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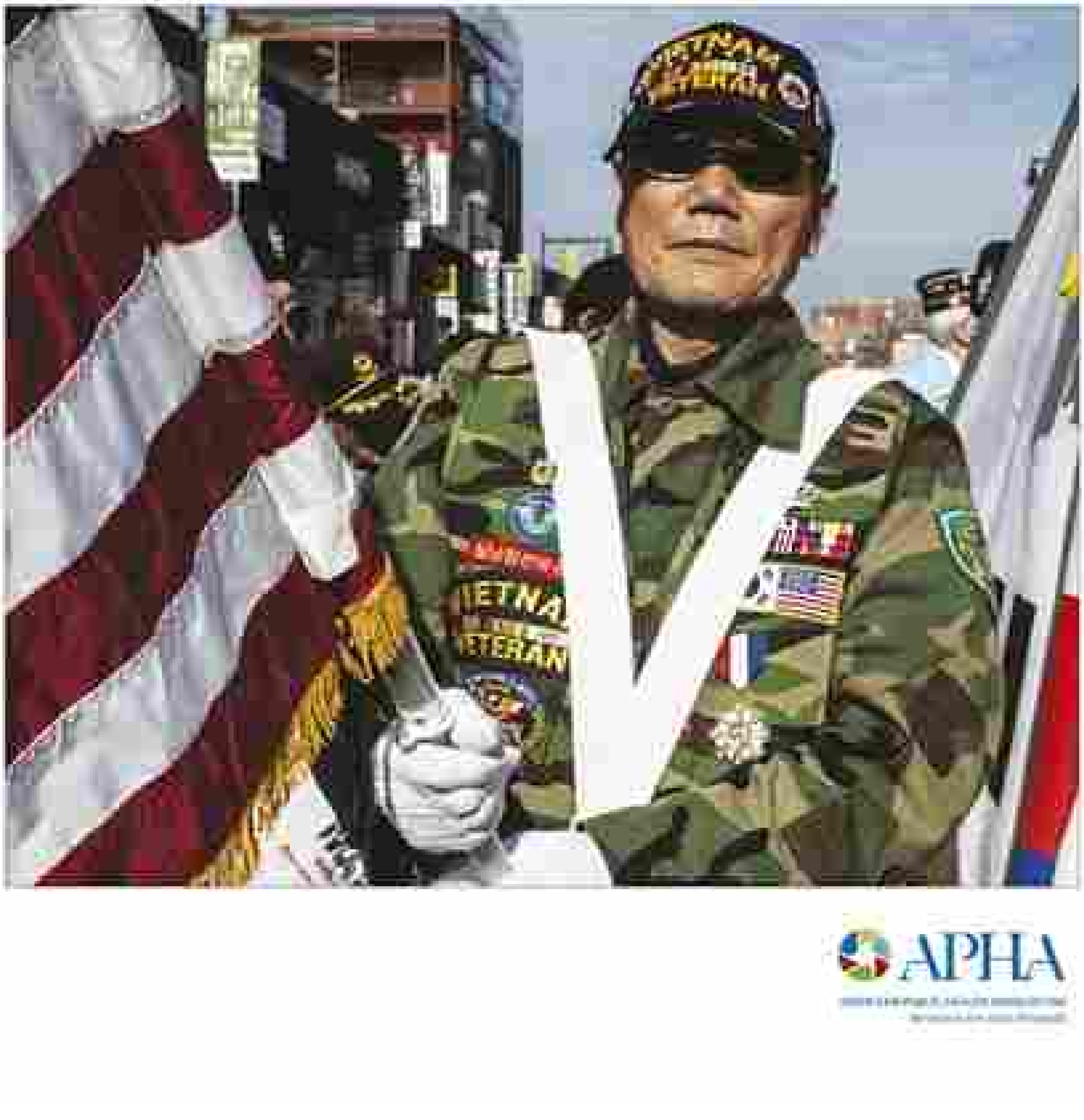

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COVER: Two members of the Monacan Indian Tribe hold hands during a ribbon cutting ceremony for the new Monacan Indian Nation Headquarters in Madison Heights, Virginia, on Tuesday, Feb 16, 2021.

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Social Justice for Marginalized Communities

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Next, Liebman et al. (p. 1456) shed light on how COVID-19 has exposed the occupational risks and health disparities experienced by farmworkers in the United States. Liebman et al. describe how community partnerships can be used to narrow the gaps in health inequities as well as the social and structural injustices that farmworkers face. In short, basic occupational protection for farmworkers is good public health policy. Similarly, Gwynn (p. 1459) describes the paradox of "essential workers" who are overexposed, overworked, and overburdened, and at the same time underpaid, undervalued, and underinsured. Blackstock (p. 1462) lays out recommendations for sustaining efforts to end the HIV epidemic, by supporting Medicaid expansion, partnering with community-based organizations, and supporting housing and employment opportunities—echoing the calls for structural changes that Basu and Moon and Ascher make. Emerson and Montoya (p. 1465) offer approaches to developing Indigenous-framed public health interventions. And Tsui and Huynh (p. 1470) issue a call to action for local health departments and schools of public health to be critical engines of change to address anti-Asian American and Pacific Islander racism and oppression.

The consistent message across all these articles is to dismantle structures and policies that have upheld marginalization and systemic racism at the federal (https://bit.ly/3fZQqKm), state, and local levels (https://bit.ly/2SFHq5t). The time has come to bring power back to communities, strengthen health care access and delivery, and, above all, confront racism in *all* of its forms to end its impact on health. We need these actions now to address the health of not just marginalized communities but the population as a whole. AJPH

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13 Years Ago

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Whetting Your Appetite for Food Advocacy

Shiriki K. Kumanyika, PhD, MPH

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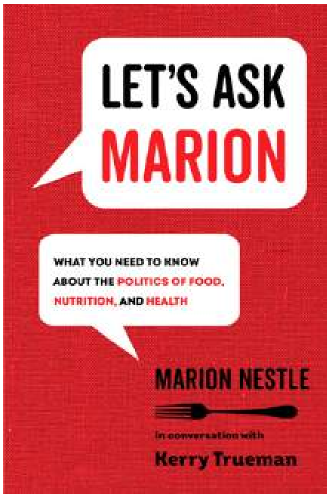

Let's Ask Marion: What You Need to Know About the Politics of Food, Nutrition, and Health
(California Studies in Food and Culture, vol. 74)
By Marion Nestle and Kerry Trueman
Oakland, CA: University of California Press;
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The US government published the first official "Dietary Guidelines for Americans" ("the Guidelines") in 1980 and publishes updates every five years.[1] These guidelines, which recommend decreased consumption of certain types of foods, may be disputed by affected food industry segments. Nevertheless, the Guidelines have endured as an important reference for how Americans can eat to reduce risks of morbidity and mortality from chronic diseases and support health and well-being. Similar to guidance issued by food and health authorities in other countries and international agencies, and consistent with epidemiologic evidence from 195 countries around the globe,[2] the Guidelines advise Americans to eat more plant foods (fruits, vegetables, grains); to eat fewer foods with high saturated fat, added sugars, and high salt content; and—in light of the unrelenting epidemic of obesity—to eat within appropriate caloric limits. However, nutrition-monitoring data suggest that the US population's mean Healthy Eating Index score has hovered around 6 (on a scale of 1–10). The percentage of adults meeting recommendations for fruit and vegetable consumption is dismally low (12% and 9%, respectively) on average throughout the United States.[3] Our food system is a big part of why this is so.

Beginning with her 2002 book *Food Politics: How the Food Industry Influences Nutrition and Health*,[4] Marion Nestle, a persistent and articulate critic of the current US food system, has continued to address the complex questions about factors that limit adherence to dietary guidance in a series of books and other writings. The title and format of her latest book are intriguing. *Let's Ask Marion* implies that "Marion" (no surname needed) is someone you should know about, which is true among public health nutrition and food policy experts, including those who differ with some of her views. The subtitle, *What You Need to Know About the Politics of Food, Nutrition, and Health,* is tempting—it hints at controversies about a topic you (should) want to know about.

The book aims to reach a broad audience, from the most naïve consumer to food and nutrition policy experts and policymakers. The text consists of a series of short essays presented in a conversational format, with Nestle answering questions posed by Kerry Trueman, an environmental sustainability advocate and author. The book's sections relate to individual, community, and global food issues. The unfolding story is of a dysfunctional food system (Nestle uses "system" to encompass the totality of food production, distribution, marketing, and consumption) that poses political and policy challenges of major proportions. These challenges extend far beyond what people might view as in the public health nutrition or public health domain, because food is linked to major, existential threats to both human and planetary health: hunger, obesity, and climate change.

The first section, "The Politics of Personal Diets and Health," answers questions that might be asked by anyone. Nestle's answers highlight the broad scientific agreement on the basics of healthy diets. She then offers explanations for consumers who may be confused or frustrated because nutrition advice is always changing. She provides guidance for thinking critically about nutrition claims and advice in the ever-changing stream of information to which consumers are exposed. The rest of the section consists of yes or no questions about low-carb diets, addictive properties of food, meat made from plants, and dietary supplements or superfoods. Nestle acknowledges that not everyone agrees with her views and that food experiences and the tradeoffs people are willing to make can be very subjective. She reminds the reader that marketing is designed to sell products and that marketers are allowed to promote them with a fair amount of latitude.

The second section, "The Community Politics of Food Choice," leaves no doubt about Nestle's agenda for change. She explains that there is currently not a food system, that is, there is no set of coordinated policies and practices designed to promote adequate food and healthy dietary choices for everyone in the population at affordable prices and to ensure that this food is safe to eat. Her use of "community" comprises food system issues that affect populations at local, state, and national levels. What the elements of the current food *non*system do is either inadequate or opposite to what might be expected from a system designed to support human survival. Five of six questions relate to understanding why the food system is the way it is, with answers designed to get readers to ask why we tolerate this situation.

Nestle uses a question about why anyone should go hungry to emphasize that the current nonsystem inherently generates and perpetuates inequities. Equity is a recurring theme here and throughout the entire book. From the introduction, we learn that the book was completed before the COVID-19 pandemic began to exacerbate preexisting inequities and cause disproportionate harm to communities of color.[5] Further on, Nestle describes how various interests in the food industry have worked against health-oriented food policies in ways that might defy common sense or common decency but have been effective.

On the question of whether we need a national food policy agency, she departs from the format of previous chapters to include a table that captures the disorganization of US food and nutrition policy. The table lists 11 different types of agencies involved with food and nutrition policies, showing each agency's mandates and oversight agency or agencies. Nestle has been one of many food and nutrition policy experts making these points about a dysfunctional or fragmented food system for some time and without much real controversy as to whether such criticism is valid. But transformative change is not occurring. The prospect of major government restructuring that would be required may be too daunting, along with the prospect of overcoming resistance from those with vested interests in the status quo.

In the third section, "The Global Politics of Diets, Health, and the Environment," Nestle counters arguments often made by food producers that practices harmful to animals, farmworkers, and consumers are necessary to have enough food to feed the world. She questions the veracity of the idea that US food producers are feeding the world based on her reading of the evidence and criticizes exportation of industrial approaches to agriculture that may undercut the ability of populations to feed themselves. Nestle also dismisses as unrealistic the possibility that the free market, with its principle of continuous growth, will act differently or any better in global markets than they do in the United States.

Nestle comments on three proposed big picture global efforts in answering questions about what comes next. She discusses the United Nations' sustainable development goals as a comprehensive and very ambitious agenda to address global human and planetary health threats but in which recommendations relevant to food systems may fail to yield the type of coordinated actions that are needed. She also comments on the EAT-Lancet Commission report as generally confirming the main messages of dietary guidance issued by national and global agencies about how dietary patterns need to change. Nestle promotes systems thinking throughout the book and, hence, sees promise in the multisystems approach reflected in the Lancet Commission on Obesity report.[6,7] The commission charts a course for addressing what she refers to as the Big Three: hunger/undernutrition, obesity, and climate change. This commission defined each of these three problems as meeting the definition of a pandemic and adapted the concept of a "syndemic" to examine them as a set of complex dynamic systems with overlapping causes and interacting effects, allowing common solutions that can be mutually reinforcing double or triple wins.

This "little book" has big messages and is well worth reading even by those already active in food and nutrition advocacy. It achieves its goal of being accessible to diverse readers. Overall, it integrates topics that are discussed separately in Nestle's previous books and that are often considered separately in public health and larger societal discourse but must ultimately be addressed by coordinated solutions. The emphasis on the importance of food systems changes for achieving societal and health equity connects to the new awareness of racial and other inequities that has come with COVID-19 and other events related to racial justice. And the conclusion calls on readers to act to solve rather than only read about these problems. AJPH

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CONFLICTS OF INTEREST

The author has no conflicts of interest to declare.

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Yes, We Can—A Cure for Public Health Catastrophism

Arnaud Chiolero, MD, PhD, and Daniela Anker, PhD

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A History of Population Health: Rise and Fall of Disease in Europe is a welcome cure for public health catastrophism.[1] The COVID-19 pandemic has indeed a flavor of doomsday and is often framed in the media and by numerous health scientists as a public health catastrophe that will change the world as we know it.[2,3] Pessimistic population health narratives are everywhere. To have a more reasonable sense of the issues at stake, it is necessary to assess the impact of COVID-19 in a global burden of diseases framework, remember where we come from, analyze trends, and take a historical population health perspective. The author, Johan Mackenbach, helps us do that through an amazing journey across death and disease in Europe in the past three centuries.

UTOPIA COME TRUE?

This book is a comprehensive description, using an impressive set of historical data, of the long-term trends in the health of European populations between the 18th and 21st centuries. The task is heroic, the author trying to address the complex and multiple—if not all—dimensions at the roots of these population health trends. He starts by asking if we are living in Utopia, and he answers himself, saying, “It is remarkable how much of [Thomas] More’s utopian health vision has been realized in the 20th century” (p. 1).

HOW CAN HE ARRIVE AT THIS STATEMENT?

Since the 18th century, the health of European populations has improved enormously, as revealed, for example, by the increase in life expectancy. Discussed in detail by Mackenbach, this is the effect of the successive decline in wars, famines, homicides, great epidemics, and nutrient deficiency as well as in maternal, infant, and perinatal mortality. More recently, the increase in life expectancy is attributable to the decrease in the mortality rate among older individuals, notably as a result of the improvement in the prevention and management of cardiovascular diseases and cancer.

The author highlights, however, important differences among European countries, especially in the timing of health improvement and sometimes with temporary setbacks—for instance, in former socialist countries following the fall of the Soviet system. These differences are mostly human made, that is, linked to economic, political, and sociocultural conditions.

RISE AND FALL OF DISEASES

One major interesting part of the book is the author’s description of the pattern of successive rises and falls of many diseases across time in European countries.[4] Reviewing trends in more than 40 health conditions, such as motor vehicle injuries, major infectious diseases, cardiovascular diseases, and cancer, he shows that most have followed a "rise and fall" pattern. For instance, the epidemics of tuberculosis and coronary heart disease followed this pattern successively in slow motion, building over decades and separated by about 50 years.[1] The author also observes that over time "delays between rise and decline have become shorter . . . suggesting that collective human action to reduce the incidence (or case fatality) of disease has become more effective" (p. 280). The book was written before the COVID-19 pandemic, but the amazing speed at which vaccines have been developed offers hope for such a quick dynamic.

How can we explain these systematic patterns? Mackenbach states,

> The general explanation for rises of disease is that human efforts to improve their living conditions often required or allowed them to undertake new activities, which later turned out to be health-damaging (p. 6).

Better living conditions and sociopolitical changes create new health risks but also the conditions for reducing these risks, and sometimes on a very short time scale.

