*, <https://pws.byu.edu/covid-19-and-masks> (reporting meta-study of 112 papers and concluding that masks could be one of the most powerful and cost-effective tools to stop COVID-19 and accelerate the economic recovery”).

<sup>75</sup> See Casey Tolan, *States Grapple with Mask Rules at Polls to Avoid Dangers of Both Superspreaders and Standoffs*, CNN, Oct 22, 2020.

<sup>76</sup> Kaia Hubbard, *These States Have COVID-19 Mask Mandates*, USNEWS.COM, Feb. 12, 2021, <https://www.usnews.com/news/best-states/articles/these-are-the-states-with-mask-mandates> (noting many states that have never imposed a statewide mask mandate, including Tennessee, Florida, and Georgia).

<sup>77</sup> See discussion accompanying note 49, *supra*. Case counts also depend on a wide variety of other factors.

can reduce the real-world effectiveness of public health policy such as mask mandates both because the spread of disease is increasing too rapidly and because it is confusing to the public when policies are enacted and retracted based on real-time reactions to case counts.

Yet many states have relied, at some point in the pandemic, on county case-counts to determine which counties should be subject to mask mandates. Some states without state-wide mask mandates require masks in high-transmission counties (as measured, primarily, by case counts),<sup>78</sup> while others with state-wide mandates have opt-out procedures for counties with low case counts.<sup>79</sup> State policymakers have also cited declining case counts as a reason for phasing out state-wide mask mandates.<sup>80</sup>

To demonstrate how vulnerability data could inform mask-mandate decisions, we overlaid our COVID-19 Vulnerability Index with data from a publicly available county-level mask mandate database,<sup>81</sup> which tracks the date each county first adopted a mask-mandate through August 5, 2020.<sup>82</sup> We grouped the counties into four groups: early mask adopters (counties that imposed mask mandates between March 1 and April 30th, 2020), spring/summer adopters, (counties that imposed mask mandates between May 1 and June 30, 2020) late adopters (counties with mask mandates between July 1st and August 5th, 2020) and very late or non-adopters (counties without a mask mandate as of August 5th, 2020)). This map is displayed below as Figure 3.

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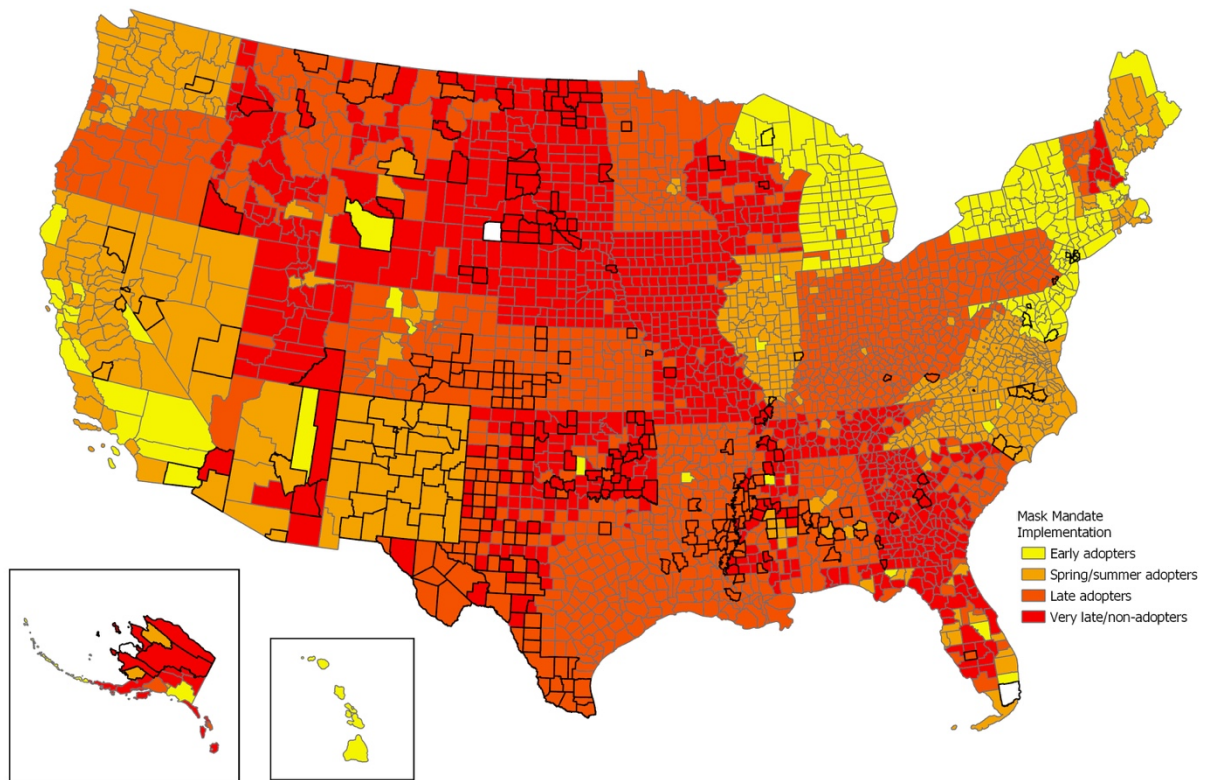
<sup>78</sup> Prior to adopting a state-wide mask mandate in November 2020, Utah categorized counties into high, medium, and low transmission counties, with masks mandated only in high-transmission counties. *See, e.g.,* Larry D. Curtis, *Utah's New High, Moderate, Low Transmission Index and Masks: What Does It Mean?*, KUTV, Oct. 13, 2020, available at <https://kutv.com/news/coronavirus/utahs-new-high-moderate-low-transmission-index-what-does-it-mean>. The categorization was based on three criteria: 7-day average of percent positivity in testing, 14-day case rate per 100,000 people, and the level of statewide ICU utilization—none of which account for county-level vulnerability to high case fatality rates. *See id.* In Mississippi, Republican Governor Reeves “first resisted imposing a statewide mask mandate, focusing instead on individual counties with high cases, until cases were spiking throughout the state in early August.” Leah Willingham, *After Mandate Repeal, Masks Required Again in Nine Counties*, US NEWS, Oct. 19, 2020, <https://www.usnews.com/news/best-states/mississippi/articles/2020-10-19/after-mandate-repeal-masks-required-again-in-nine-counties>. Reeves imposed a statewide mask mandate on August 4, which he ended on Sept. 30. *See id.* In mid-October, Reeves began reinstating mask mandates in counties with higher case counts. *See id.*

<sup>79</sup> Texas allows counties with fewer than 30 new COVID-19 cases during the prior 14 days to opt-out of the state-wide mask requirement. *See* Texas Executive Order GA-29, available at <https://tdem.texas.gov/ga29/>. As of January 26, 2021, nineteen Texas counties were exempt from the state’s mask mandate. *See id.* For a time, Montana exempted counties with three or fewer active COVID-19 cases from its mask mandate. *See* Letter, Gov. Steve Bullock, July 15, 2020, <https://dphhs.mt.gov/Portals/85/Documents/NewsLetters/MaskDirective.pdf>.

<sup>80</sup> North Dakota Governor Doug Burgum, for example, cited declining case counts (and hospitalizations) when he let that state’s mask mandate expire on January 18, 2021. *See* News Release, *Burgum Urges Vigilance to Keep COVID-19 Numbers Trending Downward as Statewide Mask Requirement Expires Monday*, Jan. 15, 2021, <https://www.governor.nd.gov/news/burgum-urges-vigilance-keep-covid-19-numbers-trending-downward-statewide-mask-requirement>.

<sup>81</sup> The database is available at <https://www.austinlwright.com/covid-research>.

<sup>82</sup> This application of our vulnerability index is imperfect for a number of reasons. The Wright et al mask-mandate database is incomplete because it only charts the date each county first adopted a mask mandate and only through August 5, 2020. Additionally, the mask database includes only county level data, which may be misleading because some cities, including big cities that cover most of a county, may have mask mandates that are not reflected in the data. *See* Austin L. Wright et al., *Tracking Mask Mandates During the COVID-19 Pandemic*, Working Paper, Aug. 4, 2020, at 2, available at [https://bfi.uchicago.edu/wp-content/uploads/BFI\\_WP\\_2020104.pdf](https://bfi.uchicago.edu/wp-content/uploads/BFI_WP_2020104.pdf) (acknowledging that the lack of local mandate data can skew analysis). Nonetheless, overlaying our vulnerability data with the mask-mandate data illustrates how similar data sets might have been used to determine where and when mask mandates were most needed.



**Figure 3:** The map above shows the timing of mask mandate implementation in counties across the US in 2020. Counties outlined in black ranked among the highest vulnerability decile.

While mask mandates are only one type of prevention for COVID-19, their uneven implementation demonstrates how many counties that were highly vulnerable to high fatality rates were left without the protection that a community-level mask mandate could provide. Our most striking finding is that, of the most vulnerable counties in the country, nearly half (forty-seven percent) were very late or non-adopters, meaning that they had no mask mandate in place before August 5, 2020.<sup>83</sup> Another thirty-six percent of our most vulnerable counties were late adopters. Thus, fully eighty-three percent of the most vulnerable counties had no mask mandate in place by July 1, 2020.<sup>84</sup>

As the voting and mask-mandate examples demonstrate, a data-driven approach to the geography of risk can help policymakers make choices that better account for the vulnerability of individuals and communities and thus develop more just and effective disaster law and policy. Similar approaches could shed important light on a number of other pressing COVID-19 policy issues, including school reopening and vaccination prioritization. These kind of geographic

<sup>83</sup> See Appendix Table 3 (showing the proportion of each vulnerability decile that were early adopters, spring/summer adopters, late adopters or very late/non-adopters).

<sup>84</sup> For a fuller analysis, see results summarized in Appendix Table 4.

vulnerability analyses are critical both because vulnerability is tied to place and geography and because many of these services and resources are likewise tied to geography: with the exception of charter and magnet schools, public schools usually serve identifiable neighborhoods whose vulnerability can be mapped and understood; vaccination clinics, while serving a less geographically bounded population, will be more or less accessible to different populations depending on where they are located and, while people obviously move between geographic areas to work and live, vaccination rates within particularly geographic areas will likely affect COVID's spread in those areas, particularly in neighborhoods where social distancing is complicated by crowded (or intergenerational housing) and reliance on public transit.

#### 4. Acknowledging Limitations of our Data-Driven Approach

Examining vulnerability in this more systematic and empirical way also highlights some of the limits and complexities inherent in vulnerability policy in general, and data-driven vulnerability analysis, in particular. These challenges include: deciding who “counts” as vulnerable and how much their vulnerability “counts,” determining the appropriate spatial unit for data analysis (data granularity), dealing with missing data, and grappling with uncertainty.

##### a. Deciding Who “Counts” as Vulnerable and How Much Their Vulnerability “Counts”

One of the primary tasks when developing a data-driven vulnerability tool like a vulnerability index is deciding who “counts” as vulnerable and, relatedly, how much weight to give the different factors that make people vulnerable. In developing our index, we accounted for four primary drivers of vulnerability: age, race, underlying health risk, and socioeconomic factors. We did not include other potential drivers of vulnerability (including undocumented status and disabilities not captured by the health data) because consistent, reliable county-by-county data is lacking. Within each of these drivers, we had to decide which specific data to use to construct our model. For example, when deciding which high-risk health conditions to include, we looked at CDC-data about which conditions increased risk, but our decision were also informed by concerns about endogeneity and collinearity (i.e., when multiple factors capture the same underlying condition) and by the availability of reliable, county-level data about that condition for every U.S. county (or as close to that as possible). While we settled on rates of smoking, obesity, heart disease, and chronic obstructive pulmonary disease, a different tool, developed at a different time for a different area, might make other choices based on the changing state of knowledge about health risks, how prevalent (and correlated) certain conditions are in the study area, and what data is widely, publicly, and consistently available at the preferred level of analysis (such as voting precinct, zip code, county). The same is true for our selection of other risk factors, including socioeconomic risk factors, race, and age.

Equally important are decisions about how to weigh these factors in an index that accounts for many different types of risk, but that are nonetheless correlated in various ways. As described above, we weighted the factors in our analysis by modeling how much each factor contributed to observed mortality rates to date.

##### b. Determining Data Granularity

A related issue for geographic vulnerability indices is deciding on the data granularity—here, which geographic unit to use: neighborhood, voting precinct, zip code, county, or some other level for which data is available. Our COVID-19 vulnerability index is a county-level index because much of the relevant health data (rates of smoking, obesity, diabetes, heart disease and chronic obstructive pulmonary disease) is not consistently available for smaller geographic units nationwide<sup>85</sup> and because most of the public health measures we initially considered (such as mail-in-voting rules and mask mandates) were being implemented on a county- or even state-wide basis. County-level data could be problematic for some purposes, however, because it averages out vulnerability over potentially large areas, rendering invisible pockets of vulnerability within more privileged areas. Thus, the choice about geographic level of analysis is a choice about whose vulnerability to see and whose vulnerability goes overlooked. Finer-grained data would be required for more localized resource targeting, such as deciding where to locate testing and vaccination centers (or polling places) during the pandemic, planning transportation for evacuations, and siting cooling centers during heat waves.

c. Dealing with Unavailable Data and Other Data Limitations

As the prior sections suggest, the availability of data affects which factors can be included in a vulnerability index. Other than for major cities, data about the prevalence of many health conditions is not available for jurisdictions below the county-level. This is particularly true of data about less common conditions because of potential privacy concerns. Even for the factors we relied on, some data were not available at the county level for a handful of rural counties where the population is small enough to allow potential identification of particular individuals. Accordingly, we had to use some state-level data to impute average rates of chronic health conditions in some rural counties, primarily in Alaska. There were also some socioeconomic factors, such as whether there was adequate access to a major hospital, that we ultimately excluded because we felt that county-level data didn't really capture the full picture of relevant healthcare shortages. In short, there are well-known limitations inherent in using health data at the county level to ascertain vulnerability. If local health departments have access to more detailed data (preferably neighborhood-level data as defined by census tracts), then they should make use of more refined information to estimate vulnerability, while still carefully maintaining and protecting privacy of individuals.

Additionally, available data always lags current conditions and some sources of data are not updated frequently. Fortunately, data about COVID-19 cases and mortality rates are easily accessible in real-time and continuously updated in our model, but other health data is not. Because vulnerability is best understood as dynamic, rather than static,<sup>86</sup> fixed health data are a limiting factor in our model. Additionally, static data can't fully capture many aspects of vulnerability; for example, "point-in-time indicators such as census data cannot capture the extent to which undocumented workers in the United States and even legal immigrants [were] made more vulnerable as a result of the 2016 presidential election."<sup>87</sup>

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<sup>85</sup> See discussion in Part II.C.4.c, *infra*.

<sup>86</sup> TIERNEY, *supra* note 4, at 75 ("arguing that "for theoretical purposes vulnerability is more appropriately conceptualized as a *process* in which different groups are affected by changes in the broader political and economic environment that either reduce or increase their propensity for loss" rather than "as a *state*").

<sup>87</sup> See *id.* at 75.

Other aspects of a community's vulnerability—or resilience—can also be difficult to capture in a vulnerability index. The story of the vulnerability of racial minorities and the poor to disaster's impacts is complicated by evidence that, in some disasters, neighborhoods with very similar demographics that suggest very high levels of risk fare very differently during and after disasters. For example, during the deadly 1995 Chicago heat wave, “eight of the ten community areas with the highest death rates were virtually all African American, with pockets of concentrated poverty”—neighborhoods where “old people were at risk of hunkering down at home and dying alone” from the heat,<sup>88</sup> a tragedy that conforms to research expectations. But, at the same time, “[t]hree of the ten neighborhoods with the *lowest* heat-wave death rates” had similar characteristics.<sup>89</sup>

Some researchers have suggested that the neighborhoods that do better during disasters tend to have higher “social capital,”<sup>90</sup> particularly “bonding social capital” that brings neighbors together to check on each other, help each other, and advocate for each other. Others have captured similar concepts in different terminology, explaining that the differences are the result of the neighborhood's “social ecology,”<sup>91</sup> its “social cohesion” and “‘social infrastructure’: the sidewalks, stores, public facilities, and community organizations that bring people into contact with friends and neighbors.”<sup>92</sup> In neighborhoods with high bonding social capital or social cohesion, residents “participate[] in block clubs and church groups,”; they “kn[o]w their neighbors.”<sup>93</sup> During heat waves, that means that “they know who in their community is most at-risk (elderly people with preexisting conditions who live alone),” and they do “wellness checks and encourage neighbors to knock on each other's doors—not because the heat [is] so exceptional, but because that's what they always do when the weather is extreme” or other challenges arise.<sup>94</sup> In a pandemic, that means that neighbors grocery shop so those at higher-risk can stay home, know about and help care for those who are ill, and help at-risk residents navigate often-complicated systems for voting, COVID-19, testing and vaccination sign-ups.

Because our index (like other similar tools) does not reflect varying levels of social capital and cohesion across neighborhoods, it may over- or under-state some communities' vulnerability. Subsequent index iterations could attempt to more fully account for this factor by identifying potential proxies for social capital (such as voter turnout), but there will always be important aspects of vulnerability that data cannot fully capture. We explore some of these other aspects in Parts III and IV below.

#### d. Grappling with Uncertainty

Each of the data and modeling decisions described above, while informed by sound methodology and data limitations, is nonetheless a choice that can alter the vulnerability analysis in important ways. Transparency around these decisions is critical for properly interpreting our results. While these issues may seem technical, they are important because complex models, with

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<sup>88</sup> KLINENBERG, *supra* note 22, at xxiii.

<sup>89</sup> *Id.*

<sup>90</sup> DANIEL P. ALDRICH, BUILDING RESILIENCE: SOCIAL CAPITAL IN POST-DISASTER RECOVERY 15, 31 (2012).

<sup>91</sup> KLINENBERG, *supra* note 22, at 34.

<sup>92</sup> *Id.* at xxiv; *but see id.* at 230 (arguing that a focus on social capital tends to obscure that, contrary to much folk wisdom, poverty and duress, including physical injury and illness, tend to strain rather than sustain social bonds”).

<sup>93</sup> *Id.*

<sup>94</sup> *Id.*

their sheen of neutrality and even inevitability, may obscure or disguise critical value and policy-laden choices between different vulnerable populations and individuals.<sup>95</sup>

Beyond these other difficulties, there are fundamental uncertainties that make any vulnerability index contingent and incomplete. When we began creating the model, there was ongoing debate, for example, about which health conditions most predispose people to poor COVID-19 outcomes. These and other uncertainties made selection of factors for inclusion all the more difficult.

And, of course, even the best data and modeling alone can't provide answers to the difficult moral and ethical questions that arise when a proposed disaster response measure may ameliorate one aspect of a community's vulnerability but exacerbate other aspects of their vulnerability, when the needs of different vulnerable groups conflict, or when there is competition between different vulnerable populations or individuals for scarce resources. These dilemmas are explored more fully in the next Part.

### III. SECOND DIMENSION: COMPETING OR CONFLICTING VULNERABILITY

Competing or conflicting vulnerabilities are inherent in every disaster situation. These tensions require us to think more holistically and carefully about trade-offs between different aspects of a particular group's vulnerability, as well as trade-offs between different vulnerable groups. In this Part, we explore these conflicts through various examples, with a particular focus on COVID-19 issues where these conflicts are particularly acute: school-reopening (for within-group conflicts) and vaccine prioritization (for between-group conflicts).

#### A. *Managing Trade-offs Between Different Aspects of Vulnerability*

Geographical mapping might be very useful in highlighting where vulnerable groups are and where to triage resources, but because those who are vulnerable to a particular disaster risk may be socially vulnerable to other risks as well, using tools like our vulnerability index can often highlight where help is needed but may still leave decision-makers uncertain how to manage competing risks, or worse yet blind to competing risks.

Indeed, due to competing risks, well intended efforts to prioritize care for vulnerable people before, during, and after disasters can nonetheless cause them harm, particularly when those efforts fail to take account of the full range of vulnerabilities facing a group. One example of this phenomenon occurred after the devastating 1995 earthquake in Kobe, Japan, when the government prioritized moving elderly and disabled survivors into temporary housing first, often separating them from their families, former neighbors, and communities.<sup>96</sup> Isolated in massive "Soviet-style public housing blocks," where it was difficult to establish new social ties, many of these survivors suffered from loneliness and at least 120 experienced what the Japanese call "*kodoku shi*" or "lonely deaths,"<sup>97</sup> when no one discovered their deaths for quite some time.<sup>98</sup> While some of these deaths may have been inevitable, others may have been prevented if these vulnerable individuals

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<sup>95</sup> Cf. Frank Ackerman & Lisa Heinzerling, *Pricing the Priceless: Cost-Benefit Analysis of Environmental Protection*, 150 U. PA. L. REV. 1553 (2002) (leveling a similar critique at the apparent "objectivity" of cost-benefit analysis).

<sup>96</sup> ALDRICH, *supra* note 90, at 89.

<sup>97</sup> *Id.*

<sup>98</sup> *Id.* at 156.

had been housed “near friends, acquaintances, or old neighbors” where they would “have felt connected to the broader community,” “would have had relatives to check on them and something [more] to live for.”<sup>99</sup> The focus on the immediate housing needs of these individuals was admirable, but failed to consider how disrupting social connections and isolating older people from their families and friends might undermine their resilience in other ways.

Strict policing of post-disaster areas to decrease vulnerability to looting, including enforcement of stringent curfews, may advance law-enforcement goals, but may also disrupt social capital in ways that undercut the community’s capacity to recover<sup>100</sup> by preventing neighbors from coming together to support and help one another post-disaster.<sup>101</sup> The same might be true of some COVID-19 lockdown strategies; completely shutting down churches, schools, and community centers might disrupt social networks and informal connections in ways that undermine the community’s resilience and ability to come together to act for the common good.

In some situations of in-group competing vulnerabilities, vulnerable groups are harmed because some aspect of their vulnerability wasn’t fully considered and that harm could have been addressed or mitigated, if properly accounted for. That might well have been the case in the Japanese-earthquake housing, as the risk of loneliness among people prioritized for housing could have been mitigated, at least in part, by resettling former neighbors in close proximity. prioritizing housing for family members of the vulnerable individuals, or by designing housing that facilitated interaction and building of new social connections.

In other cases, the conflict between different aspects of vulnerability is acute, profound, and—sometimes—seemingly insoluble. Although there are many COVID-19 response issues that may involve this kind of challenge, the question of school closures and reopenings brings this issue into sharp focus. While conflicts between various vulnerable groups (such as teachers and students) are certainly possible (and addressed in Part III.B below), the most difficult trade-offs are between different facets of vulnerability for one group: those students who are particularly vulnerable to COVID-19 illness (or at high risk of transmitting the virus to particularly vulnerable family members) and who are simultaneously particularly vulnerable to poor educational (and other) outcomes from remote learning.<sup>102</sup>

Unfortunately (and unsurprisingly), this intersection is large: many of the same students who are particularly vulnerable to illness (or transmitting illness) if they attend in-person school, are also particularly vulnerable to poor educational outcomes,<sup>103</sup> reduced access to nutritious food and other important school services,<sup>104</sup> and mental health challenges<sup>105</sup> if they attend school primarily or solely online. Preliminary data suggests that the pandemic has, indeed, disproportionately impacted vulnerable students’ learning.<sup>106</sup>

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<sup>99</sup> *Id.*

<sup>100</sup> *Id.* at 15 (arguing that social capital is the most important driver of effective community disaster recovery).

<sup>101</sup> See Lisa Grow Sun, *Disaster Mythology and the Law*, 96 CORNELL L. REV. 1131, 1189 (2011).

<sup>102</sup> We recognize, of course, that students are not a monolithic group and that their vulnerability varies widely across space and circumstances.

<sup>103</sup> See, e.g., Michelle Burris, *When Closing Schools During COVID-19, Always Remember the Marginalized*, March 26, 2020, <https://tcf.org/content/commentary/closing-schools-covid-19-always-remember-marginalized/?agreed=1>.

<sup>104</sup> See *id.* These services also include after-school programs that supervise students while parents are at work.

<sup>105</sup> See, e.g., Abby Quirk, *Mental Health Support for Students of Color During and After the Coronavirus Pandemic*, July 28, 2020, <https://www.americanprogress.org/issues/education-k-12/news/2020/07/28/488044/mental-health-support-students-color-coronavirus-pandemic/> (describing the way that pandemic school closures have cut off the primary source of mental health support for many BIPOC youth).

<sup>106</sup> See, e.g., Emma Dorn et al., *COVID-19 and Learning Loss—Disparities Grow and Students Need Help*,

Decisions about whether schools should provide instruction in-person, entirely online, or in some hybrid format thus require nuanced consideration of the multi-faceted vulnerability of the impacted communities. This weighing of different vulnerability risks, particularly early in the pandemic, has been all the more complicated because of significant uncertainty about whether and how schools could reopen safely, how best to structure online learning (or hybrid options), and how best to compensate for gaps in access and help students who are being left behind.

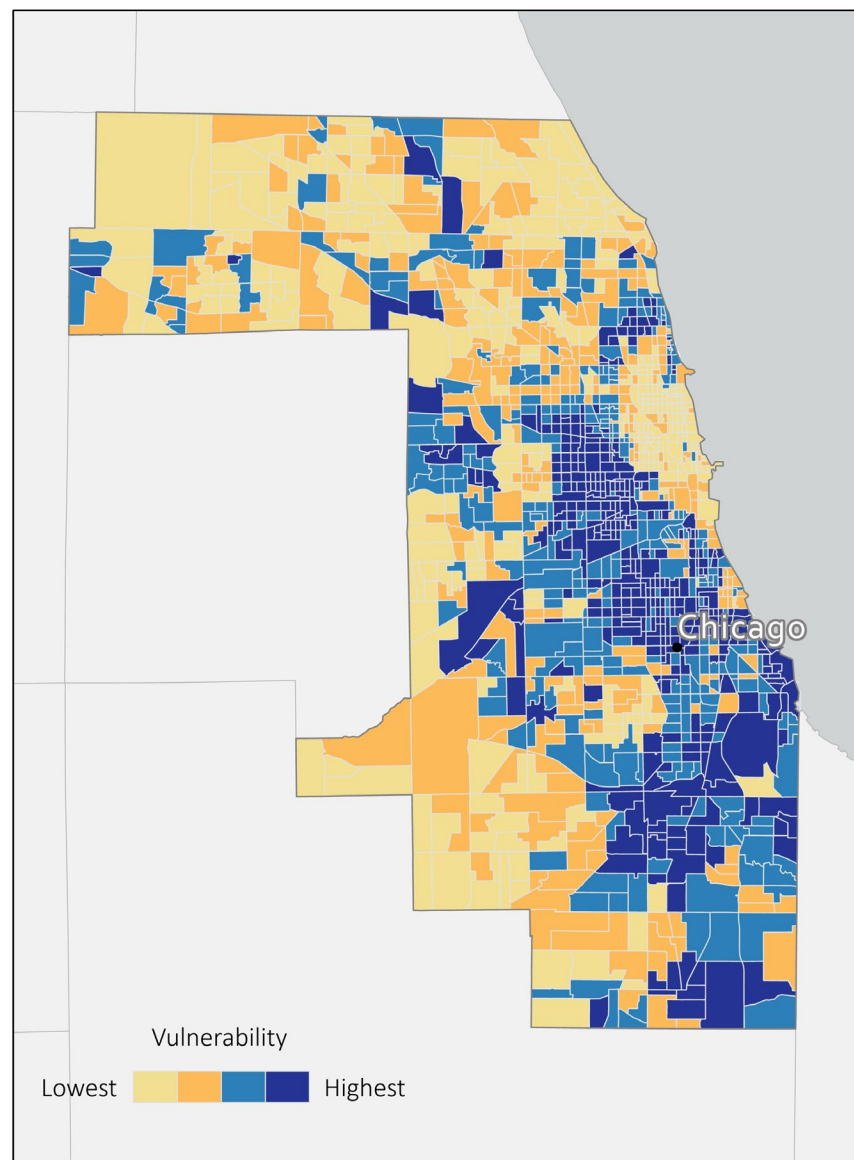
Obviously, vulnerability data and modeling cannot solve most of the difficult questions that arise in this kind of disaster scenario—when the range of possible answers all seem unsatisfactory. While modeling the spatial components of vulnerability can give insight into where to focus resources (such as PPE for schools, additional computers, free internet access, childcare programs for working parents, and mental health services) to help vulnerable populations, looking at a map does not answer a critical question: what risks are worth bearing for a community that is vulnerable both to COVID-19 and also to other significant risks (such as widening educational disparities or increasing food security for those receiving free or reduced-cost meals).

As an illustration of the problem, consider the decisions that faced the chief executive officer of the Chicago Public Schools during the pandemic. She had to decide whether to open any of the nearly six hundred-and-fifty schools in the district, and if so, which ones.