Economic growth, however, is insufficient to explain these trends alone, and Mackenbach argues that reducing health risks requires an efficient public health sector and an accessible health care system able to deliver intervention on a large scale. Challenging British physician, epidemiologist, and medical historian Thomas McKeown,[4] he argues that recent trends, especially in cardiovascular disease and cancer, prove that public health interventions and clinical medicine have actually made a difference:

> Have these improvements been a by-product of other developments which happened spontaneously? Or have population health improvements been the result of actions explicitly intended to improve health outcomes? he asks (p. 11).

And he responds that "actions" such as public health interventions have made substantial contributions to the decline in mortality and the same would be true for medical care.

PRIME MOVER? RATIONAL THINKING

Mackenbach questions the fundamental causes behind the impressive health improvement of the European populations. Could it be physical geography, institutions, technological changes, or human capital in the form of literacy, numeracy, and other economically useful human abilities? The author argues that rational thinking is the real driving force that underlies the institutional and technological changes as well as the improvement in literacy and levels of education, leading eventually to population-wide health improvement.[5] Here we can make links to the work of Steven Pinker, defending the heritage of the Enlightenment and making the case for reason and science as drivers of continuous progress across all aspects of life, including health.[6]

Mackenbach says, "I hoped that [this book] would demonstrate that 'we can': just like we create our own diseases, we have the power to get rid of them" (p. 338). Such a conclusion is an argument for remaining optimistic and offers lessons for public health strategy at a global scale inspired by the best policy lessons we can learn from European countries, notably to address potential rising health inequalities and ecological risk. This book is also a beautiful example of how surveillance data informs public health: it is a call for rational optimism[5] and for putting evidence-based and data-driven population health science at the heart of health policymaking.[6] AJPH

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A. Chiolero drafted the book review, and D. Anker reviewed it. The authors agreed on the final version.

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COVID-19's Lessons: Scientific and Social

Steffie Woolhandler, MD, MPH, and David U. Himmelstein, MD

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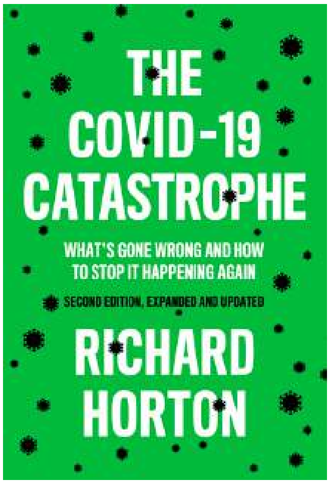

The COVID-19 Catastrophe: What's Gone Wrong and How to Stop It Happening Again
By Richard Horton
Cambridge, England: Polity Press, 2021
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Iconic (and iconoclastic) journalist I. F. Stone wrote that "[a]ll governments lie, but disaster lies in wait for countries whose officials smoke the same hashish they give out."[1(p317)] Richard Horton's lively book, *The COVID-19 Catastrophe: What's Gone Wrong and How to Stop It Happening Again*, corroborates the relevance of Stone's axiom in the age of COVID-19.

Horton, the long-time (and peripatetic) editor-in-chief of *The Lancet*, has had a unique perch for observing the pandemic's course. His journal's reputation for scientific influence and rapid publication has made it a favored outlet for landmark studies of the virus, including its clinical and social consequences and epidemiology, as well as for research on vaccine trials. Also, his broad international network of colleagues in science, medicine, public health, and public policy has given him access to insider information about the pandemic's course and government action (and inaction) in many nations.

The *COVID-19 Catastrophe* provides a quick review of the pandemic's course through early January 2021, with forays into what is known about the virus, the illness and how to prevent its spread, and vaccines. The story spans the earliest events and discoveries in China, the responses of the World Health Organization (WHO), and the spread to other Asian nations, Europe, the United States, and Brazil.

OFFICIAL LIES AND POLICY MALFEASANCE

Horton indicts officials' lies, inaction, and blunders and also notes scientists' and public health leaders' too frequent collusion in misinformation and missteps. He particularly laments British politicians' failure to heed the warnings of Exercise Cygnus, a 2016 simulation of an influenza pandemic in which it was concluded that 200 000 individuals in the United Kingdom would die and that the nation was woefully ill prepared, with the privatized and underresourced social care system for the aged and disabled a particularly weak link. Although the likelihood of a pandemic sat at the top of the United Kingdom's National Risk Register, the government took no action. Yet when COVID-19 hit, Prime Minister Boris Johnson claimed that "[w]e are well prepared" (p. 92); rather than calling out the government, the country's science advisors "became the public relations wing of a government that had failed its people" (p. 102).

As most *AJPH* readers will be aware, lies and malfeasance also characterized the Trump administration's response in the United States and that of Jair Bolsonaro's regime in Brazil, two other nations led by right-wing populists. It is tempting to conclude that would-be authoritarians are more likely to (as I. F. Stone might say) smoke their own hashish. Yet several nations with governments of a different stripe—for example, Spain, Italy, and Belgium—also fared poorly while some with authoritarian leaders (e.g., Hungary) avoided the worst of the pandemic.

Chinese authorities, after initially attempting to suppress word of the spreading viral illnesses—muzzling ophthalmologist Li Wenliang, who sounded the earliest warning—moved swiftly and forcefully to minimize infections and deaths. Heeding the lessons of the 2003 SARS (severe acute respiratory syndrome) epidemic, China had invested heavily in the science capacities needed to address pandemic threats. Within weeks of the first reported cases of SARS-Cov-2, scientists had isolated and sequenced the virus, a massive new isolation hospital had been completed, and strict quarantine measures and travel restrictions had been implemented.

Although other East Asian nations' pandemic-fighting policies varied, most were relatively successful in controlling viral spread. Singapore's strict lockdown was for the most part effective, but migrant workers, many of whom reside in overcrowded dormitories, incurred a heavy toll of infection. Hong Kong rapidly mobilized large-scale testing, and although it eschewed formal lockdowns, its populace had an impressive degree of voluntary compliance with recommended control measures. Taiwan quickly closed its border with mainland China and adopted a regime of strict quarantine. South Korea implemented intensive testing, tracing, and isolation using cell phone locations to identify contacts, a strategy that raises privacy concerns.

Outside Asia, New Zealand and Australia were able to minimize the number of COVID-19 cases, advantaged by their geographic isolation and by their governments' rapid and public recognition of the pandemic's threat and rapid mobilization to contain it. Contrary to many Western politicians' concerns that rigorous control measures would cripple their countries' economies, a number of the nations that implemented such measures accrued economic dividends (e.g., relatively rapid rebounds in production and gross domestic product).

THOUGHTS FOR THE FUTURE

In addition to the imperative for scientific truth telling, Horton draws several other lessons from the disparate patterns of the pandemic's spread. First, and most important, he urges recognition that COVID-19 is an element of a broader syndemic, the coalescence of a newly emergent pathogen in societies weakened by economic and social inequities and by epidemics of chronic conditions such as diabetes and obesity. Second, government-imposed lockdowns buy time but must be preludes to broader public health and medical interventions, as well as communications strategies that mobilize the population's cooperation and engagement. Third, health care systems must embed spare capacity, resisting the pull of market forces to maximize short-term efficiency, with particular attention to strengthening social care. Finally, the foolhardy austerity imposed on public health institutions in the wake of the 2008–2009 financial crisis must be reversed, with the public health infrastructure built back better.

Horton has both criticism and praise for WHO. He offers a generally positive appraisal of its response to the initial reports from Wuhan; having learned from its procrastination in the face of Ebola, WHO moved with alacrity to declare and respond to a global pandemic. He characterizes President Trump's withdrawal of funding for WHO as "a crime against humanity" (p. 70). But he also acknowledges WHO's glutinous bureaucracy and the rigidities and limits imposed by the nation-states that fund and govern it.

The assessment of scientists' efforts is similarly mixed: fulsome praise for the rapid development and testing of vaccines and criticism that scientists' too cozy relationships with commercial entities—and disclosure of trial results in press releases from those entities—breed public distrust and vaccine hesitancy. Further opprobrium is offered for scientists whose conviction that influenza was the main pandemic threat delayed their realization that a pandemic was upon us.

The book also ranges across the social and philosophical issues raised by the pandemic, engaging a wide array of scholarship from the social sciences and humanities, for example Didier Fassin's observation that "sickness sits at the meeting point of biology and biography" and that society confers superior legitimacy on lives taken by biological threats over those taken by political ones. In addition, Horton explores the tensions between the surveillance needed to warn of and respond to pandemic threats and the threats to liberty posed by such surveillance; the essential roles of public health and medicine and the risk of their cooptation into instruments of social control; Foucault's claim that capitalism engendered states' interest in controlling the body as an instrument of production; and David Fidler's observation that SARS (and then COVID-19) marked the first pathogens for which "sovereign states had to bend to the influence of non-state actors and global organizations" (p. 75).

Horton concludes on relatively hopeful notes. Following Arundati Roy and Slavoj Žižek, he envisions the pandemic as a portal to a better future, a catalyst for needed social and political transformation and a renewed appreciation of the centrality of health for sustainability.

The Lancet's home page declares the journal's intent "to make science widely available so that medicine can serve, and transform society."[2] It stands above other clinical journals in its willingness to engage social and political causes of ill health and its openness to heterodox views. Its editor's take on the COVID-19 pandemic mirrors the journal's scientific rigor, erudition, and high standards for prose as well as its view that social transformation is integral to medical progress. AJPH

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Mischievous Immunity: How Intellectual History Can Be Relevant for Current Public Health Practice

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See also Robertson, p. 1473.

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Herd immunity has had a banner year. After decades consigned to the writings of mathematical modelers and vaccine advocates, it burst onto the public stage in March 2020 as the world woke to the threat of COVID-19. The concept first surfaced in London, United Kingdom, where senior science advisors wondered whether herd immunity could be safely achieved by allowing the infection of low-risk individuals.[1] After this initial cameo, herd immunity took two world tours. The first involved policy, with officials in Sweden, Brazil, and the United States considering the merits of widespread epidemics. This idea received its most vigorous backing, and its most strident rejection, from the Great Barrington Declaration in October.[2] The second tour involved people: throughout 2020 observers debated whether specific populations had achieved herd immunity. Early contenders included Corona, New York (68% had antibodies in July); Dharavi, in Mumbai, India (57% by July); and Manaus, Brazil (76% by October). COVID-19's surges in spring 2021 cast doubt on those hopes.[3,4] Despite growing evidence of the efficacy of vaccination, there is also growing skepticism about whether SARS-CoV-2 will ever succumb to herd immunity. Imperfect vaccines, vaccine hesitancy, and the evolution of variant strains might allow the pandemic to persist.[5,6]

Heightened public interest has inspired scholarly investigations. Epidemiologists and clinicians have published reviews of the theory and practice of herd immunity.[7,8] Others have explored its history.[9] In "Of Mice and Schoolchildren: A Conceptual History of Herd Immunity" (p. 1473), David Robertson offers new insights. Digging deeply into writings of livestock veterinarians, he has found herd immunity's earliest occurrence yet, in an 1894 article about immunity and hog nutrition by David Salmon, the first director of the US Department of Agriculture's Bureau of Animal Husbandry. Although Salmon's understanding of immunity was quite different from modern theories, he seemed to see herd immunity as the sum of the immunities of individuals in a herd.

As Robertson shows, herd immunity came to mean different things to different scientists. In the 1920s William Topley and Graham Wilson saw herd immunity not as the sum of individual immunities but as an emergent property of a herd. In the 1950s Jonas Salk wrote about the "herd effect," the penumbra of immunity that extended beyond those who had been vaccinated. Herd immunity gained its current meanings with the work of Robert May and Roy Anderson in the 1980s. Herd immunity was often complex and multifaceted. Over the past year, however, public discourse has focused on a narrow question: what percentage of a population must be exposed or vaccinated to achieve herd immunity? Robertson's history suggests that there will never be a single answer. Salmon and a century of subsequent theorists identified many factors that shape the immune dynamics of a population. Nor will it be easy to determine whether it is better during the COVID-19 pandemic to provide partial immunity to as many people as quickly as possible (the UK approach) or to provide full immunity to half as many (the US approach). There are too many unknowns (as I write this in May) to know.

Robertson's essay also raises important questions for intellectual history. The increasing availability of digitized sources (some newly available because of COVID-19) makes it possible to search vast online collections and chart the origins of concepts. Historians have traced the emergence of "herd immunity," "virgin soil epidemics," and "risk factors."[10] Sometimes they strike gold, as with Robertson's discovery of Salmon. But this approach leaves some mysteries unsolved. What happened to herd immunity between 1894 (Salmon's work on pigs) and 1916 (Adolf Eichhorn and George Potter's work on contagious abortion in cattle)? Potter and Eichhorn worked for the US Department of Agriculture. Did they know Salmon? Another US agricultural researcher, R. R. Birch, also used the phrase around this time in discussions of swine cholera. And how did the phrase jump the Atlantic? Major Greenwood, who studied swine fever, may have played a role, but a direct link has not yet been found. As more and more sources are digitized, future historians will likely find earlier occurrences. But some answers will require traditional methods (e.g., analyses of archives and personal papers) and detailed knowledge of individual and institutional biographies.

Moreover, tracing occurrences of a phrase can only get you so far. Robertson shows how the meanings of a phrase can differ between authors and over time. Herd immunity meant one thing to Eichhorn and Potter and something else to Topley and Wilson. Are the Americans actually part of the British lineage of herd immunity? It is not yet possible to say. Sometimes it makes more sense to trace the history of an idea and not just the phrase. That is harder to do: you have to interpret sources and make judgment calls about which antecedents are relevant. Sheldon Dudley, who studied outbreaks of diphtheria at a British boarding school in the 1920s and 1930s, was close to our modern concept (i.e., what percentage of a herd must be immune for the group to be protected). Topley entertained a broader concept, in which a clean water supply or an effective public health officer could confer herd immunity by preventing the transmission of a pathogen. In 1935 he explained that the "English herd" had achieved immunity to plague and malaria because living conditions in England had improved so that those diseases no longer circulated there.[11] Although Dudley and Topley used the same phrase, they did not mean the same thing.

The science of epidemiology emerged out of the effort to understand the rise and fall of epidemics. The history of herd immunity is one piece of this long discourse, but one with enormous public interest and policy relevance today. Many of us hope to resume normal lives once herd immunity is achieved—possibly even before that milestone. The United States has invested heavily in vaccines, a reflection of our longstanding search for magic bullets.[12] Countries that can afford the vaccines are already enjoying the rewards of that approach. But the history of herd immunity suggests that alternative approaches can still have value. Salmon sought herd immunity through improved nutrition. Topley advocated optimization of public health programs. Taiwan exemplified Topley's approach: this country (and a few others) showed that COVID-19 could be controlled through strategic screening, contact tracing, and isolation. All countries should consider seriously the merits of these different ways of achieving herd immunity.

The past year has been the best of times and the worst of times for herd immunity. The new relevance of the concept has motivated substantial research that should improve our understanding of the dynamics of epidemics and our ability to model future outbreaks. But the concept has wreaked havoc on the global stage. The countries that discussed herd immunity most enthusiastically—England, Sweden, Brazil, and the United States—are overrepresented on COVID-19's bill of mortality. Perhaps "herd immunity" is a misnomer. At a March 2021 talk in Boston, Massachusetts, George Davey Smith made the case for a different phrase. Smith recognized that herd immunity was fitting when and where it originated: with US livestock veterinarians and their herds of cattle. But Smith gave more credit to the British researchers and their experiments with mice. Greenwood, Topley, and Dudley all wrote about "herds of mice," but the proper phrase for such a group is a "mischief of mice." We should join Smith in wondering whether debates would have played out differently over the past year had we all been discussing "mischief immunity" instead. AJPH

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Evaluating the Impact of Policies, Disasters, and Racism on Abortion Access: A Call for Mandated and Standardized Public Health Abortion Surveillance

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See also Roberts et al., p. 1504.