Since our COVID Vulnerability Index is only available at the county level and since Chicago Public Schools fall within Cook County, it does not provide much insight (if any at all) about the relevant geographical dimensions of vulnerability. However, the Centers for Disease Control has created a social vulnerability index (SVI) at the census block level, which provides a decent proxy for COVID-risk to school-age children. Cook County is shown in Figure 4 below.

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MCKINSEY.COM, Dec. 8, 2020, <https://www.mckinsey.com/industries/public-and-social-sector/our-insights/covid-19-and-learning-loss-disparities-grow-and-students-need-help#> (finding, for example, that by Fall 2020 “students of color may have lost three to five months of learning in mathematics, while white students lost just one to three months”).



*Figure 4. The Centers for Disease Control's Social Vulnerability Index at the Census-block Level for Cook County.*

One strategy would be to open up schools in waves over the fall and winter. If the CEO focused on COVID-19 risk, she might look at the schools in vulnerable areas and decide that, due to COVID-19 risk, schools there should not open. On the other hand, she might note that keeping schools closed would also disproportionately burden more vulnerable areas, where parents struggle financially and may struggle with childcare and homeschooling, where students might not have reliable access to the internet or adequate technology, and where the risk of falling behind is likely to be largest. Based on this latter view of vulnerability, the CEO might decide to prioritize opening up schools in the most vulnerable areas as quickly as possible. Because the same communities and

students are vulnerable to both COVID-19 and other risks, understanding geographic patterns of vulnerability doesn't provide the CEO much guidance.

Ultimately, the Chicago Public Schools opted to keep all schools closed until the third-quarter of the year, when it will open all schools to in-person instruction.<sup>107</sup> To the surprise of many researchers,<sup>108</sup> similar patterns have been observed nation-wide among school districts that serve large populations of vulnerable students. Researchers have noted that “race and poverty seem to map onto district reopening plans”: schools “that serve larger proportions of students who are nonwhite and living in higher degrees of poverty seem more likely to open remotely.”<sup>109</sup> Additionally, researchers tracking in-person visits to schools found that “school closures from September to December 2020 [were] more common in schools with . . . higher shares of students who are racial/ethnic minorities, who experience homelessness, are of limited English proficiency, and are eligible for free/reduced price school lunch.”<sup>110</sup>

The reasons for these patterns are complex, but parent preferences may have played an important role.<sup>111</sup> There is good evidence that, perhaps because of their vulnerability, BIPOC parents are making different risk judgments than white parents about schooling during the pandemic. Although BIPOC students are at disproportionate risk of poor outcomes from remote learning, BIPOC parents are less likely to support school reopenings and to choose to send their own children to school than white parents.<sup>112</sup> The same is also true of lower-income parents, despite challenges posed by jobs that cannot be performed at home and limited childcare options.<sup>113</sup>

Data from a survey we fielded through Qualtrics (responses collected between September 23, 2020 and October 2, 2020) confirmed these trends.<sup>114</sup> When asked if reopening K-12 schools is a risk worth taking, 67% of white and 62% of Asian respondents said yes, while the proportion of Black, Hispanic, and other/more than one race respondents who felt reopening schools was worth the risks it poses was far lower (49%, 46%, 44% respectively). Higher-income respondents

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<sup>107</sup> See Jesse Kirsch, *CPS Reopening*, ABC7CHICAGO, Feb. 11, 2021, <https://abc7chicago.com/chicago-public-schools-cps-update-reopening-plan-s-cluster-programs/10329629/> (describing how the February reopening will be staggered by grade-level).

<sup>108</sup> See, e.g., David T. Marshall & Martha Bradley-Dorsey, *Reopening America's Schools: A Descriptive Look at How States and Large School Districts are Navigating Fall 2020*, 14 J. SCHOOL CHOICE 534, 542, 544 (2020), <https://doi.org/10.1080/15582159.2020.1822731>

<sup>109</sup> *Id.* at 542. While the trends weren't statistically significant, “[d]istricts with larger nonwhite student populations and the poorest 25% of districts . . . were more likely to start the 2020-21 school year with remote instruction.” *Id.* at 540.

<sup>110</sup> Zachary Parolin & Emma K. Lee, *Large Socio-Economic, Geographic, and Demographic Disparities Exist in Exposure to School Closures*, NATURE HUM. BEHAV. (2020), <https://osf.io/cr6gq/>.

<sup>111</sup> Marshall & Bradley Dorsey, *supra* note 108, at 544 (noting a number of potential explanations for this pattern, which was the opposite of what they expected initially, including parent preferences and the fact that many of these students live in urban areas that have had large case counts and have powerful teachers unions that may oppose reopening).

<sup>112</sup> See Sarah D. Sparks, *Parental Racial, Income Divides Seen on School Reopening Preferences*, EDUC. WK., July 28, 2020, <https://www.edweek.org/leadership/parent-racial-income-divides-seen-on-school-reopening-preferences/2020/07>.

<sup>113</sup> *Id.* (reporting results of 6000 family poll that showed “that a majority of families who make less than \$50,000 a year wanted schools to avoid in-person instruction entirely for the 2020-21 school year,” whereas “only 27 percent of families who make more than \$150,000 a year wanted remote-only schooling”).

<sup>114</sup> For a summary of the demographics of and responses from those who participated in our nationwide survey, see Appendix Table 5.

were also more likely than lower-income respondents to agree that reopening K-12 schools was worth the risk.<sup>115</sup>

BIPOC parents and low-income parents may prefer online instruction because they are more likely to live in multigenerational housing (so infected students pose risks to older relatives), because they understand their communities are already at higher COVID-19 risk,<sup>116</sup> and because they don't trust their children's schools (which are often under-resourced already) to keep their children safe from COVID-19.<sup>117</sup>

This experience suggests that, while spatial patterns of vulnerability may not always provide much substantive guidance to decision-makers faced with conflicting intra-group vulnerabilities, those geographic vulnerability patterns may help identify places where local input into decision-making—especially input from the most vulnerable stakeholders—is particularly needed. While procedural justice suggests that vulnerable populations should always have at least some voice in critical decisions that affect them, that interest seems heightened when high-stakes decisions turn on important value judgments about how to trade-off various kinds of vulnerability and consequent harm.

The differing risk calculus made by some vulnerable communities is perhaps most fully evident in decisions by tribes like the Navajo Nation, which have essentially full control over school reopening decisions. Many tribes have kept all reservation schools closed, even as many areas have moved to a hybrid or back-in-person approach, and despite the profound difficulties remote learning poses for Native students, who often lack computer and internet access and who had some of the country's highest pre-pandemic dropout rates.<sup>118</sup> The choice to continue online instruction reflects, at least in part, a culturally specific value judgment that sending children to school poses too much risk to grandparents and other older relatives, who often reside with students in crowded, multi-generational housing.<sup>119</sup> Explaining his call for online-only instruction, for example, Navajo President Jonathan Nez pointed to a particularly pressing need to protect Navajo elders “because they are the storytellers . . . they are the heart of the Navajo Nation.”<sup>120</sup> High levels

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<sup>115</sup> Among those at making at least four-times the federal poverty level (FPL) 76% responded that reopening schools was worth the risk, whereas only 52% of those below the federal poverty level agreed. For these and additional results, see Appendix Table 6.

<sup>116</sup> See Christina A. Samuels, *Do Parents Trust Schools? Where the Fault Lines are During COVID-19*, EDUC. WK., Sept. 16, 2020, <https://www.edweek.org/leadership/do-parents-trust-schools-where-the-fault-lines-are-during-covid-19/2020/09>

<sup>117</sup> In vulnerable populations, these kinds of trends may be rooted in deeper distrust of government's ability to disseminate accurate information about COVID-19 and therefore its ability to mitigate damage and disruption to their communities. Breaking out the question of school reopening by trust in the accuracy and quality of COVID-19 information delivered by the government, we find 83% of those who trust the government's information “a great deal” also support reopening K-12 schools. This proportion drops to 70% among those who only trust the government's information “a fair amount,” 54% among those who trust the government's information “not very much,” and 38% among those who do not trust the government's information “at all.” See Appendix Table 6. Other polling confirms that Black and Latino parents are substantially less likely to trust their children's schools to keep them safe during the pandemic than white and Asian parents. See Samuels, *supra* note 116 (finding only 19% of Asian parents and 26% of white parents had “low to nonexistent trust” in their children's schools, while 39% of Black parents and 33% of Latino parents had “low to nonexistent trust” that schools would keep their children safe from COVID-19).

<sup>118</sup> See, e.g., Anthony J. Wallace, *Navajo School, Students Fight to Overcome Amid COVID-19*, APNEWS.COM (Nov. 27, 2020), <https://apnews.com/article/technology-arizona-phoenix-coronavirus-pandemic-wi-fi-23a921f457ca55d8abd319e15f781b7d> (detailing the obstacles to remote learning Native students and they great lengths many must go to just to get internet access).

<sup>119</sup> See *id.*

<sup>120</sup> See *id.*

of vulnerability on the reservation mean both that “[t]he risk of returning to class is greater” and “the price of keeping schools closed is steeper.”<sup>121</sup> The Navajo Nation, because of its sovereign status over these decisions, could make its own value judgments—consonant with the cultural values of the tribe—about school reopening. Reservation schools run by the federal Bureau of Indian Education appear to have been less responsive to community needs and preferences.<sup>122</sup>

Even beyond school closings, the Navajo Nation—driven by its understanding of the intense vulnerability of many tribal members and by high case counts—has implemented perhaps the most aggressive COVID-19 lockdowns and curfews of any jurisdiction in the country.<sup>123</sup> In December, when the Nation was in “its sixth week of a strict lockdown” with “57-hour weekend curfews,” President Nez explicitly noted that the decisions prioritized saving lives over the economy: “Even though the economy here on the Navajo Nation may be hurting because of [the lockdown,] saving lives is much more important than the economy here right now.”<sup>124</sup>

Obviously, most vulnerable groups don’t have sovereignty over these choices, and, in any event, no vulnerable group is a monolith—disagreements between different group members are to be expected. These experiences, however, do suggest that, for decisions that involve very difficult trade-offs between different aspects of a particular group’s vulnerability, there may be real value in making decisions (like school reopening decisions) at the lowest possible level (school by school or district by district) to allow for the most community input.<sup>125</sup> Additionally, decision-making needs to give particular voice and special accommodation to vulnerable groups within vulnerable groups—those with cumulative, intersectional vulnerability such as students with disabilities in vulnerable areas.

The experience with school closures also suggests the value of giving vulnerable communities and individuals more choices and options for managing their own risk. Some teachers unions and others have opposed giving parents more options on the grounds that offering hybrid and in-person learning choices will hurt learners who are completely remote because teachers will prioritize teaching the in-person students.<sup>126</sup> Those kinds of risks might be managed in other ways,

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<sup>121</sup> *Id.*

<sup>122</sup> See Rebecca Klein & Neal Morton, *As Coronavirus Ravaged Indian Country, the Federal Government Failed its Schools*, Hechinger Report, June 27, 2020, <https://hechingerreport.org/as-coronavirus-ravaged-indian-country-the-federal-government-failed-its-schools/> (arguing that reservation schools run by the federal Bureau of Indian Education, which educate around 10% of students on reservations, were “slow to shut and to offer distance learning”).

<sup>123</sup> See, e.g., Simon Romero, *Checkpoints, Curfews, Airlifts: Virus Rips Through Navajo Nation*, N.Y. TIMES, April 9, 2020 (describing strict measures including curfews enforced by checkpoints, patrols, and threats “jail time and hefty fines”); Kim Powell, *Navajo Nation Continues Strict Curfews due to “Uncontrolled Spread” of COVID-19*, Dec. 28, 2020, [https://www.azfamily.com/news/continuing\\_coverage/coronavirus\\_coverage/navajo-nation-continues-strict-curfews-due-to-uncontrolled-spread-of-covid-19/article\\_1e78e686-4984-11eb-beaa-67feb635d51f.html](https://www.azfamily.com/news/continuing_coverage/coronavirus_coverage/navajo-nation-continues-strict-curfews-due-to-uncontrolled-spread-of-covid-19/article_1e78e686-4984-11eb-beaa-67feb635d51f.html).

<sup>124</sup> Powell, *supra* note 123. The experience of the Navajo Nation also underscores the difficulty of some place-based decision-making: local public health measures to protect vulnerable populations cannot keep communities safe, despite personal sacrifices, if neighboring communities opt for less protective measures. While the Navajo Nation has implemented very strict lockdowns, many communities that border the reservation have not; many Diné live in these neighboring towns and the borders are porous, see Desi Rodriguez-Lonebear et al., *American Indian Reservations and COVID-19*, 26 J. OF PUBLIC HEALTH MANAGEMENT & PRACTICE 371 (2020), which limits the effectiveness of President Nez’s attempt to create “our little bubble here on the Navajo Nation.” Powell, *supra*.

<sup>125</sup> This suggests, too, that large teachers’ unions should be cautious about insisting—as the San Francisco teacher’s union has—that they will not agree to reopening any schools in an area until all can safely reopen. See *Editorial: To Get Vaccine Priority, Teachers Should Agree to Return to the Classroom*, L.A. TIMES, Jan. 26, 2021, <https://www.latimes.com/opinion/story/2021-01-26/covid-vaccine-teachers-return-school>.

<sup>126</sup> See, e.g., Kate Taylor, *Chicago Students Return to School on Monday. Will Their Teachers?*, N.Y. TIMES, Jan.

however, (by having some classrooms fully remote and some in-person) while still providing vulnerable students and their parents more options and thus more control over the vulnerability trade-offs they want to make.

One final point perhaps cuts in the opposite direction: in some respects, the trade-off between the safety of vulnerable students (and their families) and vulnerable students' education might be a false choice—or at least a much higher-stakes choice than it needed to be. If we had made a large-scale societal choice to prioritize vulnerable students (and, indeed, all students) by prioritizing opening schools over opening bars, in-person dining, and other businesses, we might have better controlled community spread so that vulnerable students could attend in-person school with much less risk to themselves and their families. Alternatively, if schools needed to remain remote, federal or state governments could have directed a large influx of resources to improve on-line learning for students in the most disadvantaged areas. While vulnerability indices like ours cannot dictate what our overarching societal priorities should be, they can clarify and inform the trade-offs those priorities will require and how some of those trade-offs could be minimized.

### *B. Managing Trade-offs Between Vulnerable Groups*

Another important aspect of competing or conflicting disaster vulnerability is conflicts between the needs of different vulnerable communities or groups. While it may prove helpful to think about where vulnerable groups are located—such as those vulnerable to the pandemic because of their age, those vulnerable to the pandemic because of their race, and those vulnerable to the pandemic due to both—knowing where such communities are located does not necessarily tell decision-makers how to manage trade-offs between vulnerable groups.

Some of the conflicts that have emerged between vulnerable groups during the pandemic have played out without much public attention. For example, while mail-in-balloting options benefit most COVID-19 vulnerable voters (including older voters and many of those with chronic health conditions or other disabilities), the move to vote-by-mail also dramatically decreases the number of in-person polling places, which voters with certain disabilities or limited English language proficiency rely on to provide accessibility services that help them cast a “secure, private, and independent vote.”<sup>127</sup>

Other of these conflicts between different vulnerable groups are at the heart of some of the most visible and thorny COVID-19 policy issues: in some areas (including frequently in the Chicago Public Schools system discussed above) school reopening decisions are framed as vulnerable teachers versus vulnerable students. Most prominently perhaps, the debate over vaccine priorities is rife with these tensions, pitting vulnerable essential workers against vulnerable older

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9, 2021, <https://www.nytimes.com/2021/01/09/us/chicago-schools-covid-reopening.html> (reporting the Chicago Teachers Union's argument that reopening schools hurts vulnerable students because requiring teachers “to simultaneously teach both in-person and remote students” will further disadvantage Black and Latino students, whose parents are more likely to choose to keep their children at home).

<sup>127</sup> Sabrina Gonzalez, *Vote by Mail Is One of Many Ways to Ensure the Disability Community is Included in the Next Election*, May 19, 2020, <https://www.americanprogress.org/issues/disability/news/2020/05/19/485218/vote-mail-one-many-ways-ensure-disability-community-included-next-election/>. In Oregon, an early adopter of vote-by-mail, there is no in-person voting and voters with disabilities who need official assistance must travel to the county clerk's office to get that assistance. See Oregon Secretary of State, *Services for Voters with Disabilities*, <https://sos.oregon.gov/voting/pages/disabilities.aspx>, last visited Feb. 15, 2021.

This example also problematizes the definition of a “vulnerable group”; while people with disabilities may have many common disaster needs, different types of disabilities also create divergent needs.

adults, vulnerable people who are incarcerated against vulnerable people who are homeless, and vulnerable people with a history of smoking against vulnerable people with diabetes. As discussed below, our vulnerability index's representation of geographic vulnerability can yield some important insights about how to manage these conflicts, but difficult ethical and implementation questions will also require policymakers to consider factors the spatial data can't fully capture.

From the beginning of the pandemic, there has been a general consensus among experts that ensuring equity for vulnerable populations should play an important role in determining vaccine priorities. All of the early vaccine frameworks—proposed by the World Health Organization (WHO), Johns Hopkins, and the National Academy of Sciences, Engineering & Medicine (NAMES)—included this focus on vulnerability.<sup>128</sup> Two of the most challenging questions remained: 1) how to ensure equity for vulnerable racial groups and 2) how to prioritize different vulnerable groups, particularly the large groups of older Americans versus vulnerable racial minorities.

A major question for prioritizing vulnerable racial groups has been how explicitly to prioritize race. For a variety of reasons—including the potential for increasing vaccine hesitancy among racial minorities who reasonably fear being used as “guinea pigs”<sup>129</sup>—all of the early frameworks and the guidance ultimately adopted by the CDC, rejected an explicit preference based on race or ethnicity. The NAMES framework suggested a place-based proxy for race: it proposed using geographic measures of social vulnerability—such as the CDC's Social Vulnerability Index (or something like our index)—to identify the most vulnerable areas (top 25%) in each state and then “to ensure that special efforts are made to deliver vaccine to residents” of those areas during each phase of vaccine distribution.<sup>130</sup> The Johns Hopkins framework appeared to favor an occupation-based proxy for race, noting that an “essential workers” priority could “indirectly help address the disproportionate burden” of COVID-19 on “communities of color,” so long as the definition of “essential worker” was sufficiently attentive to “racial disparities” between various occupations that might be included.<sup>131</sup>

Ultimately, the CDC's Advisory Committee on Immunization Practices (ACIP) took the occupation-as-proxy approach to vulnerability, with the first phase (1a) covering health care workers and “residents of long-term care facilities”; the second phase (1b) covering people 75 or older and “frontline essential workers”; and the third phase (1c) covering people aged 65-74 years,

<sup>128</sup> WHO, *Framework for Decision-Making: Implementation of Mass Vaccination Campaigns in the Context of COVID-19, Interim Guidance*, May 22, 2020, at 4, [https://www.who.int/publications/i/item/WHO-2019-nCoV-Framework\\_Mass\\_Vaccination-2020.1](https://www.who.int/publications/i/item/WHO-2019-nCoV-Framework_Mass_Vaccination-2020.1) (“Whenever possible, provision of immunization to vulnerable populations at increased risk of morbidity and mortality . . . should be prioritized.”); John Hopkins Bloomberg School of Public Health, *Interim Framework for COVID-19 Vaccine Allocation and Distribution in the United States*, Aug. 2020, at 22 [https://www.centerforhealthsecurity.org/our-work/pubs\\_archive/pubs-pdfs/2020/200819-vaccine-allocation.pdf](https://www.centerforhealthsecurity.org/our-work/pubs_archive/pubs-pdfs/2020/200819-vaccine-allocation.pdf) (discussing the goal of “reduc[ing] higher rates of severe COVID-19 illness and mortality being experienced by systematically disadvantaged social groups and marginalized populations”); National Academy of Sciences, *Engineering & Medicine, Framework for Equitable Allocation of COVID-19 Vaccine* 8-9 (2020) [hereinafter NAMES], <https://doi.org/10.17226/25917> (noting that “[f]or each population group, the committee recommends prioritizing for areas identified as vulnerable through CDC's Social Vulnerability Index (SVI) or another more specific index”).

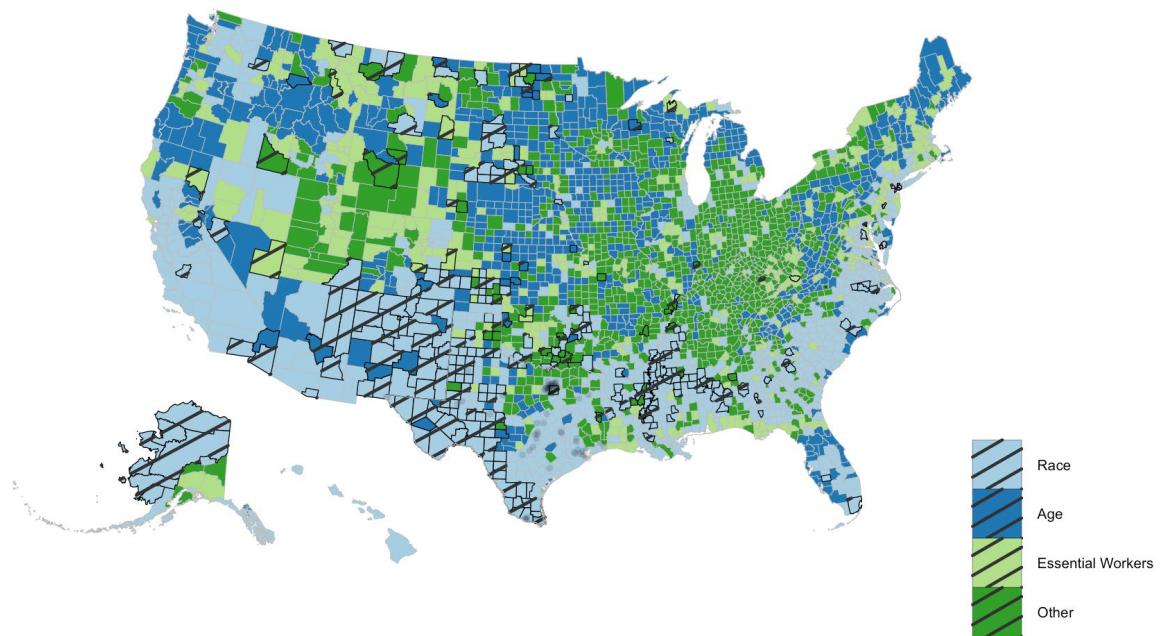
<sup>129</sup> NAMES, *supra* note 128, at 133 (rejecting an explicit preference because it “may omit other important social determinants of health,” “could be legally challenged,” and “is likely to increase mistrust in communities of color” who might be suspicious of vaccine safety “given the long history of mistreatment”). The WHO guidance did not specifically address race.

<sup>130</sup> NAMES, *supra* note 128, at 9 (explaining this strategy as a way to address vulnerability without explicitly allocating doses based on race).

<sup>131</sup> Johns Hopkins, *supra* note 128, at 12.

people between 16-64 years old “with high risk medical conditions” and “essential workers” not previously covered.<sup>132</sup> Moreover, this approach, on its face, gives relatively equal priority to older Americans and the essential-worker proxy for race and social vulnerability.<sup>133</sup>

What does our COVID Vulnerability Index data tell us about these choices? The map below in Figure 5 shows the primary driver of vulnerability—race, age, essential worker, or other—in every county in the United States, with the most vulnerable counties (those in the top decile) outlined and cross-hatched.<sup>134</sup>



*Figure 5: Primary components of COVID-19 vulnerability. Counties are colored based on which component is the primary driver of COVID-19 vulnerability (light blue=race, dark blue=age, light green=essential workers, dark green=other). Counties in the top vulnerability decile are outlined and cross-hatched.*

This map suggests two important considerations for policymakers charged with vaccine distribution: first, that the primary driver of COVID-19 vulnerability differs from county to county and second, that the predominant driver of vulnerability in an overwhelming number of the most vulnerable counties is race. The first consideration suggests that there may be wisdom in allowing states flexibility to adjust vaccination-phase priorities to best address the primary drivers of

<sup>132</sup> CDC, The Advisory Committee on Immunization Practices’ Updated Interim Recommendation for Allocation of COVID-19 Vaccine—United States, Dec. 2020, [https://www.cdc.gov/mmwr/volumes/69/wr/mm695152e2.htm?s\\_cid=mm695152e2\\_w](https://www.cdc.gov/mmwr/volumes/69/wr/mm695152e2.htm?s_cid=mm695152e2_w). The only mention of race in the guidance is in the context of the disproportionate number of racial and ethnic minorities among COVID-infected essential workers. See *id.*

<sup>133</sup> Each state is responsible for developing its own phased prioritization plan informed by the CDC’s guidance.

<sup>134</sup> Note that this top decile of counties is somewhat different from that displayed in our voter maps in Part II.C.2 because that data was through fall 2020, while the data for this map goes through February 2021.

vulnerability (and COVID-19 mortality) in their own jurisdictions if they tailor vaccination plans to local vulnerabilities. States could also use this vulnerability data, and related finer-grain data, to send extra vaccine doses to counties (or cities) to the most vulnerable jurisdictions. While states do have some flexibility to determine their own vaccination plans, informed by the CDC guidance, it is unclear how many are considering vulnerability to determine which groups should be in each phase of vaccine distribution or to triage additional doses to the most vulnerable areas.<sup>135</sup>

The second consideration suggests that in order to address the vulnerability of the most vulnerable counties, it is imperative that vaccine distribution effectively prioritize vulnerable racial groups. Unfortunately, early data on COVID-19 vaccinations suggest that the opposite is happening: vaccination rates for Black people and other minorities are lagging in many areas,<sup>136</sup> and wealthier ZIP codes have higher vaccination rates than lower-income ZIP codes.<sup>137</sup>

The reasons for these patterns are myriad. First, despite the CDC's recommendations, many states—including Texas and Florida—decided to prioritize older people over essential workers.<sup>138</sup> Second, on January 12, the Trump administration urged states to speed vaccination by opening up eligibility immediately to everyone over the age of sixty five, rather than to essential workers (like “grocery, agricultural, and transportation workers”) and those seventy five and older.<sup>139</sup> These decisions undermined the occupation-as-proxy for race approach.<sup>140</sup>

Third, even in states that prioritized essential workers on par with those 75 and over, the vaccination gap between whites and other racial groups is likely exacerbated by the online vaccine sign-up process in many states, which favors those who can easily access the internet at any time of day, who can expend significant time checking health department websites or social media for information about appointment availability, and who have friends and family who have the time and resources to help them navigate the system.<sup>141</sup> As John Hopkins Professor Alexandre White explains, without carefully planned efforts to reach underserved populations, “[i]f you focus on speed, those who are most easily accessible will be the ones who receive the most care, and those

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<sup>135</sup> Many states announced plans to use the CDC's SVI in some way, but it is not yet clear how many will actually do so. See Maria Eloisa Capurro, *States Count on an Index for Vaccinating Those Most in Need*, BLOOMBERG, Dec. 14, 2020, <https://www.bloomberg.com/news/articles/2020-12-14/who-gets-covid-vaccine-first-tool-will-help-ensure-equitable-shot-distribution> (reporting that “at least 26 states and Washington, D.C.” plan to rely on the CDC's SVI to help determine vaccine prioritization, with Tennessee having the “clearest plan” to follow NAMES's proposal “to direct 10% of vaccine doses to the most vulnerable areas”).

<sup>136</sup> See, e.g., Hanks & Conark, *supra* note 51 (noting that demographic data on vaccinations demonstrate “that just 6% of the 138,000 people who received a COVID vaccine in Miami-Dad are Black in a county with a 17% Black population”).

<sup>137</sup> See, e.g., *id.* (“New state data on vaccinations by ZIP codes map out a familiar pattern for the coronavirus pandemic. Just as low-income neighborhoods tended to get hit harder by COVID-19 spread, wealthier neighborhoods are getting their shots at a faster rate.”)

<sup>138</sup> Isaac Stanley-Becker, *Some States Buck Federal Vaccine Recommendations and Prioritize the Elderly over Essential Workers*, WASH. POST, Dec. 29, 2020, <https://www.washingtonpost.com/health/2020/12/29/covid-vaccine-priority-group-elderly/> (reporting that “Texas, Florida, and some other Republican-led states are bucking federal advice to provide early doses of the new coronavirus vaccines to front-line workers, choosing instead to prioritize the elderly”).

<sup>139</sup> See Selena Simmons-Duffin & Pien Huang, *Trump Administration Urges States to Open COVID-19 Vaccination to Everyone Over 65*, NPR, Jan. 12, 2021, <https://www.npr.org/sections/health-shots/2021/01/12/956017635/trump-administration-to-change-covid-19-vaccination-guidance-to-speed-up-rollout>.