This January, the Supreme Court of the United States granted a stay in the case of *Food and Drug Administration* [FDA] *et al. v. American College of Obstetricians and Gynecologists et al.*, reinstating the FDA requirement that mifepristone, a medication used to induce abortion, be obtained by patients in person.[1] In the case, the federal government claimed that the FDA regulation was not unnecessarily burdensome during the pandemic. But this claim is unfounded. First, even without a pandemic, the entire purpose of this medically unnecessary requirement is to be burdensome and restrict access to abortion care. Second, although abortion is a common pregnancy outcome, robust state-level data were not available to assess abortion access during the pandemic.

The federal government used the total number of abortions in just two states, Nebraska and Indiana, from two years, 2019 and 2020, to defend reinstating a medically unjustified barrier to abortion during a pandemic. They did not compare medication and procedural abortions, account for trends in abortions, or compare to states that removed the in-person requirement. In this issue of *AJPH*, Roberts et al. (p. 1504) provide crucial research on abortion access during the pandemic. However, standardized and depoliticized abortion surveillance is needed so the highest court in the country does not continue to rely on “cherry-picked data” that are, according to Justice Sotomayor, “no more informative than reading tea leaves.”[1]

ABORTION ACCESS DURING COVID-19

Roberts et al. conducted a rigorous statistical analysis accounting for gestational age, abortion type, and trends in abortion care, over 29 months and across multiple states, to examine changes in abortions in Louisiana before and after the onset of the pandemic. They found that abortions decreased by almost one third and that the odds of having a second-trimester abortion nearly doubled.

State policymakers exploited the COVID-19 pandemic by classifying abortion as “nonessential” and eliminating legal access in several states. A recent study found that fewer abortions were provided in Texas, whereas more abortions were obtained by Texas residents outside of Texas during the executive order, which prohibited abortion care.[2] Although Louisiana did not eliminate abortion access, Roberts et al. argue that the categorization of essential health care was “ambiguously worded” and may have contributed to the disruption in available services and the reduction in abortions.

The reduction in abortions and an increase in the proportion of second-trimester abortions are harmful to the health of individuals, families, and communities. First, it is likely that at least some people were forced to carry a pregnancy to term against their will, which, when compared with obtaining a wanted abortion, is associated with more life-threatening conditions, poorer physical health,[3] and a greater risk of poverty.[4] Second, although abortion is safer than giving birth, it is safest earlier in pregnancy. Policymakers who demonize abortions later in pregnancy enact policies that delay access to care, pushing abortion care to later in pregnancy. Finally, as the authors argue, restricted access to abortion may result in people self-managing abortion, which carries a risk of criminal prosecution. Despite these clear harms to maternal health, data limitations constrain researchers' ability to evaluate the impact of policies, disasters like the pandemic, and racism on abortion access.

STIGMATIZATION AND POLITICIZATION

Abortion, like birth, is a common pregnancy outcome and part of maternal health. Decades of policies, regulations, and stigma among policymakers and clinicians have separated abortion philosophically and physically from other forms of pregnancy care. For example, federal Medicaid covers births and miscarriages but does not cover abortion. Most primary care clinicians provide prenatal and miscarriage care, but not abortion. And we have standardized public health surveillance for birth, but not abortion.

FACILITATE PUBLIC HEALTH SURVEILLANCE

The US public health abortion surveillance system needs to be mandated, standardized, and depoliticized. Birth data are considered a vital statistic. Federal and state laws mandate the standardized collection of birth certificate data, and the Centers for Disease Control and Prevention (CDC) provide additional surveillance through the Pregnancy Risk Assessment Monitoring System. By contrast, state reporting of induced termination of pregnancy, the CDC's abortion surveillance program, is voluntary, and data collection forms and procedures vary widely.[5] Abortion surveillance is also politicized. Some states require unnecessary and invasive information that jeopardizes abortion client and provider confidentiality. Not all states release disaggregated data, and others purposely delay data access, for example, Texas delayed releasing data until after *Whole Woman's Health v. Hellerstedt* (579 US; July 27, 2016), a Supreme Court case on abortion restrictions, was decided.

To supplement incomplete CDC abortion surveillance data, the Guttmacher Institute conducts an important national survey of abortion providers. However, data are collected every two to three years and are limited in scope at the state level. To address abortion surveillance limitations, Roberts et al. used induced termination of pregnancy data as well as data from abortion clinics. Data were not available from seven Texas clinics, thankfully representing only 7% of abortions in the state. Using clinic data, instead of or in addition to induced termination of pregnancy data, is common practice largely because of incomplete or unavailable induced termination of pregnancy data. However, relying on clinic data can further burden abortion providers and is not always standardized, feasible, or timely.

In addition to abortion surveillance, we need public health indicators of abortion access. The CDC asserts that the importance of abortion surveillance is to "evaluate programs aimed at preventing unintended pregnancies" and ultimately "reduce the number of abortions."[5(p9)] Deeming abortion a "bad" outcome further stigmatizes and marginalizes abortion. We need public health indicators that value access to a wanted abortion as a positive maternal health outcome.[6] For example, in Sweden, abortion is included in the national public health surveillance system, and the proportion of abortions before 10 weeks gestation is a quality indicator.[7] In the United States, abortion quality indicators could be added to the proposed improvements to maternal health surveillance in the 2021–2022 MOMMA's Act (117th Congress) or the Black Maternal Health Momnibus Act (2021–2022; 117th Congress, Simple Resolution 153).

Abortion surveillance and quality indicators can also be used to evaluate and improve health equity. Birth surveillance data have been used to identify how Black women experience poorer maternal health and birth outcomes and how policies or disasters negatively affect birth outcomes for women of color.[8] Yet, 21 states do not report race or ethnicity in abortion surveillance.[5] So it is unsurprising that like most studies evaluating abortion access, Roberts et al. did not examine whether changes in abortions in Louisiana differed across racial/ethnic groups. Indeed, there is extremely limited research on how abortion restrictions disproportionately affect people of color. We must build on momentum to study racism in maternal health to evaluate "how racism is working"[9] in abortion care. However, without abortion surveillance data that accurately capture race/ethnicity, it is difficult to apply novel frameworks on structural determinants of maternal health[10] or measures of structural racism[11] to abortion research.

Equitable access to abortion is a public health priority.[12] If we want more rigorous research like that of Roberts et al. and research that evaluates racism in abortion care, then we need public health indicators for abortion and a public health abortion surveillance system that respects the confidentiality of abortion clients and providers. To improve maternal health equity, our public health systems must treat abortion as the essential and common health care and pregnancy outcome that it is. AJPH

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Reducing Opioid Overdose Deaths by Expanding Naloxone Distribution and Addressing Structural Barriers to Care

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See also Razaghizad et al., p. 1516.

Increasing access to naloxone is a key component of efforts to decrease time to overdose rescue and reduce fatal opioid overdose. The past decade has seen substantial efforts to expand naloxone availability through three primary channels: (1) emergency medical services and other uniformed first responders responding to an overdose; (2) pharmacies, both via traditional prescriptions and non–patient-specific prescription mechanisms; and (3) overdose education and naloxone distribution (OEND) programs.

In an umbrella review, Razaghizad et al. (p. 1516) focus on the last of these channels by evaluating evidence regarding the effects of OEND programs on a variety of outcomes, including knowledge regarding opioid overdose response, overdose management behaviors, population-level overdose mortality, and cost effectiveness. Qualitatively synthesizing evidence from six systematic reviews, the authors conclude that OEND programs generally produce beneficial outcomes across all domains considered, although the authors' ratings for the strength of the evidence are often "limited" or "moderate."

Improvement in knowledge regarding opioid-related overdose risk factors, symptoms, and response strategies was the only domain receiving the authors' highest confidence rating. Despite variation in context, specific curricula, and participants, studies consistently find that the "OE" component of OEND programs achieves its goals. Of note, the review does not evaluate whether programs that require education as a condition of naloxone receipt provide naloxone to fewer individuals compared with distribution mechanisms in which such training is optional or highly compressed. If educational requirements are sufficiently onerous to deter individuals from obtaining naloxone, such training may be a net negative, particularly in light of the past decade's dramatic increases in opioid overdose combined with the approval and availability of naloxone products specifically designed for use by laypeople in the United States.

It is more challenging to evaluate the extent to which improved knowledge might translate to improved overdose management behaviors and health outcomes, although self-reported data suggest that OEND programs are effective in improving participants' use of recommended overdose response strategies. However, most of the underlying studies contributing to the evidence base in this domain rely solely on pre–post comparisons among OEND participants, and several lack even preperiod or baseline data.

Furthermore, the ability of OEND programs to improve health outcomes is affected by factors outside their control. In particular, OEND program participants' behaviors are fundamentally shaped by the "risk environment" in which they exist.[1] In the United States and many other countries, this risk environment is greatly affected by both stigma against people who use drugs and the continued criminalization of many manifestations of opioid use disorder, including the possession of drugs and drug paraphernalia.

This is highlighted in the data on whether program participants report calling emergency medical services when witnessing an overdose. Particularly in the US context, rates of summoning emergency medical services following an overdose incident are often strikingly low, including among OEND-trained individuals (e.g., 10%–30%).[2] Of course, disinclination to call emergency medical services for assistance following an overdose is not a failure of OEND but, rather, reflects well-documented concerns among people who use drugs that law enforcement's accompaniment of emergency medical services will result in serious legal and social consequences, including arrest for drug or drug paraphernalia possession, homicide charges, or parole violations; loss of housing; and involvement of child protective services.[3–5] Although nearly all states have enacted overdose Good Samaritan laws intended to mitigate these concerns, laws are typically limited to minor drug crimes and are undermined by the fact that people who use drugs largely do not trust police to follow the law.[3]

Given that education and training are unlikely to address these deeply rooted concerns, and in the absence of structural changes that comprehensively address the perceived and actual risks of calling 911, the "ND" component of OEND programs has elevated importance. Unfortunately, Razaghizad et al. did not examine how effective OEND programs are at providing naloxone, particularly to individuals who may be unlikely or unable to access it from pharmacies.

The extent and specifics of naloxone distribution through OEND programs are likely key factors in their ability to produce population-level reductions in opioid-related overdose mortality. Indeed, the one study with a credible causal inference design that contributes to the "moderate" evidence rating for this outcome finds a dose-dependent relationship between community OEND enrollment and, hence, naloxone kits distributed and lower opioid-related overdose deaths.[6] Although it is certainly suggestive that OENDs with broad implementation can help reduce community rates of opioid overdose deaths, it is unclear whether this one study's findings would generalize to the other forms of OEND, particularly those that do not provide naloxone to those at greatest risk or in great enough quantities to significantly improve the likelihood that it will be immediately available at opioid overdoses throughout the community.

Indeed, one challenge to synthesizing the evidence on OEND programs is that the programs vary widely in their setting, participants, intervention design, and—perhaps most importantly—volume of naloxone distributed to the communities they serve. A recent study of 247 US syringe service programs offering OEND found that they distributed more than 702 000 naloxone doses in 2019, but more than half of all doses were distributed by just 14 (6%) programs.[7] It is likely that this varied implementation generates differential effects, and better understanding the determinants and consequences of this heterogeneity can help guide the development and dissemination of effective overdose-prevention strategies. These types of details may be outside the scope of an umbrella review of systematic reviews, but they are key for identifying gaps in populations reached, potential barriers for successful implementation, and which aspects of OEND are most important for their ultimate goal of reducing fatal opioid overdose.

Overall, the evidence Razaghizad et al. evaluated provides additional support for the proposition that OEND programs improve overdose-related outcomes. The questions then become: what are the barriers to expanding naloxone access through OENDs and other mechanisms, and how can we address them?

In the United States, these barriers largely fall into the categories of financial, regulatory, and stigma. Many programs distribute naloxone without any federal, state, or local funding support,[8] and OENDs commonly report challenges with maintaining an adequate supply.[7,9] Naloxone distribution efforts also face persistent regulatory challenges, most notably the lack of an over-the-counter formulation of the medication.[10] Given the extensive evidence that naloxone is safe, effective, and cost effective, it is beyond time to dramatically increase funding for naloxone distribution and reduce barriers to both naloxone distribution and evidence-based prevention and treatment of people with opioid use disorder. Perhaps more challenging to address are concerns voiced by some that naloxone provision promotes riskier opioid use, which persist despite the majority of evidence suggesting that any such impact is far outweighed by the beneficial impacts of increased access to the medication.[11]

The conclusions of Razaghizad et al. derive primarily from studies conducted before the stark rise in fentanyl and stimulants as increasing contributors to overdose mortality. The evolution of the overdose crisis only serves to further highlight the need for multifaceted approaches that remove barriers to naloxone in addition to addressing the structural factors that contribute to opioid use disorder and opioid-related harm, including but not limited to structural racism and continued reliance on a failed model that centers criminal–legal, and not public health, approaches to people who use drugs. AJPH

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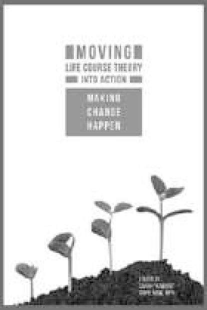

Medicaid Eligibility Expansion Is Also Associated With Improved Fiscal Health of Families

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See also Callison and Walker, p. 1522.

In January 2016, newly elected Louisiana Governor John Bel Edwards signed his first executive order—one that would expand Medicaid to hundreds of thousands of low-income Louisianans. He said then and he says now that expanding Medicaid was "the easiest big decision [he] will ever make as Governor."[1] As Secretary of the Department of Health during his first term, I was tasked by Governor Edwards to not only expand Medicaid but to also make people healthier. We undertook a variety of successful initiatives to improve the health of the state. However, it is difficult to imagine a more personally fulfilling professional task than helping to expand health care coverage—the Medicaid expansion now insures more than 600 000 Louisianans. Louisiana remains one of the poorest states in our nation, and at the time Medicaid was first expanded, approximately 40% of our state's residents were below 200% of poverty, and nearly 18% of adults lacked health care coverage.[2,3]

Although Louisiana's high uninsurance rates were universally acknowledged, the Medicaid expansion was subject to frequent and seemingly ideologically motivated attacks. The Louisiana Department of Health was interested in critically evaluating not only the health impacts of coverage but also the economic impact of expansion. To achieve this goal, the Louisiana Department of Health worked with several universities, including Louisiana State University and Tulane University School of Public Health, to commission a variety of studies to examine the evidence of the impact of the Medicaid expansion on insurance rates and the economy, among other metrics.

Louisiana State University economics professor Jim Richardson produced several studies that demonstrated that, although the primary intent of the Medicaid expansion was to improve health care for nonelderly adults, an additional side effect was a positive impact on the overall economy; Richardson's study, released in March 2018, indicated that the Medicaid expansion created an economic stimulus for the state's economy because of a net new infusion of federal dollars.[4] Richardson's study also found that Medicaid expansion sustained and created employment and increased personal earnings and state and local tax receipts. Richardson estimated a federal injection of just $1.85 billion, the creation and support of almost 19 200 jobs, state tax receipts of just over $103 million, and local tax receipts of $74.6 million.

Richardson also noted that Medicaid expansion created a new flow of federal Medicaid dollars through local economies that led to payments not only to the health care sector but also to vendors providing commodities and services to the health care sector.

Additional studies have been done that were noncommissioned, including a previous study by Kevin Callison who examined changes in hospital uncompensated care costs in the context of Louisiana's Medicaid expansion.[5] Not surprisingly, given a precipitous drop in the Louisiana uninsurance rate, the authors found a 33% reduction in the share of total operating expenses attributable to uncompensated care costs for general medical and surgical hospitals in Louisiana in the first three years after expansion.

In the current issue, Callison and Walker (p. 1522) examined the impact of Medicaid expansion on medical debt for those gaining coverage. Callison and Walker used a difference-in-difference model to compare Louisiana residents to those in nonexpansion states and found that one year after Louisiana Medicaid expansion, the number of medical collections briefly rose before declining by 8.1 percentage points or 13.5% by the third postexpansion year, and that the balances owed briefly rose before falling by 46.5%.

This study demonstrates a critically important result of the Medicaid expansion—decreased debt related to medical costs. Medical debt remains a crippling problem for many Americans—in 2019, this journal published a study by Himmelstein et al. documenting that more than half a million bankruptcies in the United States are attributable to medical debt accrued because of illness.[6]

The finding of this study, that Louisiana's Medicaid expansion was associated with a reduction in the medical debt load for those gaining coverage, demonstrates another profound implication for the individuals and families who benefit from Medicaid coverage. These results suggest that Medicaid eligibility expansion is associated with improved fiscal health of families in addition to a large body of evidence documenting lives saved and improved physical health resulting from the Medicaid expansion.[7] State leaders considering the option to expand Medicaid should weigh this important additional benefit into the calculus. AJPH

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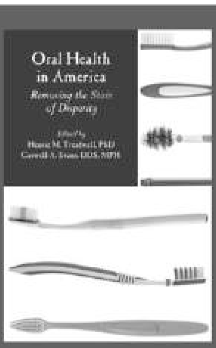

Monitoring the Spread of SARS-CoV-2 Is an Important Public Health Task

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See also Hallal et al., p. 1542.

The unique characteristics of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) have made the virus difficult to control. Asymptomatic or presymptomatic individuals account for a substantial portion of SARS-CoV-2 transmission. The high reproductive number (R_0) of SARS-CoV-2 creates the risk of exponential growth in localities where the virus has not been completely eradicated. The natural immunity period is relatively short (6–24 months). Furthermore, noncompliance with measures to control SARS-CoV-2 spread can lead to devastating public health consequences.[1] Considering the currently observed level of noncompliance with public health policies, the desirable goal of SARS-CoV-2 eradication looks elusive. As an endemic disease, COVID-19 will remain a threat. As the virus mutates, it will likely circulate throughout the globe in waves, requiring regular revaccinations. Therefore, effective public health policy[2] requires a robust public health surveillance system.

In this issue of *AJPH*, Hallal et al. (p. 1542) beautifully demonstrate the importance of sequential serological surveys to study the local spread of the virus. In the Brazilian State of Rio Grande do Sul, eight serological surveys of antibodies against SARS-CoV-2 were assessed over six months using a rapid point-of-care test performed on blood drops from a pinprick (sensitivity = ∼85%; specificity = 99.9%). Notably, the authors observed a time-dependent decline in sensitivity (up to only 42%) and applied appropriate statistical modeling to correct the decline in sensitivity over time. The study documented the spread of the pandemic in the Rio Grande do Sul, illustrating differences between Brazilian regions and suggesting the importance of local policies. Such surveys are extremely important for the timely development and implementation of local public health policies. The study by Hallal et al. is an excellent example of the statewide survey, facilitating collaboration between scientists and policymakers, public health experts, and politicians.

Many additional factors can contribute to the prolonged course of the pandemic, raising questions about the best approaches to monitor the spread of the virus. SARS-CoV-2 can be transmitted between humans and cats living in the same household, and there is evidence of cat to cat transmission.[3] Similarly, transmission between humans and other domestic and wild animals cannot be completely ruled out. The role of environmental reservoirs in the transmission and spread of SARS-CoV-2 is not clear.

As SARS-CoV-2 replicates in the gastrointestinal tract, sewage testing was recently recognized as an adjunct to patient-based surveillance and a valuable tool to assess the spread of the virus.[4] Furthermore, wastewater can be used to study the epidemiology and diversity of SARS-CoV-2 variants circulating in a community and identify new outbreaks.[5] Comparison of various surveillance methods is needed to develop the best approach. It is possible that a combination of different surveillance approaches might be needed for timely assessment of viral spread and early detection of outbreaks.

The COVID-19 pandemic has highlighted the notion of health care as a constellation of sociotechnical systems that integrate people, technology, infrastructure, culture, goals, and processes. In the modern world, a strong public health system is the foundation and innovation-driving force. A successful example of serological surveys to study the local spread of the virus in a community is a first step on the path to effective public policy and the public health messaging necessary to suppress the spread of SARS-CoV-2. AJPH

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Bridging Research and Practice to Implement Strategic Public Health Science

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See also Bunnell et al., p. 1489.

The COVID-19 pandemic has revealed a series of “fault lines” in our public health system, which include health inequities, disinformation, and insufficient surveillance systems.[1] This once-in-a-century crisis also presents significant opportunities to take stock of organizational capacities (including strengths and gaps), identify innovations to address challenges, and mobilize multiple sectors for action. In this issue of *AJPH*, Bunnell et al. (p. 1489) make the case for a new strategic public health science that seeks to fill the many gaps uncovered during the COVID-19 pandemic. In their insightful and timely article, the authors delineate six domains in need of urgent attention: health equity science, climate science, data science and modernization, communication science, policy analysis and translation, and scientific collaboration.

This scientific playbook, crafted by a team of scientists and public health leaders from the Centers for Disease Control and Prevention (CDC), builds on decades of advances in applied public health science from the CDC. For example, the Epidemic Intelligence Service, established in 1951, is the largest training program of its kind in the world and via its officers has investigated hundreds of disease outbreaks and epidemics and formalized many of the concepts of field epidemiology.[2] In seminal work published in 1963,[3] Langmuir laid the foundation for public health surveillance in the United States and globally. Since the 1960s, the CDC has developed innovations in biostatistics, ranging from mathematical modeling for infectious diseases to methods for evaluating surveillance systems.[4] The CDC has also led in the development of the “Guide to Community Preventive Services” (the Community Guide), a systematic review that makes recommendations for the use of public health programs and policies based on scientific evidence.[5]

Building on this scientific history, there is a persuasive rationale for a strategic public health science, particularly a vision that corresponds closely with the competencies for the next generation of public health practitioners.[6] For example, we need a greater entrepreneurial orientation among practitioners—with this, we can build on research from business and economics to identify and carry out innovative approaches to organizational change, resulting in a higher likelihood of evidence-based practice.

The challenges ahead involve how to implement this scientific roadmap: What will make strategic public health science a reality? Do we have the political will to comprehensively fund and carry out this ambitious agenda? What will increase the reach, relevance, and impact of future research for public health practice? How might this plan for public health science place a central focus on health equity?

STRATEGIC PUBLIC HEALTH SCIENCE

A useful framework for implementing strategic public health science is the push–pull–capacity model (Figure 1). This model posits that for science to affect practice, there must be a combination of the push (a basis in science and technology), the pull (a market demand from practitioners), and the capacity (the delivery ability of public health and health care systems).[7] The text that follows presents examples of activities to move a science-based agenda for public health forward, not an exhaustive list.

Push Imperatives

Multiple elements need attention if we are to address the push of science. First, more studies need to follow principles of designing for dissemination, which is “an active process that helps to ensure that public health interventions, often evaluated by researchers, are developed in

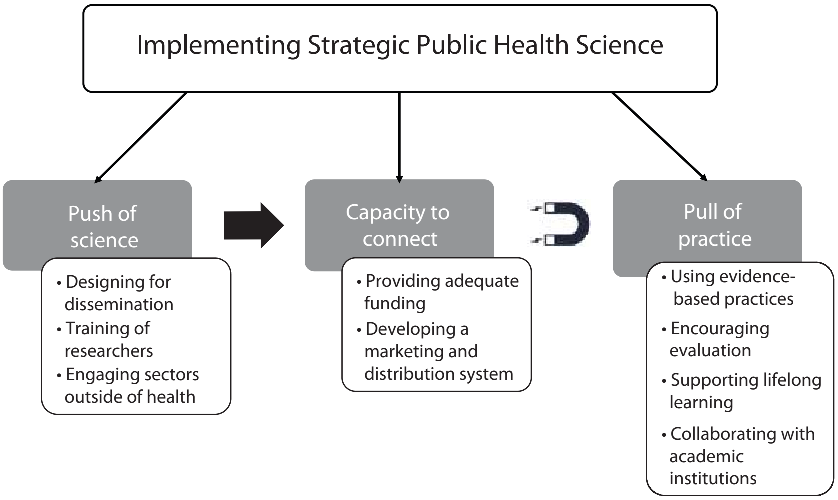

FIGURE 1— **Implementing Strategic Public Health Science in a Push–Pull–Capacity Framework**

ways that match well with adopters' needs, assets, and time frames."[8(p1695)] In particular, designing for dissemination requires the early, meaningful, and frequent engagement of multiple stakeholders in the scientific process. A second push element involves the training of public health researchers based on competencies in strategic public health science with a focus on the needs and priorities of practice. This should involve partners such as the Association of Schools and Programs in Public Health, which has a significant focus on public health competencies and educational approaches. Finally, progress in strategic public health science will require innovative approaches for engaging sectors outside health (e.g., communication, political science, environmental science). Principles of transdisciplinary team science are likely to speed up the process of multisector collaboration and research.[9]

Pull Imperatives

For strategic public health science to have the intended impacts—improving public health practice, population health, and health equity—there needs to be a stronger pull from practice. There is room for improvement. For example, in the Community Guide, only 54% of studies reviewed were practice based, which was defined mainly by whether participants were allocated to intervention and comparison conditions in their natural settings.[10] The pull from practice can be enhanced by engaged and enlightened public health leaders who (1) place a high priority on using evidence-based practices; (2) encourage routine program evaluation, resulting in more practice-based evidence; (3) support a culture of lifelong learning; and (4) develop formal collaborations with academic institutions.

Capacity Imperatives

Capacity building—the connectors between the push and the pull—is a process that results in higher levels of skills and abilities to carry out and disseminate high-quality research to address the needs of public health practice. Capacity-building efforts are often aimed at improving the use of scientific evidence in day-to-day public health practice. Capacity begins with adequate resources. For the research community, addressing the elements of strategic public health science will involve strong commitments from major funders of research (e.g., National Institutes of Health, CDC). Public health agencies have seen significant declines in per capita spending since 2010, with a 16% decline for state health departments and an 18% decline for local health departments.[11] As the implementers of the products of public health research, this gap in resources must be addressed. There is also a need for a marketing and distribution system that connects research generators with research users. Elements of such a system involve audience segmentation, how research is packaged, how research is promoted, and the evaluation of the process.[12]

IMPLEMENTATION AND HEALTH EQUITY

After priorities are refined and research–practice connections are established, the next stage for strategic public health science should involve a plan for implementation. This blueprint might describe the specific activities to accomplish pieces of the agenda, how to fund the new approaches to science, key partners, who is accountable for implementation, the time frame, and a plan for measuring progress.

Throughout implementation, a strong focus is needed on health equity. Although health equity science is one of the six domains of the approach outlined by Bunnell et al., it should also be a cross-cutting theme for implementation across all of the domains. This will require science to do things differently than in the past—ranging from the questions we pose, who defines these questions, the partners involved during implementation, how power is shared during the research process, and how findings are disseminated and applied.

The COVID-19 experience has shown us that we need to conduct science differently than in the past; this provides opportunities for practice-based research that is more innovative and equitable, resulting in approaches that place a higher value on prevention and social justice. We need to harness the recent attention on public health from the public and policymakers to reimagine our approaches to strategic public health science. AJPH

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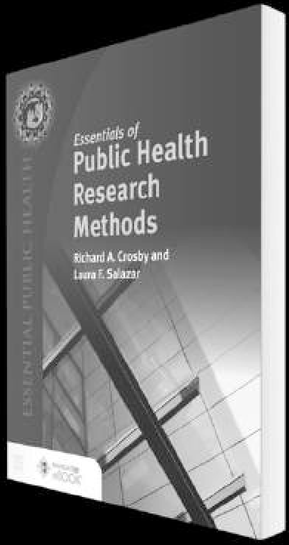

Unlocking the Means of COVID-19 Spread From Prisons to Outside Populations

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See also Sims et al., p. 1533.

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Prisons, jails, and similar facilities may foster and exacerbate viral outbreaks in certain areas of the United States. By their nature, they are semipermeable systems where the majority of those in the system live in close quarters, are largely excluded from the surrounding population, and possess severely circumscribed autonomy, mobility, and resources. The systems also include a somewhat smaller group of staff and visitors who cycle between the facility and the outside population much more frequently, interacting with both.

Clearly prison conditions are conducive to COVID-19 becoming a health threat to those in the system. What is less clear is the potential for that threat to translate to a public health threat to populations neighboring these facilities. Assessing the mechanisms behind prison to population virus transfer is further complicated by variations in factors such as the size and type of facility, reporting and disclosure, infection response protocols, prevailing politics, vulnerable versus nonvulnerable population size, and the variety of competing explanations for virus transfer.

In "Prisons and COVID-19 Spread in the United States," Sims et al. (p. 1533) add to a growing body of research on prisons and COVID-19 by investigating the possibility of virus transmission to surrounding communities. This interesting work is focused on the first wave of the pandemic as a model of what to consider for the onset of future pandemics. Those who are comfortable with reading statistical output may wish to pursue their own line of inquiry by consulting the article's detailed appendix.

Their findings, in brief, are that prisons are significantly associated with increased COVID-19 infections, but not deaths, in the counties where they are located. When broken down by type, the relationship between correctional institutions and increased infections in the county are significant only for state prisons, as opposed to federal prisons or jails. When considered from the time of virus onset, the number of cases of COVID-19 peaks around the 60-day mark and decreases thereafter.

Although this work is methodical and logically grounded, Sims et al. are careful to stipulate that, for a variety of reasons, they are unable to draw *causal* inference from this work. Three commonly accepted criteria for establishing a causal relationship between the cause and perceived effect are that (1) the cause precedes the effect, (2) the cause is related to the effect, and (3) plausible alternative explanations for the effect have been ruled out.[1] Sims et al. establish both temporal precedence and the relationship between their proposed cause (prisons) and the effect (increased COVID-19 infection). As the authors mention, it is currently not possible to rule out the possibility that the observed disparity in COVID-19 cases was attributable to greater frequency of testing in prisons. Gaps and inconsistencies in how or whether institutions report COVID-19 testing and infection data in prisons make this impossible. However, other research reports that when COVID-19 testing was conducted in prisons, something that mainly occurred in state prisons, the infection rate was found to be much greater than that of the neighboring population.[2]

The regression models explaining COVID-19 infection rates also stymie causal inference. Although the binary variable "prisons" was significant and sturdy, the model's explanatory value does not increase with its inclusion. Tables C and D, included in the Sims et al. Appendix, reveal no appreciable difference in R^2 values for a model that controls for prisons (Table D, model 2, $R^2 = 0.845$) and an otherwise identical model that does not (Table C, model 1, $R^2 = 0.845$).

This inability to establish a causal relationship is not unexpected, given the severe constraints on available data on COVID-19 in prisons. In fact, the same problem arises in other, similar studies. The Prison Policy Initiative supported a report by Hooks and Sawyer[3] that also sought to establish the link between the number of incarcerated persons per square mile and the spread of COVID-19 to the surrounding community during the first wave of the pandemic. Using a smaller set of similar covariates, Hooks and Sawyer similarly found a significant relationship between the density of internees and increased COVID-19 case load in smaller counties, but no significant relationship with deaths attributable to the infection. In another study, funded by the American Civil Liberties Union, Lofgren et al.[4] used a SEIR (susceptible-exposed-infectious-removed) model to simulate the rate of infection and death inside prisons and in the surrounding community under a range of different policies during the first wave of a COVID-19–type pandemic. In that study, models employing shelter-in-place policy severely decreased the risk to the surrounding population but predictably demonstrated little effect on those in the prison. Otherwise, models based on decreasing prison populations offered respite to those in the prison but offered a less notable decrease in the risk of infection to the surrounding population.