<sup>140</sup> Hanks & Conark, *supra* note 51 (explaining that “[i]nequities have been worsened in part” by vaccination plans that “skipped over essential workers, who often are low-income and disproportionately people of color, in favor of senior citizens”).

<sup>141</sup> See *id.*

who have been historically isolated from healthcare access . . . will be the ones most likely to suffer without vaccine coverage.”<sup>142</sup> Existing vaccination efforts thus fall well short of the concerted effort required to reach traditionally underserved populations who also exhibit high levels of distrust in government and vaccine-hesitancy.

Would using a vulnerability index like ours—or the CDC’s SVI—to inform a place-based proxy for race to guide vaccine-prioritization have been a more effective approach for achieving vaccine equity? The answer probably depends, in large part, on the details of distribution logistics and the extent of outreach to vulnerable communities. Even data-driven attempts to equalize resources between areas or to promote more equitable outcomes by targeting disadvantaged areas for resource infusions may be thwarted when richer, white citizens can easily avail themselves of the resources allocated to more vulnerable neighborhoods. There are widespread reports of whiter, richer residents with easy computer access, more flexible work schedules, and time to navigate complex online distribution regimes appropriating appointment slots in many low-income, minority neighborhoods;<sup>143</sup> some are even crossing state borders to do so.<sup>144</sup> Moreover, targeted outreach and careful messaging to racial minorities and lower-income people will be required to help mitigate high levels of distrust and vaccine-hesitancy among these groups.

These examples demonstrate the limitations of a place-based approach to addressing vulnerability. One might try to compensate for some of these failings by imposing stricter limitations on who can obtain vaccinations at a particular location, but enforcement would likely necessitate that people show identification or address verification, which creates additional access hurdles for vulnerable populations, in general, and undocumented residents, in particular. It may be more effective to use spatial vulnerability data to determine where more targeted distribution mechanisms are needed, such as providing vaccinations through employers like groceries stores and agricultural companies, and where developing targeted messaging to vulnerable groups is critical.

We will pick up the vaccination discussion again in the next Part, as we address yet another dimension of vulnerability.

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<sup>142</sup> *Id.*

<sup>143</sup> See, e.g., Sean McMinn et al., *Across the South COVID-19 Vaccine Sites Missing from Black & Hispanic Neighborhoods*, NPR.org, Feb. 5, 2021, <https://www.npr.org/2021/02/05/962946721/across-the-south-covid-19-vaccine-sites-missing-from-black-and-hispanic-neighbor>. The same phenomenon was observed when San Antonio tried to address disparities in COVID-testing access by using its geographic equity matrix, <https://cosagis.maps.arcgis.com/apps/MapSeries/index.html?appid=184271d3b89748e5b6ba183463da804a>, to map locations for “three cost-free pop-up sites that rotate around different parts of the city each week.” Soo Rin Kim et al., *Which Cities Have the Biggest Racial Gaps in COVID-19 Testing Access*, (July 22, 2020), <https://fivethirtyeight.com/features/white-neighborhoods-have-more-access-to-covid-19-testing-sites/> (finding, based on an “extensive review of testing states,” that “sites in communities of color in many major cities face higher demand than sites in whiter or wealthier areas in those same cities,” which means that “Black and Hispanic people are more likely to experience longer wait times and understaffed testing centers”). Unfortunately, these testing centers quickly became overwhelmed as residents from across the city flocked to the sites to take advantage of testing that was easily accessible without a doctor’s referral and free. The government testing sites thus became “part of the disparity by concentrating demand even as they seek to address it in underserved neighborhoods.” Kim, *supra*.

<sup>144</sup> See, e.g., Simon Romero et al., *Can’t Get a Shot? Thousands of ‘Vaccine Hunters’ Are Crossing State Borders to Get Theirs*, N.Y. TIMES, Feb. 4, 2021, <https://www.nytimes.com/2021/02/04/us/covid-vaccines-crossing-states.html>.

#### IV. THIRD DIMENSION: POLITICAL VULNERABILITY

Another critical dimension of disaster vulnerability is political vulnerability. We use the term political vulnerability to encompass a variety of ways that disasters make already vulnerable groups even more vulnerable to certain kinds of harms, including political neglect, stigmatization, disenfranchisement, displacement, and other forms of exploitation. Like the other forms of vulnerability we have discussed thus far, political vulnerability overlaps with, reinforces, and is reinforced by other dimensions of vulnerability. Nonetheless, because disasters often provide opportunities for political elites and special interests to weaponize communities' vulnerability against them—and because vulnerability data can sometimes provide a blueprint for exploitation—it is critical to identify and explore these additional aspects of disaster vulnerability.

##### *A. Political Neglect*

One important aspect of political vulnerability is political neglect, which might occur inadvertently or intentionally. Neglect might manifest itself in two main ways. First, we might see a lack of political will to address harms to some vulnerable populations but not others. Alternatively, neglect might take a more extreme form and undermine efforts to address vulnerability to a disaster more broadly. For example, a disaster's disproportionate impact on vulnerable populations might undermine the political will to mobilize disaster aid and adopt mitigation measures or undermine the public's willingness to comply with those measures.

As to neglect that falls unevenly among vulnerable populations, this may be complicated by the already complicated dynamics of competing vulnerable populations jockeying for resources, such as vaccinations. As Figure 6 illustrates, this might be producing a dire outcome. Vulnerability mapping comparing vaccination data to mortality data and even case count data in Chicago demonstrates that the most vaccinated zip codes are those that face the least peril from COVID-19.

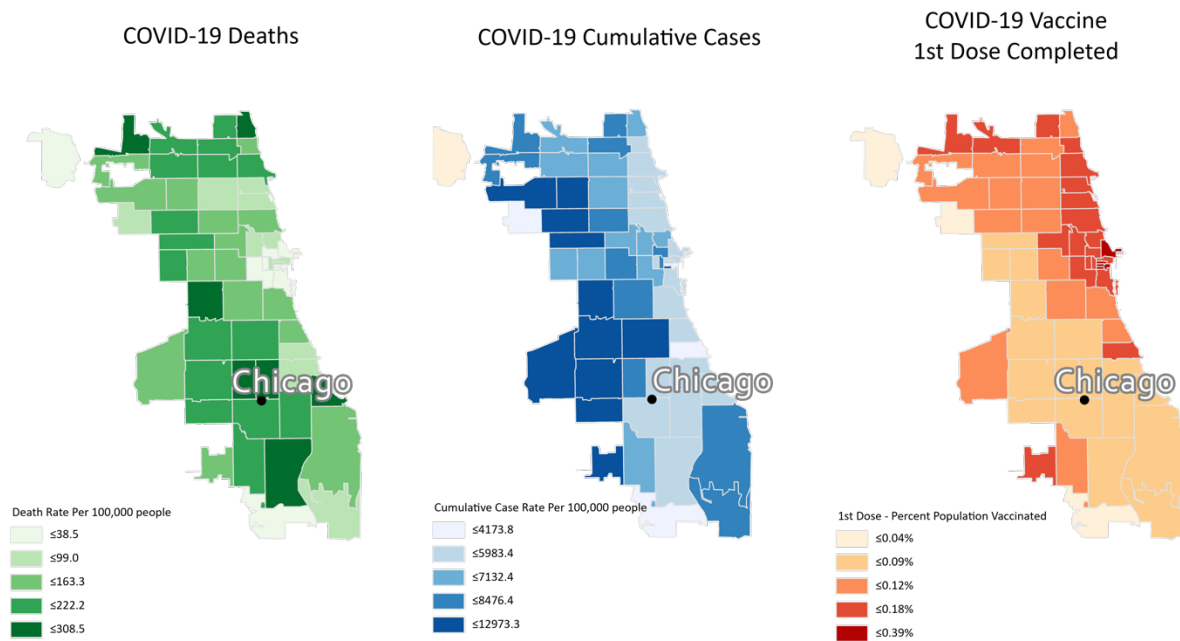


Figure 6. COVID-19 Deaths and Cumulative Cases (Case Counts) Compared to Vaccines at the Zip Code Level.

While these maps underscore both the depth of the problem and the importance of public data more generally, they also do not seem to be enough to change momentum. Another factor pointing to the prominent role of neglect in propping up these disturbing results is that these striking comparisons are possible only because the city of Chicago has a regularly updated, publicly available database of vaccinations by zip code.<sup>145</sup> Yet many states are reporting little to no data about vaccination rates by geographic area or by race.<sup>146</sup> While most counties do not report this level of data, for the counties that do, similar trends have been noted by the media in San Diego,<sup>147</sup> New York,<sup>148</sup> and Maricopa County in Phoenix.<sup>149</sup>

The second sort of manifestation of neglect—in which highlighting the impacts of disaster on people of color results in less support for government disaster relief than featuring white

<sup>145</sup> See Chicago Data Portal, *COVID-19 Vaccinations by Zip Code*, <https://data.cityofchicago.org/Health-Human-Services/COVID-19-Vaccinations-by-ZIP-Code/553k-3xzc>, last visited Feb. 9, 2021.

<sup>146</sup> See Emily Zylla et al., *Ensuring Equity: State Strategies for Monitoring COVID-19 Vaccination Rates by Race and Other Priority Populations*, <https://www.shvs.org/ensuring-equity-state-strategies-for-monitoring-covid-19-vaccination-rates-by-race-and-other-priority-populations>, last visited Feb 22, 2021.

<sup>147</sup> See Jared Aarons, *San Diego's 'Vaccine Gap' Concerns Minority Leaders*, Feb. 11, 2021, <https://www.10news.com/news/coronavirus/in-depth-san-diegos-vaccine-gap-concerns-minority-leaders>.

<sup>148</sup> See Troy Closson, *Stark Disparities in Vaccine Rollout by ZIP Code*, N.Y. TIMES, Feb. 17, 2021, <https://www.nytimes.com/2021/02/17/nyregion/vaccine-rollout-neighborhood-numbers.html>.

<sup>149</sup> See Max Gordon, *Data Shows Large Differences in Vaccination Rates between Maricopa County's ZIP Codes*, Feb. 12, 2021, [https://www.azfamily.com/news/continuing\\_coverage/coronavirus\\_coverage/data-shows-large-differences-in-vaccination-rates-between-maricopa-countys-zip-codes/article\\_153eef32-6d99-11eb-b1c8-9f2fbc3fbc5.html](https://www.azfamily.com/news/continuing_coverage/coronavirus_coverage/data-shows-large-differences-in-vaccination-rates-between-maricopa-countys-zip-codes/article_153eef32-6d99-11eb-b1c8-9f2fbc3fbc5.html).

victims—is suggested by research conducted in the aftermath of Hurricane Katrina. One study that varied the apparent race or ethnicity of Hurricane Katrina victims featured in a news story found that readers supported significantly less generous government disaster assistance for Black victims than for white victims.<sup>150</sup> The authors concluded that their “results suggest that public support for large-scale governmental relief efforts is weakened when hurricane victims are disproportionately African American.”<sup>151</sup> Perhaps cognizant of these dynamics, government officials and reporters sometimes attempt to make deaths more relatable by arguing that the vulnerable people who are dying are, in fact, just like everyone else, even when they are not.<sup>152</sup>

One might expect these dynamics to play out somewhat differently in a pandemic because everyone is experiencing it—everyone is at some level of risk—and experiencing it for a long time. We might well expect that political will and individual commitment to implementing public health measures would wane over time, as COVID-19 exhaustion sets in. Whether the fact that everyone is at risk makes people more or less sympathetic to public-health calls to protect the vulnerable seems a more complicated question. In some respects, the pandemic might underscore our interconnectedness: as noted in Part II.B, our health and well-being during the pandemic is, to some extent, intertwined with everyone else’s. Failure to protect the vulnerable from COVID-19 might interrupt food and other supply chains, deepen economic damage, and allow more deadly, contagious, and resistant strains of the virus to emerge.<sup>153</sup>

At the same time, the fact that everyone is at some risk means that everyone’s self-interest is more directly in play than when choosing, for example, whether to donate to a particular disaster cause or support federal relief for a disaster in another state. People might feel differently about prioritizing vaccines for vulnerable populations if it means they have to wait longer themselves.

Additionally, the fact that everyone is at-risk might lead less vulnerable people to manage that anxiety by creating psychological distance between them and the vulnerable victims, by treating the victims as “other.” The public focus on vulnerability—the familiar reciting of the ages, preexisting conditions, and other demographic characteristics of COVID-19 victims that made them vulnerable to the worst outcomes—often seems more a way of separating the majority from the victims (reinforcing an aura of relative safety and perhaps justifying more personal risk-taking) than an expression of empathy or concern for addressing either the underlying vulnerabilities or the public health measures that could mitigate risk to the most vulnerable.

Such “othering,” in other contexts has been shown to decrease empathy.<sup>154</sup> As one commentator put it, “Part of the reason this majority-white, majority non-elderly country has been so blasé about COVID-19 deaths is that mostly Black people and old people are dying.”<sup>155</sup> That

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<sup>150</sup> Shanto Iyengar & Richard Morin, *Natural Disasters in Black and White: How Racial Cues Influenced Public Response to Hurricane Katrina*, WASH. POST, June 8, 2006. The researchers also found significant effects of skin color with readers generally supporting less generous payouts for darker skinned victims. *Id.*

<sup>151</sup> Shanto Iyengar & Kyu S. Hahn, *Natural Disasters in Black and White: How Racial Cues Influenced Public Response to Hurricane Katrina*, June 10, 2007, at 12 unpublished manuscript, available at <https://pcl.stanford.edu/research/2007/iyengar-katrina-cues.pdf>; see also ROBERT R.M. VERCHICK, *FACING CATASTROPHE: ENVIRONMENTAL ACTION FOR A POST-KATRINA WORLD* (2010) 160-64 (discussing studies suggesting that unconscious or implicit bias might affect how much disaster aid minority individuals and communities get).

<sup>152</sup> KLINENBERG, *supra* note 22, at 213-24.

<sup>153</sup> See discussion accompanying note 56, *supra*.

<sup>154</sup> See Olga Khazan, *A Failure of Empathy Led to 200,000 Deaths*, ATLANTIC, Sept. 22, 2020, <https://www.theatlantic.com/politics/archive/2020/09/covid-death-toll-us-empathy-elderly/616379/>.