It should be noted that each of the above studies lacks a *causal* link between infection rates in prisons and infection rates in their surrounding populations. What each of these studies has in common is the agreement that prison populations are particularly vulnerable during the first wave of a disease event and they are not independent of the surrounding population. This intimates that the problem situation of prisons and virus transmission is not well structured, which limits the options available for effective policy response.

Prisons are not health problems in and of themselves. Rather, their structure and their relationship with the surrounding population makes them a problem situation that is subject to multiple competing conceptualizations of the actual problem. Studies such as those conducted by the American Civil Liberties Union and the Prison Policy Initiative conceptualized the problem as having to do with the size of the prison population. Alternatively, Sims et al. structured their recommendations around public health infrastructure and response coordination. It is certainly plausible that any or all of these conceptualizations offer useful policy alternatives. But this is hardly comprehensive.

Given the complex nature of this problem situation, a strong next step would be to better structure the problem of disease transmission between prisons and the community. Each of these studies share a gap between inference and prescription. Each analysis was intended to reveal the presence of a problem situation. The policy suggestions, however, are either solutions in search of problems or unsubstantiated afterthoughts.

Problem structuring is a frequently neglected process of comparing, testing, and contrasting multiple formulations of what actually constitutes the problem.[5] Whereas the problem situation appears to be the role of prisons as infection incubators and the transfer of that infection to outside communities, the actual problem is associated with the mechanisms through which the infection is transferred (e.g., visitation and consultations, incarcerated person transfer), exacerbated in the prison (e.g., impedance of preventatives, resistance to rule changes), or other aspects that may give rise to an undesirable outcome.

The variety of policies that were instituted for prisons in response to COVID-19 throughout the country[6] present the opportunity for quasiexperimentation that would aid in the problem-structuring effort by comparing their relative successes. The initial policy chaos that characterized the initial COVID-19 response in the United States could, therefore, be of benefit. But, careful work should also be done to reveal other promising, but untried, options.

In many ways, the work of Sims et al. raises more questions than it answers. But, it is important to get this work into public knowledge and onto the policy research agenda. AJPH

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Alternatives to Detention: Immigration Reform Grounded in Public Health

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See also Ly et al., p. 1497.

In this issue of *AJPH*, Ly et al. (p. 1497) outline arguments for ending immigrant detention in the United States and propose both rights-based and health-based rationale for why the United States should move to alternatives to detention. They detail various international treaties, some US-ratified and some not, that in totality secure the rights of people, including noncitizens, to physical and mental health and related protections. Given these and other legal instruments, Ly et al. systematically outline how US policy on immigrant detention violates detainees' human rights. Specifically, detention makes it impossible to realize detainees' right to health and, thus, endangers the greater public health.

Critically, Ly et al. also detail how the conditions within US immigrant detention centers, including overcrowding and lack of personal hygiene products, actively harm detainees by increasing their risk for communicable disease, which has been documented in numerous studies.[1,2] Such is the case during the COVID-19 pandemic in which some of the largest outbreaks have occurred in immigrant detention centers. The inability of detainees to physically distance, a key recommendation for decreasing COVID-19 spread, underscores how detention itself creates the greatest harm to detainees and actively prohibits their right to health.[3] Thus, Ly et al. argue for the urgent need for alternatives to administrative detention (ATDs).

As described by the authors, ATDs are practices through which asylum seekers and other relief-seeking migrants can be supported in the community setting while they await immigration proceedings. The most successful ATDs are those with robust social services including legal counsel, migrant rights–based counseling, and access to medical care, much as refugees are welcomed and supported when they arrive in the United States. It is worth noting that asylum seekers and refugees are seeking the same thing: relief from "persecution or fear of persecution due to race, religion, nationality, political opinion, or membership in a particular social group."[4] A refugee has been granted that status before arrival in the United States, whereas an asylum-seeker undergoes evaluation for relief after arrival to the United States. Notably, many more asylum seekers apply for relief than are eligible or are granted it, but the types of persecution from which refugees and asylum seekers flee are the same. Moving toward the model of welcome and support that refugees receive would have the multipronged benefit of allowing safer passage and entry to people who have both international and domestic rights to apply for asylum and also protect the general US public health by knowing more about those who enter the country.

The United States has attempted to pilot many ATD programs. One pilot program the authors describe is the Family Case Management Program (FCMP) run by Immigration and Customs Enforcement (ICE). FCMP was cut substantially short by the Trump administration, citing excessive cost. These changes were despite the Department of Homeland Security's own budgetary analysis in 2019 that demonstrated that US taxpayers paid $133.99 per day to detain an adult and $319.37 per day to detain a family in immigration detention, whereas the costs of an ATD program would be $4.13 per day for an adult and $36 per day for a family.[5,6] Official reports of the FCMP showed compliance rates of 99% with court appearances.[6] However, the FCMP was run by private contractors, which receive far more federal funding to operate detention centers than they do to run ATD programs.[5] According to public filings by one private contractor, ICE accounted for 25% or more of the total revenues earned from 2017 to 2019, representing nearly $1.5 billion paid for immigration detention programs.[7] Thus, the lack of commitment to ATDs may not be driven by high costs but, rather, by financial rewards that incentivize detention over ATDs in the private sector. Future ATD programs in the United States may be most effective when run by local community service providers that seek to provide wrap-around services that include case management, legal counsel, and affordable housing, rather than by for-profit companies.

Moreover, as Ly et al. note, examples of ATDs can be found globally including in Costa Rica, Ecuador, and Sweden. These countries have ATDs specifically for asylum-seeking children and unaccompanied minors. Importantly, some ATDs, like those in South Korea, have been particularly useful during the COVID-19 pandemic as they have served as a way to test and treat more than 390 000 undocumented immigrants without arrests, thereby helping curb disease spread in this population and within their broader communities.

Presently, Ly et al. are completing a comparative analysis of migration laws and policies around the world, including use of detention and provision of ATDs. Their findings have the potential to greatly improve understanding of global best practices for rights-respecting immigration policies. However, to maximize the comprehensiveness and utility of their study, there must be inclusion of rigorous analysis of how these laws are implemented and enforced. For example, the Flores Settlement Agreement requires children in the United States to be detained for fewer than 72 hours by the Department of Homeland Security (i.e., Customs and Border Patrol and ICE) before either release or transfer to the custody of the Office of Refugee Resettlement.[8] Yet, as shown under multiple administrations at varying points in time, this rule is violated frequently.[9] While law and policy provide theoretical defenses, it is their implementation and enforcement that result in either protection or violation of detainees' rights.

Civil immigration detainees who have not been convicted of a crime also have legal protections under the US Constitution and case law. Under the Due Process Clause of the Fifth Amendment, federal detainees who have not been convicted cannot be held in conditions that amount to punishment.[10] Detention facilities are required to provide medical care based on standards set by the US Secretary of Health and Human Services and ICE detention standards. Facilities are also required to provide access to legal support (e.g., law library, attorney visits, legal mail, immigration hearings), recreation, family contact and visitation, and the opportunity to practice religious beliefs.[11] While scholars and advocates often lean on international treaties on human rights to demand legal security for detainees' rights, litigation in the United States has historically been necessary to demonstrate when these rights are not upheld. Thus, collaboration with litigators will be integral to establishing an immigration system grounded in public health.

For these reasons, we must heed Ly et al.'s recommendations to end immigrant detention and embrace ATDs while also implementing a multipronged approach that utilizes the rights-based arguments to create systems of implementation and accountability that ensure detained migrants' rights are upheld. Collaboration among governmental agencies including the Department of Health and Human Services, human rights lawyers, and medical and public health practitioners will be needed to create accountability measures. Furthermore, investments in partnerships with community-based organizations will strengthen the development of ATDs and move away from current for-profit management of detention alternatives. Lastly, with the aid of the findings from Ly et al.'s aforementioned global comparative analysis, improvements in current ATD models as well as domestic law to uphold their reliability will help ensure divestment from the current detention system. AJPH

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CONFLICTS OF INTEREST

R. Mishori is the senior medical advisor for Physicians for Human Rights. K. R. Peeler is a pro bono medical expert with Physicians for Human Rights.

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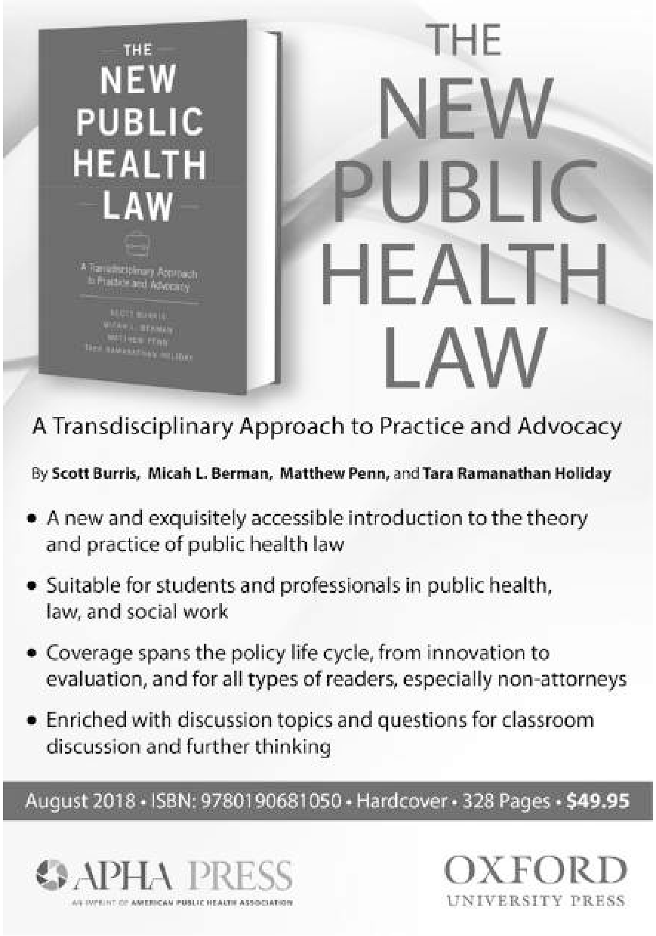

Tallying the Ancillary Consequences of COVID-19

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See also Roberts et al., p. 1504, Zhu et al., p. 1518, and Sims et al., p. 1533.

The COVID-19 pandemic has been the defining public health crisis of this generation. At this writing, almost 600 000 Americans and more than 3 million people worldwide have died of COVID-19. In the United States, COVID-19 was the third leading cause of death in 2020, which is remarkable for a disease first diagnosed the last day of 2019. In parallel with the direct consequences of the virus itself, in the United States efforts to control the spread of COVID-19 occasioned a wholesale transformation of how the country operated, which has its own health implications.

Unemployment rose in early 2020 to the highest levels that the United States had recorded since 1948, when data collection started, and by April 2020 every state had reached unemployment rates higher than those experienced during the Great Depression of the 1930s.[1] More than 45 million people filed for unemployment during the pandemic, or nearly as many people as live in half of US states.[2] As K–12 schools closed to in-person learning, nearly all US schoolchildren had disrupted learning during the pandemic,[3] resulting in substantial potential learning loss among a generation of children.[4]

We anticipate that there will be emerging science from which we can learn much in the coming months and years that documents the long-term health consequences of these economic and educational losses. As the science slowly advances this understanding, three articles in this issue of *AJPH* begin to better quantify the health losses ancillary to COVID-19, pointing the way to both where health burdens will accrue in coming years and how we can better act to mitigate similar consequences of future outbreaks.

Taking a big picture view, Zhu et al. (p. 1518) document disease-specific excess mortality throughout 2020. Using data from the National Center for Health Statistics, they find higher mortality from a range of other diseases that started soon after the outbreak of the COVID-19 pandemic and continued throughout 2020. Interestingly, the number of excess deaths from cardiovascular disease mirrored increases in COVID-19 cases, offering hints about the reasons for these excess deaths. Zhu et al. suggest that essential health service disruption—worse when the pandemic was worse—may account for the concurrent increase in deaths. We suggest that changes in anxiety and other mood disorders that accompanied the worsening of the pandemic might also explain this observation, building on well-established observations both of worsening mental health during the pandemic[5] and that poor mental health and social isolation are linked to greater cardiovascular disease risk.[6]

In quite a different analysis, Roberts et al. (p. 1504) echo the theme of service disruption affecting mortality well beyond the direct impact of the virus itself. The authors used monthly service data from abortion clinics in Louisiana and neighboring states and showed that the number of abortions per month among Louisiana residents decreased by 31% after the pandemic and that the odds of having a second trimester abortion increased. These findings, largely consistent with previous work in Texas,[7] show how service disruptions during COVID-19 extended well beyond the services that we may typically think of as being related to the virus itself. Importantly in this case, an ambiguously worded directive from the Louisiana health department about whether abortion was an essential service may have contributed to clinic closures in Louisiana, reinforcing the importance of attention to service provision changes in the context of a pandemic that can have substantial implications for population health.

The third article following this theme in this issue of *AJPH* looks at a different aspect of the pandemic's impact (Sims et al., p. 1533). Merging data collected by the Department of Homeland Security on the location of all federal prisons, state prisons, and local jails with COVID-19 case and death counts collected by Johns Hopkins University, they show that the presence of a state or federal prison was associated with increased county-level COVID-19 cases. This suggests that public health needs in US counties may be greater in areas where there are larger prison facilities and may point to the need for more services focused on such counties. This article, taken together with the other two articles discussed here, suggests that areas where there may be high viral spread—as in where there are prisons—may go on to have a higher burden of need during a pandemic, in terms of both viral infection itself and its ancillary health consequences.

These articles, and the science that we expect to see emerge in coming months, contribute to our understanding of the pervasive influence of the COVID-19 pandemic on our health across several domains. They also point to our need to anticipate the pervasive direct and indirect influence of pandemics on health, so we can mitigate the consequences of such events. Fundamentally, our response to COVID-19 nationally has been marked by efforts to mitigate viral spread, centering on efforts at limiting mobility and social contact. Those efforts were indeed essential early in the pandemic. However, as we are now learning, those efforts came with substantial ancillary costs. This includes the limitation of other services that paved the way for poor health in multiple other domains. In addition, even as we moved to limit contact in the general population, we did far less than we should have to reduce the risk of acute spread in areas where we had enforced congregate living, such as in the prison system, which has long been growing as part of the US system of mass incarceration. This added an undue burden, not only on those incarcerated but also on the communities that surround these prisons.

These observations push us to examine the scope of our thinking when we consider the risks and benefits to particular approaches to pandemic control in future outbreaks. A fuller exploration of the pros and cons will require more definitive accounting of the direct and indirect costs of the pandemic and of how the costs could have been lowered with different approaches to the pandemic in 2020. We look forward to the science evolving and learning from it to improve how we think about—and act in—future pandemics. AJPH

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CONFLICTS OF INTEREST

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Joining Health Care and Homeless Data Systems Using Privacy-Preserving Record-Linkage Software

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Homelessness dramatically reduces life expectancy and contributes to poor health outcomes directly (through exposure to the elements and violence) and indirectly (through poor management of chronic medical conditions).[1,2] The prevalence of chronic medical conditions that would benefit from primary medical care is high among people experiencing homelessness; however, emergency departments often function as the site of health care, resulting in fragmented care at the level of the institution or provider.[3,4] Despite evidence demonstrating the beneficial effects of permanent housing with supportive services for some people experiencing homelessness,[5] there is uncertainty regarding the long-term impact on health.[6]

As many regions of the United States attempt to address the increasing number of people experiencing homelessness, housing advocates are eager to better understand the needs of potential clients and receive feedback on the impact of interventions on health services utilization, quality of life, and mortality. Additionally, there is a need to better estimate the number of people experiencing homelessness and to establish a system to prioritize limited housing based on factors such as chronicity of homelessness and vulnerability—a concept that often includes medical comorbidities.

Gaps in counting, characterizing, and tracking outcomes of individuals experiencing homelessness could be addressed in part through cross-sector data linkages—especially between databases capturing housing services (regional homeless management information systems [HMIS]) and health care services. In addition to providing information to housing agencies, such linkages could spare participants from the redundant collection of medical histories across the many access points of disjointed systems. Although the value of longitudinal, comprehensive databases has been recognized for many years, most database projects have been realized within local governmental entities or the Veterans Health Administration system, which is advanced in its ability to join geographically distinct health centers.[7,8]

The rarity of data sharing beyond intragovernmental partnerships and affiliated health centers results from challenges of data governance, privacy, and technical barriers for privacy-preserving record linkage. People experiencing homelessness often have diagnoses (e.g., substance use disorders) and life experiences (e.g., incarceration) that justify strong protections around data sharing. Protecting privacy through anonymizing databases is one option; however, the anonymization process complicates joining data between agencies and databases. The evolution of methods for privacy-preserving record linkage and increased software options[9,10] in concert with the growth in large national data networks provides novel opportunities for data integration across disparate systems.

We provide a perspective from a project undertaken in the Chicago, Illinois, region, where we overcame challenges and assembled a data set that captured health services utilization, medical conditions, and housing services across separate health systems. We joined data from two HMIS entities (Chicago and suburban Cook County) to the Chicago Area Patient-Centered Research Network (CAPriCORN)—a regional data infrastructure node that is part of a national initiative (PCORnet) funded by the Patient-Centered Outcomes Research Institute and composed of health systems to increase the efficiency of carrying out population research initiatives.[11,12]

DATA-SHARING INFRASTRUCTURE

We used the PCORnet platform to aggregate data across six disparate health systems and joined these data to data extracted from HMIS's community-based proprietary database (WellSky Inc., Overland, KS). HMIS databases are regional, with each geographic region implementing its own platform. Housing services data extracted from HMIS are not routinely captured by the electronic health records of health systems; therefore, they are not included in PCORnet's common data model. PCORnet supports a living common data model that is refined episodically and could expand to data sets not historically captured in clinical care settings. Foundational to PCORnet is the use of technologies that permit institutions to participate in shared data analyses while maintaining oversight of identifiable data in their own infrastructures.

By building databases that reside in each institution but adhere to the structure of PCORnet's data model and connect through a shared query platform, CAPriCORN performs analyses on de-identified data across nine participating health care systems. Because PCORnet databases are updated quarterly, the system is designed for retrospective analytic data sets and not real-time data exchanges. Central to CAPriCORN is an administrative infrastructure with data use agreements, a centralized institutional review board, a steering committee that prioritizes proposals, and a nonprofit honest broker to enable de-identified data linkages (MRAIA Inc., http://www.mraia.org, Chicago, IL).

Privacy-preserving record linkage is a novel method by which person-level identifiers, such as name, date of birth, Social Security number, and gender, are replaced using an irreversible one-way algorithm (hashing) to create a unique code no longer considered identifiable per HIPAA (the Health Insurance Portability and Accountability Act).[13] Using privacy-preserving record linkage, queries extract data attached to these unique codes from disparate systems to create a de-identified data set (Figure 1). Because all participating institutions use the same hashing process (Health DataLink, acquired by Datavant Inc.), de-identified data are joined using these unique codes while preserving HIPAA privacy requirements. Data are subsequently aggregated through a central hub, which does not contribute data and thus can join and de-duplicate data without risk of reidentification.

To evaluate our health system and homeless system data linkage, we created an analytic data set protected even further by replacing hashed IDs with a nonderived study identifier after aggregation and de-duplication steps. We identified homelessness in health systems through a relatively specific *International Classification of Diseases, 10th Revision* (*ICD-10*; Geneva, Switzerland: World Health Organization; 1992) code: Z59.0. Among those identified as homeless by *ICD-10* codes, we captured medical comorbidities and patterns of health care utilization. By linking databases, we identified the following discrete typologies: homelessness only recognized by the health system without housing services, homelessness with housing services other than stable housing, and homelessness with provision of stable housing. Our model for joining data across health systems and incorporating data from other entities serves as a template for linking data while preserving privacy.

COUNTING HOMELESSNESS

Valid estimates of persons experiencing homelessness are an ongoing challenge for homeless advocates and government policymakers in Chicago and suburban Cook County. Methods for enumerating people experiencing homelessness are labor intensive and better developed for capturing the "literally homeless" as defined by Rossi et al.[14]; point-prevalence estimates miss some individuals cycling through homelessness because of institutionalization or impermanent housing.[14] Our process for linking data systems enabled us to more completely quantify homelessness by including both recipients of housing services and those coded as homeless during health care encounters. Our joined list of people experiencing homelessness revealed that approximately one in five patients were identified solely by *ICD-10* code. To minimize false positive indicators of homelessness, we excluded *ICD-10* codes that were conceptually less specific than Z59.0: Z59.1—"Inadequate housing," Z59.8—"Other problems related to housing and economic circumstances," or Z59.9—"Problem related to housing and economic circumstances, unspecified." Inclusion of additional Z59.x codes increases detection of homelessness[15] but with an expected cost of reduced specificity.

CONDITIONS AND HEALTH SERVICES USE

Self-reported medical conditions among people experiencing homelessness are captured by regional HMIS databases. Although people experiencing homelessness report health services utilization with

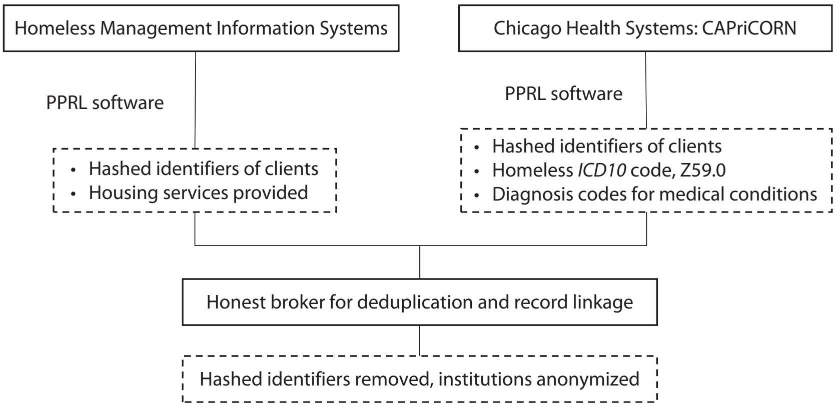

FIGURE 1— Schematic Depicting the Record-Linkage Infrastructure to Join Data From 6 Regional Health Care Systems and 2 Regional Homeless Management Information Systems: Chicago and Suburban Cook County, IL

Note. CAPriCORON = Chicago Area Patient Centered Outcomes Research Network; *ICD-10* = *International Classification of Diseases, 10th Revision* (Geneva, Switzerland: World Health Organization; 1992); PPRL = privacy preserving record linkage.

moderate to good reliability,[16] incomplete reporting of conditions is possible for those with impaired recall or understanding of their medical history. We captured chronic conditions documented by health systems' diagnostic codes and patterns of health services and, not surprisingly, found stark differences across homeless typologies. Ordered by decreasing intensity of housing services (i.e., stable housing, unstable housing, and no homeless services), there was a monotonic increase in emergency department visits (including mental health or social service visits). Individuals experiencing homelessness without housing services experienced fragmented care across emergency departments and had the highest prevalence of substance use disorders and mental health conditions. These findings were expected based on previous literature and likely related to diagnoses (psychiatric or substance use disorders) that contribute to disorganized receipt of health care.[17] We are now able to quantify and characterize a difficult to engage population—homeless individuals not recorded in regional homeless databases—and track the impact of future interventions on health services utilization.

CHALLENGES AND FUTURE OPPORTUNITIES

In the United States, it remains a challenge to join data across entities responsible for health care and homeless services, especially when most entities are not part of the same governmental or health system administrative structure. Barriers include technical logistics, privacy concerns for a vulnerable population, lack of trust given the novelty of such linkages, data ownership, and proficiency to prepare and transfer data. These challenges are compounded in regions without a health information exchange to assemble health data across institutions. A critical step for our success was the gradual establishment of trust built through collaborations in a regional Housing for Health collaborative that assembled housing providers, government agencies, philanthropies, health systems, and health services researchers. Building on the developed administrative infrastructures and underlying technology promoted by a national research network (PCORnet), we overcame cost, data ownership, privacy, and technical barriers. We have developed an open source record-linkage software system available for download (https://linkja.github.io) that has been subsequently used for additional data linkage projects; we joined homeless data with data from Cook County's adult probation agency, health system, and medical examiner's office.

The realization of this unique data linkage showed that there was a discrete subset of homelessness identified solely by health systems characterized by extremes in health care fragmentation and mental health and substance use disorders. Our hope is that our findings—care fragmentation and reliance on emergency departments for health care—will motivate health system leaders and payers to contribute to housing solutions. Chicago has initiated a flexible housing subsidy pool, which is modeled after a program in Los Angeles County, California.[18] Given the severe financial impact of COVID-19, we expect a future surge of homelessness precipitated by job loss and medical bills. Linkages between medical and housing systems will be increasingly important and can expand to other domains, such as food insecurity. Common data models such as PCORnet's could become more valuable by incorporating of tables dedicated to harmonized representation of housing data.

Our project serves as one template for realizing data linkages across health sectors that extend beyond medical systems. We demonstrated how a regional collaboration between health systems, an honest broker for data linkage, and homeless information systems could overcome barriers to generating knowledge beneficial for addressing a critical social determinant of health—housing homeless individuals.

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W. E. Trick analyzed the data and drafted the editorial. W. E. Trick and J. C. Hill drafted data use agreements. W. E. Trick, J. C. Hill, and P. Toepfer contributed to convening partners. W. E. Trick, J. C. Hill, P. Toepfer, F. Rachman, and B. Horwitz interpreted the data. W. E. Trick, J. C. Hill, P. Toepfer, F. Rachman, and A. Kho conceptualized the project. All authors edited the editorial.

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CONFLICTS OF INTEREST

A. Kho is a strategic advisor and equity holder in Datavant (through Acquisition).

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Income and Income Inequality Are a Matter of Life and Death. What Can Policymakers Do About It?

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Poverty and inequality are among the most pressing and persistent problems in US society, and the COVID-19 pandemic underscores how perilous—and deadly—inaction on these issues can be. People with low incomes work essential jobs in transportation, food production and delivery, health care, and other service-oriented industries that put them at risk for contracting COVID-19 and may compound existing health, social, and economic challenges they faced even before the pandemic. Additionally, about half of these low-wage workers are non-White and are more likely to experience barriers to health care and suffer from comorbidities than their White counterparts because of systemic racism.[1] Beyond occupational risk, people with low incomes suffer from more comorbidities that heighten the risk of infection and hospitalization. Data from Medicare, for example, showed that low-income older adults were more likely to be diagnosed with and hospitalized for COVID-19 (Figure 1)[2]; once hospitalized for COVID-19, older adults and those with certain underlying medical conditions face a mortality risk of 30% or higher.[3] The COVID-19 pandemic clearly shows that income inequality is a matter of life and death.

In stark contrast to the experience of low-income populations, high-income individuals were significantly more likely to keep their jobs and telework after social-distancing guidelines were implemented across the country. The extremely wealthy have fared even better; estimates from advocacy organizations suggest that the wealth of US billionaires has increased by $1.1 trillion since March 2020, signifying that they have not only recovered but have become richer since the pandemic started.[4] This finding clearly illustrates how income and wealth inequality is perpetuated in the United States. Meanwhile, tens of millions are still unemployed, with some of those receiving unemployment benefits, and the poverty rate increased from 9.3% in June 2020 to 11.8% in December 2020, with the steepest increases among Black individuals, children, and people with a high school education or less.[5,6] Without deliberate interventions, economic recovery from the pandemic will surely be hardest for the most vulnerable and marginalized populations.

INCOME SHAPES HEALTH AND LONGEVITY

Because income is a significant, well-documented determinant of health, the effects of low income and income inequality are reflected in population health. Referred to as a "cause of causes" or "fundamental cause" of health outcomes, income shapes the resources at our disposal, the disease risks we are exposed to, and our ability to mitigate these risks.[7] Decades of research have shown that low-income people have poorer self-reported health and higher rates of communicable and noncommunicable diseases and injuries because of a constellation of risk factors, such as smoking, unhealthy diet associated with food poverty and insecurity, stress and anxiety, and unemployment and job insecurity, among others.[8,9] Income influences health throughout a person's life course; for example, low-income mothers are more likely to have babies with low birth weight, which, in turn, is associated with negative physical and mental health outcomes.[10] Among older adults, low wealth—a more appropriate measure of socioeconomic position at older ages than income—is associated with a more marked decline in physical and psychosocial functions.[11]

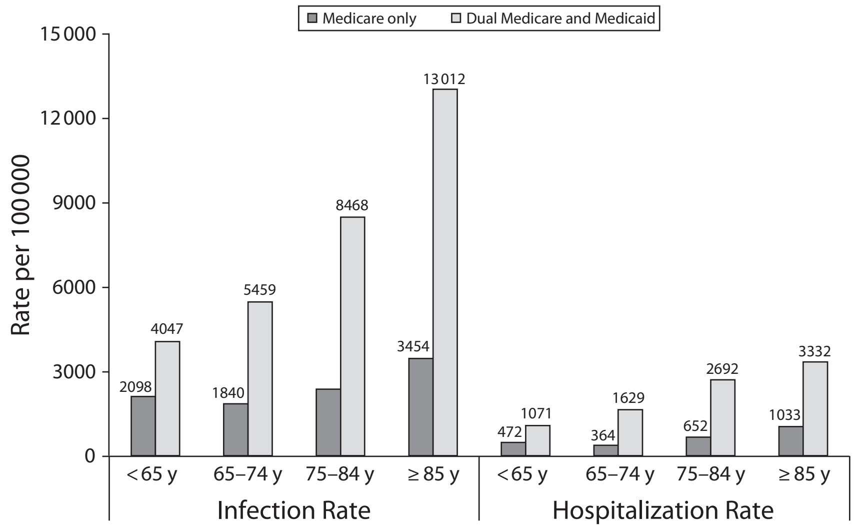

FIGURE 1— COVID-19 Infection and Hospitalization Rates Among Medicare Beneficiaries: United States, January 1–November 21, 2020

Note. This figure shows COVID-19 infection and hospitalization rates per 100 000 Medicare beneficiaries by age group as reported by the Centers for Medicare & Medicaid Services.[2] More than 12.2 million primarily low-income Medicare beneficiaries also qualify for their state's Medicaid program and receive either full or partial benefits. At any age, dual-eligible beneficiaries experience higher rates of COVID-19 infection and COVID-19–related hospitalizations.