<sup>155</sup> See *id.* (arguing that “White people’s brains psychologically sort minorities as ‘out groups’ that stir less empathy”).

creation of psychological distance is likely aided by geographical distance, rooted in segregation and reflected in our maps, between the more privileged and the most vulnerable.<sup>156</sup>

Our 2000-person survey, fielded between September 23 and October 2, 2020,<sup>157</sup> may suggest that people are more willing—or at least say they are more willing—to sacrifice for the vulnerable than the discussion thus far suggests. Participants were asked two questions about vaccine prioritization: one about prioritizing “high risk groups” and the other about prioritizing “essential workers.”<sup>158</sup>

For the first question, participants were asked whether “high risk groups” should be given priority to receive the vaccine before other people. Half of our sample were randomly given a version of this prompt that asked about “high risk groups like the elderly and people with preexisting conditions,” whereas the others saw a version that said “high risk groups like racial minorities and low-income people.” Around 83% of participants supported vaccine prioritization for high risk groups like the elderly and those with preexisting conditions; support dropped to 70% for prioritization of racial minorities and those experiencing poverty. All racial and ethnic groups and all-income levels expressed less support for prioritizing racial minorities and poor people than for prioritizing the elderly and those with preexisting conditions, with Black participants exhibiting the largest drop in support for prioritizing minorities and low-income people<sup>159</sup> and the lowest-income groups exhibiting the smallest drop in support.<sup>160</sup> For both prompts, racial minorities and low-income people were significantly less supportive of giving vaccine priorities to high-risk groups. What the lower support for high-risk-group prioritization among minorities may suggest is not clear. It could reflect vaccine-hesitancy (concerns about vaccine safety) rather than unwillingness to prioritize vulnerable groups.<sup>161</sup> It could also suggest the desire not to feel somehow stigmatized by being given a place in the front of the line or the backlash that might provoke in others (both discussed in sections below).<sup>162</sup>

We also asked survey participants how willing they were to support aggressive public health measures to protect high risk groups and essential workers by limiting the spread of COVID-19. Across the board, respondents indicated high levels of support for aggressive public health measures, with 88% strongly or somewhat supportive of taking those measures. These numbers were high across all race and ethnic groups. Respondents below 100% of the federal poverty line

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<sup>156</sup> See *id.* (“Segregated neighborhoods have also helped insulate White Americans from the horror Black Americans face, because the ambulance sirens and the packed hospital wards are typically far from their own zip codes.”).

<sup>157</sup> For a summary of the demographics of and responses from those who participated in our nationwide survey, see Appendix Table 5.

<sup>158</sup> For detailed results, see Appendix Table 7.

<sup>159</sup> See *id.* The average drop in support from framing high risk individuals as the elderly and those with preexisting conditions to racial minorities and those experiencing poverty was 11.6 points. Among Black respondents the drop was 15.0 points. (The next largest drop was a 12.1 point drop in support among white respondents.)

<sup>160</sup> Comparing support of prioritization between “the elderly and people with preexisting conditions” and “racial minorities and low-income people,” those at the lowest income levels had the lowest drops in percentage support (with <100%FPL and 100-150%FPL dropping only 7 and 9 points, respectively).

<sup>161</sup> See discussion in Part IV.E, *infra*.

<sup>162</sup> When asked whether “essential workers” should be prioritized for vaccination, people, across the board, expressed even higher levels of support. In one randomized prompt, “essential workers” was modified with “like doctors and nurses” and in the other it was modified with “like hospital janitors.” There was no statistically significant difference between the support levels associated with the two prompts (87% for doctors and nurses, 89% for hospital janitors).

and those without a college degree were the only groups that exhibited a statistically significant lower level of support, although those numbers were still above 80%.<sup>163</sup>

While these numbers suggest strong support for taking steps to protect vulnerable populations, we recognize that expressed support may be more aspirational than real. Moreover, the data do show that people were more willing to prioritize the elderly and those with pre-existing conditions for vaccine distribution than racial minorities and those experiencing poverty. This was even (and sometimes especially) true for the very groups such a priority would ostensibly benefit, perhaps because of vaccine-hesitancy or fear of being stigmatized. These numbers suggest both the need for sensitive outreach to these groups and the difficulty of addressing long-standing, deep vulnerabilities—and the distrust those disparities breed—under the time pressure disasters create. Attention to addressing vulnerability during disasters will not be enough without addressing underlying vulnerability and distrust outside moments of crisis.

The potential lack of political will to take adequate measures to protect the most vulnerable also underscores how problematic it can be for states to forbid more local jurisdictions, where vulnerable groups may have more voice, from implementing their own public health mandates like mask mandates and more localized lockdowns. These state-wide decrees, such as bans on local mask mandates, can make it more difficult for vulnerable communities to protect themselves.<sup>164</sup>

### B. Stigmatization

Another aspect of political vulnerability that must be considered when evaluating disaster-response measures aimed at helping vulnerable communities is that targeting those communities for resources or public health measures may risk stigmatizing the people and communities we are trying to benefit.<sup>165</sup> Stigmatization might be inadvertent or part of a concerted government effort to construct disaster enemies to shift blame for the disaster or to justify harsh crackdowns or withholding information from the public.<sup>166</sup> During COVID-19, the possibility of stigma is perhaps most acute in the context of localized implementation of public health measures that suggest (directly or indirectly) that a particular community is a hotspot for disease.<sup>167</sup>

Thus, the possibility of stigma might be particularly relevant to one of our modeling examples: mask mandates. If, as one might expect, vulnerability data suggested that mask mandates are most needed in predominantly poor, minority neighborhoods, authorities must

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<sup>163</sup> Among respondents below the federal poverty line, 80.4% supported aggressive public health measures to protect high risk groups and 82.1% to protect essential workers. Among respondents with a high school education or less the numbers were 82.0% and 83.6%, respectively, and among respondents with some college (but no degree), the numbers were 83.9% and 84.84%, respectively. See Table 2. These respondents may feel the economic pinch of aggressive public health measures like lockdowns more acutely than other groups.

<sup>164</sup> Cf. *Romer v. Evans*, 517 U.S. 620 (1996) (invalidating, as a violation of equal protection, a Colorado constitutional amendment that forbid localities from adopting anti-discrimination laws to protect gay, lesbian, or bisexual individuals).

<sup>165</sup> Some have suggested, for example, that prioritizing BIPOC people for early vaccination might inadvertently stigmatize BIPOC individuals and communities as victims or spreaders/carriers of disease. See, e.g., Sigal Samuel, *Should People of Color Get Access to the Covid-19 Vaccine Before Others?*, VOX.COM, Oct. 28, 2020, <https://www.vox.com/future-perfect/2020/10/2/21493933/covid-19-vaccine-black-latino-priority-access>.

<sup>166</sup> See Lisa G. Sun & Ronnell A. Jones, *Disaggregating Disaster*, 60 UCLA L. REV. 884, 884 (2013).

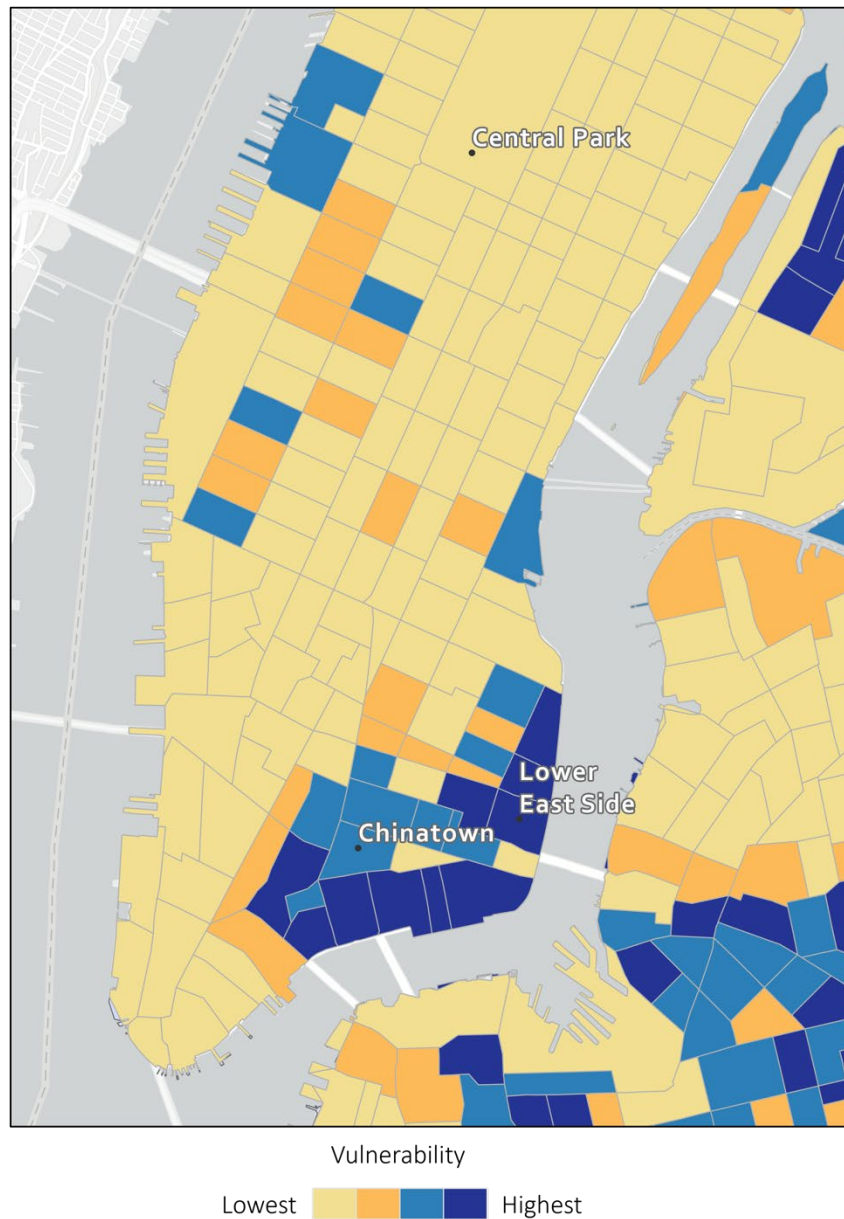
<sup>167</sup> Cf. CDC, *Covid-19: Reducing Stigma*, <https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/reducing-stigma.html> (observing that “[f]ear and anxiety about a disease can lead to social stigma” and that “stigma and discrimination can occur when people link a disease, such as COVID-19, with a population, community, or nationality”).

choose to implement mask mandates only in those communities. Those communities where masks are required might then be stigmatized as particularly dangerous or infectious places—as epicenters of disease—that should be avoided, when possible. That association between poorer, nonwhite communities and disease might further damage those communities’ already struggling businesses and even fuel narratives of blame that could increase prejudice and hate crimes.

Consider, for example, what might happen if policymakers in Manhattan were to use census block-level vulnerability data to determine in which areas to mandate masks: Chinatown and the adjacent Lower East Side—“the only remaining working-class neighborhoods in Manhattan south of Central Park”<sup>168</sup>—would be obvious candidates for a mask mandate. As illustrated in Figure 7, their relative vulnerability jumps out on this vulnerability map based on the CDC’s block-level Social Vulnerability Index.

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<sup>168</sup> Sarah Ngu, *Will Luxury Towers Edge Out the Last of the Working-Class Chinese in New York’s Iconic Chinatown?*, VOX.COM, Sept. 25, 2019, <https://www.vox.com/the-highlight/2019/9/18/20861446/new-york-city-chinatown-gentrification-lower-east-side>.



*Figure 7. The Centers for Disease Control's Social Vulnerability Index at the Census-block Level for Manhattan.*

These neighborhoods are pockets of “high” and “extreme” vulnerability in a sea of “low” and “moderate” vulnerability areas. If policymakers chose to implement mask mandates in Lower Manhattan only in the Lower East Side-Chinatown neighborhoods, this area—which is lower-income and much more heavily Asian American (and more racially diverse, generally) than most of Manhattan—might be stigmatized as a COVID-19 hotspot.<sup>169</sup>

<sup>169</sup> See NYU Furman Center, *Lower East Side/Chinatown*, <https://furmancenter.org/neighborhoods/view/lower->

This possibility is especially pernicious given the long history of stigmatizing and blaming predominantly minority or low-income neighborhoods during disease outbreaks.<sup>170</sup> There is particular reason to be sensitive to this in the context of COVID-19 because Chinatowns have already been a particular target of this kind of prejudice, and bias against Chinese American and Chinese restaurants and stores has increased during the pandemic, fueled at least in part by the “China virus” rhetoric of President Trump and others.<sup>171</sup>

While Chinatowns may be a worst-case scenario for COVID-19 stigmatization, this pattern holds more generally as well: neighborhoods with high levels of COVID-19 vulnerability are also highly vulnerable to stigmatization. Research has demonstrated, for example, that white people are even more likely to hold negative racially stereotyped views of Black neighborhoods than of Black people, with Black neighborhoods perceived as “impoverished and undesirable,”<sup>172</sup> “crime-ridden,” “rundown,” “dangerous,” and “dirty.”<sup>173</sup> More generally, research has found that “[a]s the concentration of minority groups and poverty [in a neighborhood] increases, residents of all races perceive heightened disorder” and decay and have a more negative mental picture of the area.<sup>174</sup> Vulnerability-driven mask mandates might compound and reinforce these preexisting associations.

Other targeted COVID-19 response measures might likewise risk stigmatization, including imposing more aggressive lockdowns, prioritizing certain neighborhoods for vaccination,<sup>175</sup> or enforcing stricter school closures. On the flip side, a decision to prioritize in-person school

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east-side-chinatown#, last visited Feb. 14, 2021. In 2018, 27.3% of the area’s residents identified as Asian, 9.1% as black, 25.6% as Hispanic, and 35.3% as white. *See id.* The poverty rate was 30% (versus 17.3% citywide), and the median household income was “\$49,180, about 24% less than citywide median household income (\$64,850).” *Id.*

<sup>170</sup> *See, e.g.,* ADAM KUCHARSKI, *THE RULES OF CONTAGION* (2020); *see also* Marian Liu, *The Coronavirus and the Long History of Using Diseases to Justify Xenophobia*, WASH. POST, Feb. 13, 2020, <https://www.washingtonpost.com/nation/2020/02/14/coronavirus-long-history-blaming-the-other-public-health-crises/> (quoting Johns Hopkins medical anthropologist Monica Schoch-Spana explaining that “[w]hat you have over history and throughout modern-day outbreaks is people fixing blame on a contagious disease on outsiders”); Robert Klemko, *Coronavirus has been Devastating to the Navajo Nation*, WASH. POST., May 16, 2020, [https://www.washingtonpost.com/national/coronavirus-navajo-nation-crisis/2020/05/11/b2a35c4e-91fe-11ea-a0bc-4e9ad4866d21\\_story.html](https://www.washingtonpost.com/national/coronavirus-navajo-nation-crisis/2020/05/11/b2a35c4e-91fe-11ea-a0bc-4e9ad4866d21_story.html) (noting that some “community leaders” in towns adjacent to the Navajo Nation have blamed outbreaks on tribal members).