Additionally, the presence of income inequality itself has been linked to negative health outcomes. There has been a significant increase in income inequality in the United States since the 1980s following deliberate government policies to reduce tax rates and shrink social safety net programs. Today, 50% of all household income goes to the top 10% of earners, and only 13% goes to the bottom 50% of earners. Similarly, 31% of household wealth goes to the top 1% of households, and only 2% of household wealth is held by the bottom 50% of households.[12,13] It is important to note that racism has played a significant role in creating the income and wealth differential in the United States; in 2019, the typical White family had eight times more wealth than a typical Black family ($184 000 vs $23 000).[12]

Increasing income inequality has coincided with disparities in health and longevity. For example, societies with wider income inequalities have been found to have higher rates of interpersonal violence and mental illness.[14] There has also been an increase in gaps in survival between high- and low-income individuals, with top earners increasing their life expectancy and low-income individuals decreasing theirs.[15] Although inequality is an ecological phenomenon, one potential mechanism for how it affects individuals is through a psychosocial pathway; research suggests that inequality is a "social stressor" that causes social anxiety and chronic stress and erodes social support and cohesion, which are essential health resources.[14,15]

The effect of income on health is arguably most consequential in its role in extending life, and there is strong evidence for the negative, nonlinear association between income and mortality in the United States. For example, three studies using distinct longitudinal panel data have consistently shown that adults with higher personal or family incomes face lower rates of all-cause mortality.[16–18] One of these studies estimates that after adjusting for race and age, people in the highest income decile (≥ $105 500 per year in 2019 dollars) have incident mortality rates that are 38% lower than the rates of those with an average household income (approximately $52 500–$63 500 per year).

On the other hand, people in the lowest household income decile (≤ $11 500 per year) face incident mortality rates that are more than two times higher than the rates of people with average incomes. Another recent study, which used 1.4 billion tax records, showed that there is a 14.6-year life expectancy difference between males in the top 1% and the bottom 1% of the income distribution; among females, the difference is 10.1 years.[19] In addition, the advantage in longevity among high-income individuals grew between 2001 and 2014. This relationship between income and mortality holds even when lifetime earnings or wealth are used as measures of exposure. Additionally, sudden decreases in income or wealth are associated with a higher risk of death.[20]

Income's effect on health often follows a "social gradient," or stepwise pattern, whereby people with incrementally higher incomes fare better than their lower-income counterparts.[7] This pattern is often cited as a rationale for paying attention to people across the income distribution because a narrow focus on people with very low incomes would miss those in the middle, whose health is also negatively affected by inequality. Although a gradient is observed between income and mortality, income gains among people with high incomes provide lower returns in longevity than do income gains among people with low incomes. For example, one study found that increasing one's annual income from $14 000 to $20 000 (a $6000 increase) would have the same benefit in life expectancy as increasing one's annual income from $161 000 to $224 000 (a $63 000 increase).[19] In another study, individuals with annual household incomes below $49 100 (in 2019 dollars) had the greatest reduction in mortality risk from an increase in income; the benefit among people with higher household incomes was smaller and not statistically significant.[18]

These findings highlight the importance of broad strategies that will benefit people across the income distribution; at the same time, the diminishing returns of increased income on mortality also emphasize that people with the lowest incomes have the most to gain from policy interventions and should be prioritized. As one study aptly concludes, people with lower incomes are "paying with their lives to sustain high inequality."[16(p187)]

THE POLICY OPTIONS

With the election of President Joseph Biden and Democratic control of Congress, there is renewed hope for federal policy to address income and wealth inequality in the United States. We briefly describe several ideas with varying complexity, feasibility, and popularity; President Biden, Vice-President Kamala Harris, and other Democratic presidential candidates advocated many of these while campaigning before the election. Our aim here is not to be exhaustive or prescriptive; instead, we illustrate the gamut of options that can address income inequality now and in the long term.

At a minimum, providing cash and in-kind support (e.g., through the Supplemental Nutrition Assistance Program or cash assistance) to individuals and families experiencing poverty is paramount, especially during the current period of significant job loss and uncertainty. President Biden issued an executive order authorizing an expansion of the Pandemic Electronic Benefits Transfer program that increases the dollar amount low-income families receive to cover food costs for children who would have received meals through school. The executive action also increased Supplemental Nutrition Assistance Program allotments, and these are important first steps. For workers risking their health to earn a living and provide essential services during the pandemic, hazard pay is a straightforward and fair solution that can help low-wage workers while the pandemic is ongoing.

In the medium to long term, several policy options can be explored. One approach is to increase the minimum wage. Although several states and cities have passed local ordinances to increase their minimum wage and President Biden has signed an executive order to raise the minimum wage of federal contractors, the federal minimum wage, which sets a pay floor for all states, has not changed since 2009—the longest period without an increase in its history. Even more concerning, between 2009 and 2019, the inflation-adjusted value of the minimum wage has decreased by 17%, leading to significant losses for minimum wage workers.[21] The Congressional Budget Office estimates that increasing the federal minimum wage from $7.25 to $15.00 per hour by 2025 would increase the incomes of up to 27 million low-wage, predominantly Black and Brown workers and lift close to one million people out of poverty.[22] However, poverty alleviation should not be the only goal in increasing the minimum wage, especially because many people will still be unable to cover all their local costs of living at $15 per hour.

Although increasing the minimum wage may lead to some job loss as the Congressional Budget Office has recently projected, significantly more low-wage workers will benefit from such a policy, leaving them better off as a whole. There is also evidence that jurisdictions that increased the minimum wage experienced stronger wage growth for those in the lowest income bracket compared with jurisdictions that did not implement any changes.[23] In terms of health benefits, higher minimum wages have been linked with a decrease in infant mortality and low birth weight births.[24]

Changes to the tax code can also be implemented. The Earned Income Tax Credit (EITC), often described as the "single most effective antipoverty program for working-age people," has helped lift millions of low- and moderate-income workers out of poverty, primarily those with children.[25] Research has also shown that the EITC is a cost-effective intervention that improves survival, self-reported health, and child development.[10,26,27] The EITC can be expanded, or a similar program can be developed, to benefit childless, low-income people, including those who cannot find steady employment. A federal jobs guarantee, which provides every person seeking employment a living-wage job with full benefits through the government, gained a lot of support among Democratic presidential hopefuls as a means of achieving full employment and eliminating poverty. Although much more complex and ambitious than other proposals, a jobs guarantee is purported to boost the economy and create millions of public and private sector jobs.[28]

However, the EITC, a jobs guarantee, and other similar programs that rely on workforce participation may still leave out elderly individuals, disabled individuals, and informal caregivers who cannot take on full-time employment.

Finally, policymakers can consider adopting progressive tax policies to fund social programs. A wealth tax, for example, can be used to improve access to health care, housing, and job training. Such an approach can achieve multiple goals, such as increasing the disposable income of families and individuals, decoupling the role of income in accessing health-promoting resources, and reducing the magnitude of income inequality, which, as we pointed out, is independently associated with negative health outcomes. Other policies gaining popularity and acceptance are guaranteed income programs such as universal basic income and negative income taxes, which could replace or supplement current means-tested safety net and antipoverty programs.[29] These redistributive policies would increase the role of government in reducing inequality, which helped narrow inequality in the United States and elsewhere in the early to mid-20th century.

These policy options are no longer just ideas on a page. Florida residents overwhelmingly voted to increase the minimum wage to $15 per hour by 2026, joining seven other states and Washington, DC, that are gradually increasing their hourly wages.[23] Private companies such as Costco and Target have also increased the starting wages of their employees to $15 per hour or higher; in another, highly publicized example, Gravity Payments increased the minimum income of its employees to $70 000 a year. The City of Stockton, California, is experimenting with universal basic income and has reported positive preliminary results, and close to 30 other cities have pledged to do the same.[30] Since the pandemic began, Congress has three times approved relief checks, increases to unemployment benefits, and other financial aid to individuals in need, which are policies that share similarities to guaranteed income programs. The expanded child tax credit included in the most recent pandemic package, which provides up to $300 monthly per child for one year, is essentially guaranteed income for families with children—an idea that a minority of Republicans supported, although at the expense of other social safety programs.

Even before the COVID-19 pandemic, income inequality in the United States was a social ill that exacted economic and health costs primarily borne by the poorest in society. With a nation reeling from inequality's unmistakable effects, the current administration has an opportunity to transform health, lives, and livelihoods by enacting some of the policies we have listed, along with reforms in education, immigration policy, racial equality, criminal justice, and other structural factors that shape the experience of disadvantaged and vulnerable populations in this country. Like most Americans, we hope our leaders will heed the call—science, justice, and hope are on their side.

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Strategies for Successful Vaccination Among Two Medically Underserved Populations: Lessons Learned From Hepatitis A Outbreaks

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Traditional models of preventive care rely heavily on delivering services in established clinical settings. These settings might provide incomplete access for certain medically underserved populations, such as people who use drugs (PWUD), people experiencing homelessness (PEH), and people who are incarcerated or detained, because of either barriers in accessing care or past experiences of stigma and discrimination. Missed opportunities for delivering preventive vaccination services to medically underserved populations can lead to increased transmission, morbidity, and mortality. Between 2016 and 2021, widespread person-to-person outbreaks of hepatitis A across the United States—disproportionately affecting PWUD and PEH—highlighted both the challenges encountered and innovative solutions required in bringing preventive services to medically underserved populations.[1]

These same populations are disproportionately affected by the COVID-19 pandemic. Many PWUD and PEH have underlying medical conditions placing them at increased risk for severe illness from COVID-19, which underscores the importance of COVID-19 vaccination.[2] PEH often live in congregate facilities, and both PEH and PWUD are frequently incarcerated or detained in correctional facilities.[3,4] In both settings, increased transmission of SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2), the virus that causes COVID-19, has been well documented.[5,6] When COVID-19 vaccine supplies were limited, states used a phased approach. Because of increased risks for people living in congregate settings, some public health departments vaccinated these populations earlier than the general population (for additional reading, see the Supplemental References, available as a supplement to the online version of this article at https://www.ajph.org). Health departments implementing COVID-19 vaccination can adapt lessons learned from the recent hepatitis A outbreaks to reach medically underserved populations and prevent COVID-19.

Hepatitis A, a vaccine-preventable liver infection, is caused by the hepatitis A virus and is transmitted through the fecal–oral route.[7] From January 2016 through March 2021, 35 US states reported person-to-person hepatitis A outbreaks; these outbreaks accounted for more than 38 000 cases, which is unprecedented in the postvaccine era.[8] In response, health departments administered millions of hepatitis A vaccine doses (Centers for Disease Control and Prevention [CDC], unpublished data, 2021).[9] CDC increased technical assistance to state and local health departments and compiled best practices for administering vaccines to PWUD and PEH. Here we describe successes in, challenges of, and strategies for increasing hepatitis A vaccine uptake among PWUD and PEH during outbreaks and their implications for COVID-19 vaccination in these populations.

ENGAGING THE POPULATION

Poor access, distrust of public officials and health care providers, previous experiences of stigma, and vaccine hesitancy can interfere with vaccine uptake among medically underserved populations. To effectively engage medically underserved populations, it is important to understand local attitudes, beliefs, and practices that contribute to vaccination barriers. To help overcome mistrust, health departments have partnered with community-based organizations, local providers, and peer navigators who have long-standing, trusted relationships with medically underserved populations (Table A, available as a supplement to the online version of this article at http://www.ajph.org). Vaccine acceptance during community vaccination events has improved as repeat events have been offered. Concerns about vaccine safety and efficacy or infection risk have been addressed through education and outreach materials.

ADOPTING INNOVATIVE VACCINE DELIVERY METHODS

The Section 317 Immunization Program (Section 317), administered by CDC, supports public health immunization infrastructure in the United States.[9] Section 317 provides limited funding for states to purchase vaccines for underinsured or uninsured populations. It also provides operational funding to strengthen state immunization program infrastructure, ensuring better vaccine access and improving outbreak response. Because of limited funding, CDC-funded state and city immunization programs decide which vaccine products are purchased and made available to eligible individuals. Immunization programs then identify providers who can successfully distribute vaccines to eligible populations. Some states have provided supplemental funding to Section 317 programs during hepatitis A outbreaks to take advantage of lower federally procured vaccine pricing.

Federally Qualified Health Centers, community health clinics, Health Care for the Homeless clinics, and local health departments are well suited to administer vaccines; however, prior to the hepatitis A outbreaks, many were not enrolled as providers that could administer Section 317 vaccine. Immunization programs enrolled new providers to increase vaccination coverage among PWUD and PEH. They also adopted nontraditional outreach methods to reach people who do not regularly seek care in traditional health care settings (Table A). Mobile vans and foot teams were used to conduct outreach in locations where vaccinating staff were unavailable and vaccine could not be shipped or stored on site (e.g., outdoor encampments, public libraries). Satellite clinics were used to offer vaccines to an entire facility (e.g., jail, homeless shelter). The goal of these methods was to reach people where they already received other social services, which has been demonstrated as effective in improving vaccine uptake.[10]

Many health departments found correctional facilities, and occasionally emergency departments, to be effective venues for reaching individuals at risk for hepatitis A. Partnerships with sheriffs' associations were helpful in establishing connections with local jails, where there is high turnover of PWUD and PEH coming from and returning to the community. Some immunization programs enrolled local jails or emergency departments as providers of Section 317 vaccine or purchased equipment, such as refrigerators and digital temperature monitoring systems, to allow facilities to independently store, administer, and track hepatitis A vaccine. In emergency departments, having a vaccination champion and using standing orders and automated electronic health record alerts were keys to success.[11]

Given the long duration of community hepatitis A outbreaks, health departments used different surge staffing models and enrolled additional vaccinators to meet increased staffing demands (Table A). States and cities also expanded the scope of practice of pharmacists, emergency medical technicians, and other nonphysician providers to administer vaccinations.

TRACKING VACCINE ADMINISTRATION

An effective vaccine monitoring and evaluation plan can help track the success of vaccination efforts, identify opportunities for improved delivery, prioritize efficient use of limited resources, and ensure that vaccines reach the intended populations. State immunization information systems (IISs) have been used successfully during pediatric vaccine-preventable disease outbreaks for monitoring and evaluation. These systems can also be used to automate reminders and reduce unnecessary duplicate doses. Unfortunately, not all health departments have IISs, and many have encountered challenges using the systems to track outbreak-related hepatitis A doses.

As an example, infrastructure to report adult immunizations is less developed than for childhood immunizations. Also, interoperability between IISs and electronic health records is frequently lacking.[12] Moreover, participation by private pharmacies and providers is often voluntary in the case of adult doses; in 2018, the national estimated percentage of adults with one or more vaccinations documented in an IIS was 56%.[13] When hepatitis A doses were entered, it was often not possible to record the type of event, the indication for vaccination, or individual risk factors. This means that it was often difficult during an outbreak to monitor whether hepatitis A vaccine doses were reaching PWUD and PEH.

Health departments and CDC are working to improve IIS infrastructure. Meanwhile, health departments have developed simple, timely, and innovative solutions such as keeping a spreadsheet tally or administering a weekly local health department survey to gather aggregate vaccine administration numbers. Instead of tracking individual risk factors, health departments record the number of hepatitis A doses administered by event type (e.g., mobile clinic, foot team) or event location (e.g., syringe service program, homeless shelter), which still provides information on whether hepatitis A vaccine doses are reaching appropriate populations. Some health departments have used tablets or smartphones for timely tracking during field events and provided vaccine pocket cards to remind clients when to return for a second dose.

CONCLUSIONS

By engaging medically underserved populations, adopting innovative vaccine delivery methods, and creating flexible solutions to vaccine tracking, health departments have been able to reduce barriers and improve hepatitis A vaccine uptake. Two strategies were consistently successful across health departments during the hepatitis A outbreaks. First, meeting people where they are, a central strategy in harm reduction for PWUD, was the most successful approach employed by health departments. Second, establishing and strengthening partnerships with organizations that have trusted relationships with medically underserved populations was critical to success.

During the current pandemic, many populations in addition to PWUD and PEH are being disproportionately affected by COVID-19, and each state has the complex task of determining vaccination prioritization for these groups. Although approaches to implementation are constantly evolving, PWUD and PEH, particularly those living in congregate settings, were prioritized earlier in some states. Regardless of the prioritization scheme used, the underlying challenges of reaching medically underserved populations, such as distrust and stigma, remain. Lessons learned from hepatitis A outbreaks can help in delivering COVID-19 vaccine to and improving vaccination uptake among a variety of medically underserved populations, including PWUD and PEH.