<sup>171</sup> Nature, OpEd: *Stop the Coronavirus Stigma Now*, April 7, 2020, <https://www.nature.com/articles/d41586-020-01009-0>; Lin Taylor, *As Lunar New Year Arrives, COVID-19 Pushes Chinatown Businesses to the Brink*, JAPAN TIMES, Feb. 12, 2021, <https://www.japantimes.co.jp/news/2021/02/12/world/chinatowns-coronavirus-impact/> (recounting how “Chinatowns, in particular, have been hit harder and for longer [by COVID-19’s economic impacts], partially due to xenophobia related to the origins of COVID-19, which led to an avoidance of the area”).

<sup>172</sup> Courtney Bonam, Caitlyn Yantis & Valerie Jones Taylor, *Invisible Middle-Class Black Space: Asymmetrical Person and Space Stereotyping at the Race-Class Nexus*, 23 GROUP PROCESSES & INTERGROUP RELATIONS (2018), <https://doi.org/10.1177/1368430218784189>

<sup>173</sup> Courtney M. Bonam, Hilary B. Bergsiker & Jennifer L. Eberhardt, *Polluting Black Space*, 2016 J. OF EXPERIMENTAL PSYCHOL. 1, 6 (“finding that people hold a “negative and prevalent picture of Black space as failing: physically degraded, unpleasant, unsafe, and lacking resources,” which “suggests lay people (likely irrespective of race) are aware of a generalized image of Black areas that echoes the U.S. historical legacy of confining Black Americans to impoverished, blighted spaces”).

<sup>174</sup> Robert J. Sampson & Stephen W. Raudenbush, *Seeing Disorder: Neighborhood Stigma and the Social Construction of “Broken Windows,”* 67 SOC. PSYCHOL. Q. 319, 319 (2004); *see also id.* at 320 (arguing that “[r]esearch on implicit bias and cultural stereotyping suggests that Americans hold persistent beliefs linking blacks and disadvantaged minority groups to many social images, including but not limited to crime, violence, disorder, welfare, and undesirability as neighbors” and that these beliefs “are reinforced by the historical association of nonvoluntary racial segregation with concentrated poverty, which in turn is linked to institutional disinvestments and neighborhood decline”).

<sup>175</sup> *See* Samuel, *supra* note 165 (discussing potential vaccine-prioritization stigma).

instruction for certain neighborhoods or students (because of high social vulnerability, limited access to online learning, or other related factors) might stigmatize those school communities, or the particular students singled out, as underperforming, underachieving, or substandard.

At least in some of these cases, however, the risk of stigmatization can be ameliorated by choosing a different geographic unit as the locus for decision-making. In our mask mandate modeling, for instance, our vulnerability data are county-level data and, while it is certainly possible that a whole county could be stigmatized as a COVID-19 hotspot, that seems much less likely than stigmatizing a particular neighborhood.<sup>176</sup> Similarly, county-wide lockdowns may be less stigmatizing than neighborhood lockdowns. State-wide mask mandates (or lockdowns) seem unlikely to generate any stigma at all. This suggests that minimizing the risk of stigma should be one factor both in deciding the geographic unit at which data will be analyzed and in determining which jurisdictional level should impose public health measures.<sup>177</sup>

### C. Disenfranchisement

As our discussion on accommodations provided to voters in Part III.C suggests, the failure by some states and counties to make it a priority to protect vulnerable voters during the COVID-19 pandemic threatened to (and likely did) suppress the vote among vulnerable populations. It is, of course, hard to prove a counterfactual: what would turnout have been among lower-income, older minority voters if every county had opted for the safest possible voting method—automatic mail-in ballots for every citizen? But there is good reason to believe that some of these voters, faced with the choice of risking their health (or even their lives) to vote, forfeited their right to vote because they could not cast their ballot safely. Our data show that millions of voters in places like New Orleans, Louisiana; Jackson, Mississippi; and Houston, Texas were put to that choice.

In some counties, this voter suppression may have been the unintended consequence of political paralysis or a misguided attempt to protect election integrity,<sup>178</sup> but in others, it may well have been intentional. The history of overt voter suppression in the states that have been most resistant to COVID-19 voting changes makes this latter possibility all the more plausible. The worst offenders—including Texas, Louisiana, Mississippi and Tennessee—are states with long, ugly histories of voter suppression.<sup>179</sup> It's hard to view Texas Governor Greg Abbott's decision to limit all of Harris County to one absentee-ballot drop box location, for example, as anything other than a transparent ploy to make absentee voting even more difficult for the already limited number of vulnerable Harris County residents who were able to qualify for an absentee ballot.<sup>180</sup>

<sup>176</sup> This argument may be less persuasive in states where counties are relatively small.

<sup>177</sup> This analysis need not preclude lower jurisdictional levels such as municipalities from imposing their own public health measures if they decide that the public health benefits to their community outweigh the risk of stigmatization.

<sup>178</sup> See, e.g., Emily Bazelon, *Will Americans Lose Their Right to Vote in the Pandemic*, N.Y. TIMES, May 5, 2020, <https://www.nytimes.com/2020/05/05/magazine/voting-by-mail-2020-covid.html> (reporting that some state officials cited potential fraud as a reason not to expand mail in balloting).

<sup>179</sup> Each of these states was a covered jurisdiction under Section 5 of the Voting Rights Act. Department of Justice, *Jurisdictions Previously Covered by Section 5*, <https://www.justice.gov/crt/jurisdictions-previously-covered-section-5>, last visited Feb. 12, 2021.

<sup>180</sup> Harris County, “a Democratic stronghold” that includes Houston, spans some 1700 square miles, Emma Plattoff, *Voters, Voting Rights Groups Sue Gov. Greg Abbott over Order to Close Ballot Drop-off Locations*, TEXAS TRIB., Oct. 2, 2020, <https://www.texastribune.org/2020/10/02/texas-greg-abbott-ballot-drop-lawsuit/>, and is approximately 41% Hispanic, 18% Black, 6% Asian, and 31% white, see John D. Harden, *Five Maps Illustrate Houston's Racial-Ethnic Breakdown by Neighborhood*, HOUSTON CHRON. Feb. 26, 2018,

And, indeed, once we had constructed our vulnerability index and identified the most at-risk counties, our team of researchers worried, in fall 2020, that our data could be used as a blueprint to suppress the vote among vulnerable voters by making clear how little state (and local) officials had done to allow them to vote safely. If the data had been available even earlier in the process, election officials intent on suppressing the vote might have used it to deter vulnerable voters by making polling places in the most vulnerable counties feel even more unsafe (by lifting mask mandates in those counties or limiting polling places to ensure longer lines). In fact, as we shared earlier drafts of our work that focused on voter risks prior to the election, reviewers worried that political opportunists might use it to strategically scare off voters. This potential for exploitation is always present with vulnerability data, although officials likely already have some sense of the demographics of different neighborhoods in their jurisdiction (so more detailed data may simply allow them to refine their exploitative strategies). As we show in other work, for example, the choice of Texas election officials to limit absentee ballots to those over age 65 (and nobody else) left the most vulnerable counties completely exposed.<sup>181</sup>

While voting during the pandemic is the most dramatic example of disaster-vote-suppression (especially since the 2020 presidential election was one of the most contentious in living memory), disasters often force us to confront how holding typical in-person elections, without modification, in disaster's wake may systematically disenfranchise vulnerable voters. After a major disaster like a hurricane and flood, many residents will be temporarily (and sometimes permanently) displaced from their homes—sometimes quite long distances and sometimes across state lines. After Hurricane Katrina struck in August 2005, many New Orleans' residents were displaced to nearby Baton Rouge, but many others temporarily settled across state lines in Atlanta, Memphis, Jackson, and Houston<sup>182</sup> (which received more of the New Orleans diaspora than any other city).<sup>183</sup> All told, “around two-thirds of the city’s population was not living in” New Orleans when mayoral elections were held the following spring.<sup>184</sup> While wealthier evacuees might have had the means to travel back to New Orleans to vote, poorer “voters in exile,”<sup>185</sup> particularly those out-of-state, would almost certainly have been disenfranchised without significant expansion of absentee voting.<sup>186</sup>

While the most vulnerable to COVID-19 have generally been confined to, rather than displaced from, their homes, they were nonetheless “voters in exile” from traditional in-person elections in 2020. Their predicament, captured and clarified by our index and maps, demonstrates the need to be attentive to both individual and community vulnerability when shaping voting law and policy. That means recognizing that voting law reforms that have traditionally been

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<https://www.chron.com/houston/article/Five-maps-illustrating-Houston-s-racial-breakdown-12711221.php>. County officials had arranged for multiple drop boxes throughout the County until the Republican governor ordered them closed. See Platoff, *supra*.

<sup>181</sup> See our forthcoming paper COVID-19 and the Voting Rights Act.

<sup>182</sup> Brian Brox, *Elections and Voting in Post-Katrina New Orleans*, 16 S. STUD. 1, 3 (2009), <http://www.tulane.edu/~bbrox/BroxSoSt.pdf>.

<sup>183</sup> Laura Bliss, *10 Years Later*, BLOOMBERG, Aug. 25, 2015, <https://www.bloomberg.com/news/articles/2015-08-25/8-maps-of-displacement-and-return-in-new-orleans-after-katrina>.

<sup>184</sup> Brox, *supra* note 182, at 3.

<sup>185</sup> Cf. NAOMI KLEIN, *THE SHOCK DOCTRINE* 5 (2007) (“Within 19 months [of Hurricane Katrina], with most of the city’s poor residents still in exile, New Orleans’ public school system had been almost completely replaced by privately run charter schools.”)

<sup>186</sup> Even with these accommodations, voter turnout was lower than in the prior mayoral election. See Brox, *supra* note 182, at 13.

characterized as “convenience voting”<sup>187</sup>—including vote-by-mail, online voter registration, and early voting—may actually be “survival voting” for certain voters in certain circumstances.

Disenfranchisement post-disaster may also take forms other than voter suppression. Disasters also present an opportunity for decision-makers to exploit a community’s heightened vulnerability during and after the disaster to make decisions, without community input or buy-in, that undermine the community’s well-being or that a majority of the community opposed pre-disaster. Naomi Klein explored this dynamic in her book *Shock Doctrine*, recounting how, immediately post-Katrina, the state took control of New Orleans’s already struggling public schools and then closed neighborhood schools and outsourced the city’s education system to privately-run charter schools in the nation’s most aggressive experiment with “market-based” school reform.<sup>188</sup> Post-disaster displacement and damage made organizing against these efforts all but impossible. That decision remains immensely controversial today, with some metrics suggesting improvements in student learning, but others suggesting a system that has failed its most vulnerable students.<sup>189</sup> What is clear is that many of New Orleans’s low-income Black residents continue to lament the loss of long-established neighborhood schools, which brought communities together, and to decry the strict, “no-excuses” charter schools they say discriminate against and demoralize disadvantaged children.<sup>190</sup> Their experience stands as a stark reminder that vulnerable populations are at risk post-disaster of being politically steamrolled so that powerful elites can enact unpopular reforms with minimal, if any, consultation with the most affected populations.

#### D. Displacement

Communities’ heightened post-disaster vulnerability has also been weaponized against them to facilitate forced relocation of vulnerable residents. After the 1906 San Francisco Earthquake, city elders moved quickly to relocate the city’s Chinatown, which—while devastated by the earthquake and subsequent fire—occupied some of San Francisco’s most valuable and sought-after real estate.<sup>191</sup> Only the intervention of China’s Empress and the threat of losing lucrative Chinese trade dissuaded city officials from permanently exiling Chinatown’s displaced residents from their homes.<sup>192</sup>

After the 2004 Indian Ocean Tsunami, government-mandated “coastal buffer zones” displaced tsunami-ravaged fishing villages from their traditional coastal lands, ostensibly to

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<sup>187</sup> See, e.g., Caltech/MIT Voting Technology Project, *Voting: What Is, What Could Be*, (July 2001), [https://arquivo.pt/wayback/20170823193309mp/\\_http://www.umic.pt/images/stories/publicacoes1/July01\\_VTP\\_Voting\\_Report\\_Entire.pdf](https://arquivo.pt/wayback/20170823193309mp/_http://www.umic.pt/images/stories/publicacoes1/July01_VTP_Voting_Report_Entire.pdf).

<sup>188</sup> KLEIN, *supra* note 185, at 3; Kenneth J. Saltman, Schooling in Disaster Capitalism: How the Political Right is Using Disaster to Privatize Public Schooling, 34 TEACHER EDUC. Q. 131, 131 (2007); Naomi Klein, How Power Profits from Disaster, GUARDIAN, July 6, 2017, <https://www.theguardian.com/us-news/2017/jul/06/naomi-klein-how-power-profits-from-disaster> (recounting how “the famed free-market economist Milton Friedman” framed Katrina’s destruction of schools and displacement of students as a “tragedy” but “also an opportunity to radically reform the educational system”).

<sup>189</sup> Colleen Kimmett, *New Orleans’ All-Charter School System Has Proven a Failure*, IN THESE TIMES, Aug. 28, 2015, <https://inthesetimes.com/article/10-years-after-katrina-new-orleans-all-charter-district-has-proven-a-failur>.

<sup>190</sup> See *id.*

<sup>191</sup> See, e.g., Richard Gonzales, *Rebuilding Chinatown after the 1906 Earthquake*, NPR, April 12, 2006, <https://www.npr.org/templates/story/story.php?storyId=5337215>.

<sup>192</sup> See *id.*

protect vulnerable residents from future disasters, but sometimes to clear the path for new beachfront luxury resorts.<sup>193</sup>

After Hurricane Katrina in 2005, public housing residents faced a similar threat of displacement (and replacement). Indeed, some politicians seemed to revel in the opportunity Katrina presented to push poor Black residents out of New Orleans. Soon after Katrina hit, U.S. Congressman Richard Baker (R-La) said, “We finally cleaned up public housing in New Orleans. We couldn’t do it. But God did.”<sup>194</sup> Not surprisingly, many public housing residents “suspected that landlords and city decision-makers were deliberately trying to make it as difficult as possible for people like them to return to New Orleans—suspicions that have been largely borne out.”<sup>195</sup>

After Katrina, the New Orleans Housing Authority demolished its four largest public housing complexes even though they were located on relatively high ground and many units did not suffer major damage during the storm.<sup>196</sup> The last of the complexes to be demolished was the Iberville Housing Development, which had 821 public housing units.<sup>197</sup> While many of these units were in disrepair and unoccupied,<sup>198</sup> Iberville was still considered the “crown jewel of the projects” and a “gem of Depression-era buildings,” and it occupied a “coveted location next to the French Quarter.”<sup>199</sup> By the end of 2019, the HUD-funded (and still incomplete) mixed-income development on the Iberville site had 300 public housing units, 227 market rate units, and 151 moderately priced units.<sup>200</sup> The other redeveloped complexes lost a much higher percentage of public housing units, with an overall loss of thousands of units.<sup>201</sup> Consequently, while some former public housing residents now have much nicer units, most were left with section 8 vouchers to compete (often unsuccessfully) for private units in a very tight post-storm rental market and many never returned to New Orleans from the cities to which they were evacuated.<sup>202</sup>

Some politicians expressed the (arguably paternalistic) view that New Orleans’s poorest residents would be better off staying in the communities to which they relocated, despite the fact that most expressed a strong desire to return to their former homes. For the most part, however, research does not bear out this view that Katrina’s survivors were better off in the cities to which they were relocated in the storm’s immediate aftermath.<sup>203</sup> Nonetheless, this remains a common

<sup>193</sup> See, e.g., *ActionAid, Fisheries-Based Livelihoods in THE POST-TSUNAMI CONTEXT: PEOPLE’S REPORT FOR INDIA, THE MALDIVES, SRI LANKA & THAILAND*, June 4, 2007, at 33, available at [https://actionaid.org/sites/default/files/fisheries\\_based\\_livelihoods\\_in\\_the\\_post-tsunami\\_context.pdf](https://actionaid.org/sites/default/files/fisheries_based_livelihoods_in_the_post-tsunami_context.pdf) (recounting fishers’ fears in Sri Lanka, Thailand and India that their governments were displacing them to make way for resort hotels).

<sup>194</sup> Susan Saulny, *Clamoring to Come Home to New Orleans Projects*, N.Y. TIMES (June 6, 2006).

<sup>195</sup> TIERNEY, *supra* note 4, at 140.

<sup>196</sup> See Robert D. Bullard & Beverly Wright, *Race, Place, and the Environment in Post-Katrina New Orleans*, in ENVIRONMENTAL JUSTICE AFTER HURRICANE KATRINA, 19, 28-30, *supra* note 23.

<sup>197</sup> Jessica Williams, *Former Iberville Housing Complex Reimagined as New Community*, NOLA.COM, Nov. 12, 2019, [https://www.nola.com/news/politics/article\\_23e7220a-057d-11ea-a319-5314db00d55d.html](https://www.nola.com/news/politics/article_23e7220a-057d-11ea-a319-5314db00d55d.html).

<sup>198</sup> See *id.*

<sup>199</sup> Saulny, *supra* note 194.

<sup>200</sup> Williams, *supra* note 197.

<sup>201</sup> See Richard A. Webster, *New Orleans Public Housing Remade After Katrina*, NOLA.COM, July 18, 2019, [https://www.nola.com/news/article\\_833cc3f5-2d6d-5edc-bc0f-ecd55ead7026.html](https://www.nola.com/news/article_833cc3f5-2d6d-5edc-bc0f-ecd55ead7026.html). For example, St. Bernard went from 1,464 public housing units to 221 in the redeveloped mixed income complex, and C.J. Peet went from 1,403 to 193. See *id.*

<sup>202</sup> *Id.*

<sup>203</sup> See TIERNEY, *supra* note 4, at 142 (arguing that “far from confirming this hypothesis [that poor Black residents displaced by Katrina were better off elsewhere], members of those populations did not benefit from moving” and “were not necessarily better off” when evaluated by a number of metrics, including “employment, housing quality,

tactic: casting post-disaster measures that target and harm vulnerable populations as efforts to protect those groups.

While COVID-19 has not directly damaged property in ways that promote turnover and gentrification, the pandemic nonetheless threatens disaster gentrification analogous to what has been observed in past disasters.<sup>204</sup> Waves of eviction in vulnerable neighborhoods are likely as eviction relief expires across the country,<sup>205</sup> clearing the path for future redevelopment.<sup>206</sup> Anecdotal evidence suggests that some landlords are using COVID-19 infections as a justification for evicting tenants “for cause” to free up units for remodeling or replacement by more high-end housing.<sup>207</sup> Additionally, many rural areas are experiencing serious pressure on housing and rental markets as city-dwellers, freed from geographic restrictions by work-at-home policies (which may become permanent), buy or rent homes in rural communities.<sup>208</sup>

### *E. Exploiting the Vulnerable to Protect the Privileged*

Putting the vulnerable in harm’s way to protect the privileged is a common theme in the history of disasters. During the Great Mississippi Flood of 1927, as floodwaters threatened New Orleans and levees protecting the city faltered, city elders met to devise a plan to save New Orleans.<sup>209</sup> At their urging, Louisiana’s Governor ordered levees downstream of New Orleans dynamited, sparing the city by diverting flooding into the predominantly poor, Black communities to the south.<sup>210</sup>

This history makes clear that Black Americans and other vulnerable groups have good reason to distrust that disaster decision-makers will act in their best interest. Likewise, the infamous Tuskegee Experiment exemplifies the ways in which, outside of the disaster context, Black Americans have also been exploited by health care providers and researchers. It is, unsurprising then, that many Black Americans have expressed fears that the government and pharmaceutical companies want to prioritize racial minorities for vaccine distribution to use them as “guinea pigs” to test the vaccine’s effects before distributing it to the wider population.<sup>211</sup>

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neighborhood quality, health, and mental health”).

<sup>204</sup> Richard Florida, *Will Coronavirus be the Death of Cities? Not so fast*, WALL ST. J., Dec. 10, 2020 (arguing that “left to its own devices, [the pandemic will accelerate trends that] reinforce and exacerbate our existing class and racial divides and reinforce economic and geographic inequality, as the affluent and the advantaged plant their stakes in the most desirable places” and that “[i]t will take conscious and intentional action to avert a new wave of gentrification in cities, suburbs and rural areas”).

<sup>205</sup> See Will Parker, *U.S. Poised for Wave of Evictions in January as Federal Ban Expires*, WALL ST. J., Dec. 13, 2020, <https://www.wsj.com/articles/u-s-poised-for-wave-of-evictions-in-january-as-federal-ban-expires-11607855401>.

<sup>206</sup> See Florida, *supra* note 204.

<sup>207</sup> Leticia Miranda, *Landlords Could Exploit COVID-19 Victims to Fast-Track Evictions*, NBC NEWS, Aug. 13, 2020, <https://www.nbcnews.com/business/business-news/landlords-could-exploit-covid-19-victims-fast-track-evictions-housing-n1234220> (recounting attempted eviction of renters who had tested positive for COVID-19 as a “nuisance” and reporting that COVID “has emerged as a convenient way to facilitate” pushing out current tenants to allow for gentrification).

<sup>208</sup> Florida, *supra* note 204.

<sup>209</sup> See JOHN M. BARRY, *RISE TIDE: THE GREAT MISSISSIPPI FLOOD OF 1927 AND HOW IT CHANGED AMERICA* (1998).

<sup>210</sup> See *id.*

<sup>211</sup> See Samuel, *supra* note 165.

Similarly, Indigenous people have good reason to distrust both the government and the medical establishment.<sup>212</sup> Because of a long litany of past abuses, well-intentioned efforts to foster Native inclusion in vaccine research and to prioritize Native peoples in vaccine distribution are likely to generate suspicion and resistance. For example, when the Navajo Nation review board charged with approving medical research gave accelerated approval to enrolling interested Navajo members in the Pfizer vaccine trial to improve the trial's diversity and representativeness, "tribal members [immediately] accused their government of allowing them to be guinea pigs, pointing to painful times in the past when Native Americans didn't consent to medical testing or weren't fully informed about procedures."<sup>213</sup> Rumors spread that Navajo people were going to be intentionally infected with COVID-19 so that protective antibodies could be harvested from their blood to treat others.<sup>214</sup> Community outreach and longstanding relationships between the Johns Hopkins Center for American Indian Health and the tribe helped temper concerns sufficiently to enroll enough tribal members to allow comparison of immune responses in Native participants to those of other demographics.<sup>215</sup>

This historically-informed fear of exploitation and distrust of government and the medical profession is reflected in much higher levels of vaccine-hesitancy among racial minorities. Our survey confirms the trends observed in other research: the proportion of people unwilling to be vaccinated was lowest for white and Asian respondents (19% and 22% respectively), jumped to 36% for those who self-categorized as being "other race or more than one race," 41% for Hispanic respondents, and was highest among Black respondents with nearly 47% reporting that they were "not willing" to receive an FDA approved vaccine in 2021. We also observed a directional trend in vaccine hesitancy across income groups. Nearly 41% of those below the federal poverty line were vaccine hesitant with vaccine hesitancy decreasing in each subsequently wealthier subgroup until the number of vaccine hesitant individuals decreased to only 12% among those living at or above four-times the federal poverty line. Logistic regression modeling of our results also showed that those who do not trust the government or the mass media to deliver accurate information about COVID-19 are more likely to be vaccine hesitant.<sup>216</sup> While using tools like our vulnerability index to target vulnerable *neighborhoods* for vaccine distribution, rather than vulnerable *individuals* (particularly on the basis of race), may mitigate some of this concern, it cannot eliminate it entirely.

The ways that the vulnerable are sacrificed to protect the privileged post-disaster may be less dramatic, but they can be equally damaging. Because they typically have less political voice, vulnerable neighborhoods are often targeted for disaster-related locally undesirable land uses, such as new landfills necessitated by debris clean-up,<sup>217</sup> which aggravate existing environmental justice issues, and temporary post-disaster housing,<sup>218</sup> which can tax already strained infrastructure.

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<sup>212</sup> Melissa Sevigny, *For Native People, Coronavirus Vaccine Trial Raises Specter of Past Traumas*, NPR, Dec. 14, 2020, <https://www.knau.org/post/native-people-coronavirus-vaccine-trial-raises-specter-past-traumas> (detailing past abuses inflicted on Native people by "doctors and scientists," including forced sterilization of Native women and "misused blood samples" collected from Havasupai tribal members for unauthorized purposes).

<sup>213</sup> Felicia Fonsenca, *Fast Rollout of Virus Vaccine Trials Reveals Tribal Mistrust*, AP NEWS (Jan. 4, 2021), <https://apnews.com/article/us-news-flagstaff-arizona-clinical-trials-coronavirus-pandemic-712d482a83cb49464745fca7f8b93692>.

<sup>214</sup> *See id.*

<sup>215</sup> *See id.*

<sup>216</sup> For detailed results, see Appendix Table 8.

<sup>217</sup> Reilly Morse, *Environmental Justice Through the Eye of Hurricane Katrina*, at 12-13, [https://inequality.stanford.edu/sites/default/files/media/\\_media/pdf/key\\_issues/Environment\\_policy.pdf](https://inequality.stanford.edu/sites/default/files/media/_media/pdf/key_issues/Environment_policy.pdf); Bullard & Wright, *supra* note 196, at 25-27.

<sup>218</sup> Although there was a tremendous need for temporary housing after Hurricane Katrina, many New Orleans

Indeed, systematic data about neighborhood vulnerability like our vulnerability index can be misused by politicians and corporations to identify neighborhoods to exploit and burden.<sup>219</sup>

Indeed, vulnerability data like that generated by our index is Janus-faced: it can be a map for targeting and exploitation—for knowing where to locate disaster “bads” like landfills or where to make voting most difficult and risky; but it can also interrogate and reveal these patterns, helping us to monitor, identify, and hopefully check these kind of abuses. Without indices like ours, for example, it would be harder to detect—and even harder to prove—patterns of voter suppression during the 2020 elections. And while there is always risk that unsavory decision-makers will take vulnerability data as an instruction manual for exploiting vulnerable populations, most politicians already have at least a crude sense of which neighborhoods are politically vulnerable<sup>220</sup> so data may primarily allow them to refine, rather than discover, ways they can harm vulnerable populations during and after disasters.

## V. CONCLUSION

In this Article, we have leveraged the unique COVID-19 window into disaster vulnerability to answer the long-standing call of disaster scholars to use data-driven approaches to identify and explore the geographic dimensions of vulnerability. Our COVID-19 Vulnerability Index illuminates how sustained attention to geographic vulnerability can help policymakers triage scarce resources (such as testing centers, contact tracers, and vaccine doses) to particularly vulnerable areas and help policymakers understand where implementing aggressive public health measures or COVID-19 voter accommodations may do the most good.

At the same time, our experience has clarified that to really see and address disaster vulnerability in three-dimensions also requires attention to two additional dimensions of vulnerability that spatial data don’t fully capture: conflicting and competing vulnerability (among and between vulnerable groups) and political vulnerability. Without attention to conflicting and competing vulnerabilities, we may be insufficiently attentive to the ways school reopenings implicate many different aspects of students’ vulnerability or how speeding vaccine delivery by expanding age priorities may deepen racial inequity in COVID-19’s impacts. And, without attention to the political dimension of vulnerability, we may fail to see how localized mask mandates might stigmatize vulnerable communities or how vulnerability data might be used to suppress the vote. These examples make clear that vulnerability data can be used as both a blueprint for and a check on weaponizing or exploiting a community’s vulnerability.

Consideration of all three of these critical dimensions of disaster vulnerability—geospatial, competing and conflict, and political—makes clear how much research and policy work lies ahead. The same patterns and dimensions of vulnerability we have identified here must also be addressed internationally. We must also find better tools for identifying and addressing intersectional, cumulative vulnerabilities of individuals and groups. And, most fundamentally, we must work, at home and abroad, not only to ensure that disasters do not replicate and deepen existing patterns of

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residents nonetheless “viewed [FEMA] trailer parks as an additional blight rather than the solution to the housing problem,” ALDRICH, *supra* note 90, at 135 and many neighborhoods rejected proposals to site the trailer parks in their communities. *See id.*

<sup>219</sup> *Cf. id.* at 138 (reporting that “researchers found that many companies conduct a ‘windshield survey’ by driving through potential host communities [for undesirable land uses] and noting signs of disconnectedness, low capital, and poverty”).

<sup>220</sup> *See id.*

vulnerability but also to address and mitigate the underlying vulnerabilities of “normal times.” Sustained attention to addressing the multiple dimensions of vulnerability during disasters will not be enough without sustained attention to addressing vulnerability outside moments of crisis.