Some strategies used during hepatitis A outbreaks have already been implemented for COVID-19. Health departments are leveraging and strengthening Section 317 infrastructure, and the Health Resources and Services Administration and CDC are engaging Federally Qualified Health Centers to reach medically underserved populations. Partnerships with trusted providers serving PWUD and PEH will be pivotal in reaching these populations and improving vaccine confidence.

Two COVID-19 vaccines currently administered in the United States require a two-dose series, so recording vaccinations in IISs is even more important to track series completion. Multiple reminder methods, such as vaccine cards, electronic health record alerts, and outreach teams, will be helpful to ensure second-dose follow-up.[14] Protecting medically underserved populations from vaccine-preventable diseases will require continued long-term investment in vaccination champions, administration infrastructure, IISs, community partnerships, and workforce capacity.

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Generation Public Health: Fixing the Broken Bridge Between Public Health Education and the Governmental Workforce

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With more than 600 000 lives lost and counting, the COVID-19 pandemic in the United States has resulted in the loss of tens of millions of jobs and gravely disrupted children's education. The pandemic has laid bare long-term underinvestment in the public health workforce, including staff losses and underfunding for public health education. The American Rescue Plan Act of 2021 will invest $7.4 billion to recruit, hire, and train individuals in health departments and related entities.[1] For this effort to succeed, however, we must assess workforce needs, increase access to education for future public health professionals, alleviate the burden of high student loan debt, improve and expand hiring programs for public health graduates, and invest in the existing public health workforce.

THE ROLE OF PUBLIC HEALTH PROFESSIONALS

Public health professionals work to keep whole communities healthy. Public health is a diverse field and employs professionals in numerous job functions within government agencies, research institutes, universities, hospitals, nonprofit organizations, and corporations. Government agencies, including the federal government, local health departments (LHDs), state health departments (SHDs), and tribal and territorial health departments, play unique roles in the public health system, including disease surveillance, reporting, screening, treatment, and counseling; laboratory testing; vaccine inventory and distribution; food safety; behavioral health; regulatory inspection and licensing; emergency response; maternal and child health and newborn screening; HIV and substance use disorder prevention; and nutrition.

Beyond preventing and controlling infectious diseases like COVID-19, public health professionals prevent chronic diseases like cancer, diabetes, and heart disease, and promote the opportunity for health. It has been estimated that for every dollar spent on public health, we save $14.30 on health care and other costs.[2] However, without ongoing investment, a public health workforce cannot be sustained.

THE PUBLIC HEALTH WORKFORCE: DECADES OF UNDERINVESTMENT

The public health workforce is a critical element of the public health system and infrastructure, but a reduction in the number of public health workers in the core government public health workforce is well documented. In 2000, the workforce was estimated to be just under 500 000 workers, or 160 workers per 100 000, which represents a decline from 219 per 100 000 in 1979.[3] In the most recent formal enumeration, in 2014, the number had decreased further to an estimated 290 988 (range = 231 464–341 053).[4] Recent estimates indicate a loss of more than 20% of SHD and LHD workers since the Great Recession.[5] Funding has followed a crisis-and-neglect pattern, with investments increasing temporarily after emergencies such as the World Trade Center attacks, and then again shrinking, resulting in an inability to sustain a highly trained public health workforce as a basis for a vibrant public health system.[6] Lack of funding means that SHDs and LHDs cannot fully provide the Foundational Public Health Services, a "minimum package" of public health services.[7]

Workforce losses are expected to worsen. A 2017 survey found that 22% of the government public health workforce was planning to retire by 2023 and 24% was considering leaving for other reasons.[8] According to recent media reports, harassment related to COVID-19 has led at least 190 senior health officials to leave the field,[9] but the overall workforce crisis has been

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documented for decades.[10,11] Additionally, the current workforce does not represent the demographics of the communities they serve, likely rendering them less effective.[8]

Public health challenges are becoming more complex because of increased availability of large-scale data, the "infodemic," climate change, and the aging of the population. Responding to these challenges can require strategic decision-making, an understanding of scientific evidence for prevention and health promotion, collaboration across sectors, data analytics, financial management, and systems thinking. Rebuilding the US public health system requires a new generation of highly trained, diverse public health professionals to create a healthier America.

These professionals will need a public health education. The current governmental public health workforce has not only lost staff, but it is also likely undertrained. Public health degrees are uniquely designed to meet the needs of the public health workforce, yet only 14% of governmental public health professionals today have formal education in public health.[12] At the nonsupervisory and manager levels, workers with public health degrees reported fewer competency gaps.[13] Public health graduates develop competencies not integral to other disciplines, such as epidemiology, biostatistics, health systems and policy analysis, health program planning and evaluation, and health communication. Although not every employee of a health department needs a public health degree, a 2021 study matching public health workforce taxonomies with US Department of Labor Standard Occupational Classifications (SOC) codes identified 56 SOC-matched occupations in government public health agencies, of which 34 were found in a data set of job postings requiring or preferring master's-level public health graduates.[14] Several occupations listed in the American Rescue Plan, including epidemiologists, program managers, communication and policy experts, social support specialists, and disease intervention specialists,[1] either require public health degrees or are particularly suited for public health graduates.

GRADUATES' LOAN DEBTS CAN PRECLUDE GOVERNMENT CAREERS

According to the National Center for Education Statistics, in 2019, the median debt of public health graduates nationally was $52 263, but first-destination earnings were approximately $48 866.[15] Although the Public Service Loan Forgiveness program was designed to encourage graduates to consider lower-paying jobs in the public or nonprofit sector, it has provided loan forgiveness to only 1% of those who applied.[16]

Degree programs in medicine, nursing, mental health, veterinary medicine, education, and law have scholarship and loan repayment programs like the National Health Service Corps, encouraging students to consider lower-paying careers in underserved communities. PhD programs often offer funding or loan repayment; however, few if any such programs exist for public health graduates. Therefore, the student debt burden makes salary a significant factor in career decision-making for public health students,[17] especially for students from lower-income backgrounds. This ultimately reduces diversity and talent in the public health workforce, weakening its effectiveness.[8]

Lower salaries, in the absence of functioning loan forgiveness programs, may also deter students from public service. In a recent study, government positions for 666 master's-level public health graduates from 2018 to 2019 paid a median of $55 000 and an average of $58 000, whereas 2578 graduates in all other sectors received a median of $60 001 and an average of $68 332 (C. Plepys, Association of Schools and Programs of Public Health Data Center, written communication, March 4, 2021). Additionally, the better benefits or job security that once attracted students to government employment have declined through reductions in traditional benefits such as pension plans, government shutdowns and furloughs, and negative media coverage of government. Loan repayment programs for new federal workers are now rarer. Meanwhile, the for-profit sector is increasingly hiring public health graduates,[18] and new research shows that younger staff are more likely to leave the government public health workforce in search of higher-paying jobs.[19] An analysis of the employment outcomes of 53 463 public health graduates over four years (2015–2018) conducted by the Association of Schools and Programs of Public Health found that only 17% entered into government as their first post-graduate employment, in contrast to health care (27%), corporations (24%), academia (19%), nonprofits (12%), and other sectors (1%).[20] An analysis of 33 563 jobs posted from July 2019 to June 2020 for public health master's graduates found labor market competition, especially from pharmaceutical and insurance firms.[14] Even with increased enrollments in public health degree programs, it is unlikely that enough public health graduates are entering government to address unmet needs.

GRADUATES FACE BARRIERS TO ENTRY INTO GOVERNMENT

Although many public health students are motivated to work in government, they encounter barriers to entry beyond lower salaries, including concerns about career paths, employee empowerment, and opportunities for innovation within government.[17] The hiring process for many government agencies is lengthier than in other sectors, averaging 98.3 days in the federal government in 2018,[21] whereas the national average was only 35 to 41 days[22] in 2019; further, it often requires candidates to use different application procedures, such as specialized resume formats or civil service examinations.[23] Unless hiring processes are streamlined, significant efforts are needed to educate students about the government recruitment process, yet many schools and programs of public health lack staff to provide this guidance.

RECOMMENDATIONS

The loss of public health workers combined with the mismatch with new graduates' career choices have a direct impact on the health and lives of all Americans. To ensure a highly trained, diverse public health workforce and replace retiring workers while adding to the capacity to handle the COVID-19 pandemic and other public health challenges, we offer several recommendations.

Recommendation 1: New Workforce Research

Existing public health workforce research primarily focuses on enumeration and training of the existing workforce. The National Center for Health Workforce Analysis within the Health Resources and Services Administration's Bureau of Health Workforce funds a network of Health Workforce Research Centers; however, they focus on a range of health professions but not on public health disciplines specifically. The last formal enumeration study was in 2014.[4] Large-scale surveys[8] and assessment of the Foundational Public Health Services [7] should be complemented with research on the number and types of workers needed in specific public health occupations to provide the Foundational Public Health Services, the educational or training requirements for these occupations, analysis of labor market competition for public health graduates and related occupations,[14] and the impact of unpaid internships and student debt on career choice. New research, like the "Staffing Up" study being conducted by the Public Health National Center for Innovations and the de Beaumont Foundation, should be supported, and the National Center for Health Workforce Analysis or a similar agency should fund new Public Health Workforce Research Centers, housed in academic institutions with research infrastructure, which should collaborate with public health practice organizations and produce annual reports.

Recommendation 2: Loan Repayment

The proposed Public Health Workforce Loan Repayment Act (HR 6578)[24] would provide loan repayment for approximately 1000 public health students entering into government employment each year. This is far less than is needed even to replace retirees, without accounting for new hires needed to handle COVID-19. The National Association of County and City Health Officials leads an informal coalition of public health, health care, and labor groups that support initiatives like HR 6578, and other organizations recommend reforms to public service loan forgiveness. Existing loan forgiveness or repayment for clinicians should also encourage work in public health.

Recommendation 3: Recruitment and Reform

Recruitment pipelines and partnerships. Some recruitment pipelines exist that facilitate students' entry into government, such as the Presidential Management Fellowship, the CDC's Epidemic Intelligence Service and Public Health Associate Program, and the Council of State and Territorial Epidemiologists' Fellowship Program. However, each of these programs only hires approximately 30 to 200 graduates per year into public health agencies. Such programs should be reviewed to ensure that they attract diverse candidates, and they should be significantly expanded and connected more directly with LHDs and SHDs.

In the corporate world, paid internships—field experiences designed to provide real-world applications of academic training for currently enrolled students—are a mainstay of college recruitment and are often designed to convert students to full-time hires. In contrast, internships or practica in government public health are frequently unpaid, excluding students who are eager to work in public service but cannot afford to do so. Additionally, the Council on Linkages Between Academia and Public Health Practice encourages Academic Health Department partnerships to connect academia with governmental public health agencies to enhance the capacity of the organizations and improve the pipeline into governmental public health, and these partnerships should be supported further. Investment in partnerships between public health degree programs and local, state, or federal health departments (as part of the Rescue Plan), expanded internship-to-job recruitment pipelines, and new programs to encourage diverse and previously untapped populations to join the public health workforce will help alleviate the workforce gap. The Biden administration's proposed US Public Health Job Corps or Public Health AmeriCorps could fund public health interns, support service learning, and create a hiring pathway into government that keeps equity and inclusion at the center.

Hiring reforms or hiring exemptions. In addition to investing in new pipelines, the slow, complicated hiring process in government agencies should be streamlined, or public health hires should be provided an exemption to typical hiring protocols—a critical hiring authority. An analysis of civil service hiring policy should be conducted, including assessment of possible disparate impacts on diverse candidates. The newly relaunched National Consortium for Public Health Workforce Development, with its emphasis on governmental public health pipeline and recruitment improvements, can advocate for reforms.

Recruitment marketing campaigns and career guidance. A recruitment marketing campaign, implemented by a new partnership between academia and government, can improve student perceptions of government careers. This campaign should focus on the meaningfulness of public service and benchmark with other successful college recruitment programs like the Peace Corps, Teach for America, or private-sector talent acquisition programs. Career advisors who guide public health students should be key partners in this effort. Currently, a career guidance Web site is being developed by the Kennedy Krieger Institute, to guide potential students toward public health careers and raise awareness of the field.

Clinician and specialist training in public health. New training and recruitment programs must also be established for clinical and other professionals to enter public health careers. Part of the recruitment campaign described here should include efforts to entice nurses, physicians, veterinarians, laboratory professionals, informaticists, and other relevant professionals to obtain education or training in public health, in exchange for graduates' commitment to working in government public health for a specified period.

Recommendation 4: Workforce Investment

After assessment of the training needed in specific public health occupations, new training requirements can be implemented for the current workforce. Partnerships with existing training entities, combined with expanded, funded partnerships with academia (including funding for subsidized master's-level education or other credentialing through formats for working professionals) will help the current workforce gain the skills needed to tackle the greatest public health crisis in a hundred years and to develop healthier communities. Barriers to training, such as staff not being permitted to take time away from regular tasks to take part in training, should be addressed. There should also be new investments by the Health Resources and Services Administration or related agencies to support public health faculty to design curricula that best match governmental workforce needs.

To improve retention, salaries in SHDs and LHDs must be benchmarked with competing sectors and increased. Morale must be improved via leadership training, clearer career pathways, mentoring programs, and policies encouraging innovation.[19] Collaboration between organizations such as the National Association of County and City Health Officials, the Association of State and Territorial Health Officials, and the Association of Schools and Programs of Public Health is essential for creating a unified public health workforce recruitment and training plan. Most importantly, expanded funding for the public health workforce must become permanent.

CONCLUSION

Public health is at a critical inflection point in the United States. A trained, qualified public health workforce is a crucial element of the health of Americans. We can no longer rely on "emergency"-based, short-term, earmarked funding that disappears when a crisis ends. Without long-term investment in education for new public health professionals and programs easing entry into government careers, a recovery from COVID-19 and improvements in the public's health will be impossible. The time has come for unified action to leverage the power, passion, and public service motivation of public health students and the current public health workforce. The health of our nation depends on it.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to report.

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More Than Mapping: Improving Methods for Studying the Geographies of Food Access

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Geospatial analyses of food environments—neighborhood food sources such as supermarkets, corner stores, restaurants, or food pantries—and their impacts on dietary health have become commonplace over the past 25 years. Early research varied in approach. One key article in 2002 advocated a range of methods ranging from focus groups to policy analysis.[1] Yet, as spatial data and geographic information systems (GIS) software became widely available to researchers and practitioners across the social sciences, public health, and medicine, mapping and geospatial analysis have been the predominant methods. One review published in 2012 found that 53% of published research on the food environment used geospatial analysis, "by far the most common way to measure the food environment."[2(p1175)] Another review from 2017 found that 49.6% of articles in this area included geospatial analysis before 2007.[3] From 2007 through 2015, that percentage increased to 65.3%.[3]

The use of mapping to analyze the food environment has clear benefits. Maps are often intuitively understood by both policymakers and the general public. They suggest a clear path for intervention, highlighting the neighborhoods most often excluded from capital investment. Maps are also affectively powerful, offering striking visuals of disparities in ways that motivate political action. The authors of this article have all taken part in research that uses geospatial analysis to identify areas with low access to healthy foods, and we see value in this approach. Spatial proximity is a key determinant of food access, and maps provide a useful tool for research in this area.

Yet, as geographers, we also recognize that maps can limit how food access is conceptualized and studied. As we describe here, most maps of food access emphasize physical distances between spatially fixed points, minimizing other factors shaping access. They measure retailers as distinct sites, rather than nodes of larger production and distribution chains with widely varying store environments and sometimes fraught relationships with local residents. While improving, geospatial analyses still often neglect the active role of food consumers in navigating their physical and social environments. This includes daily mobility patterns, ties to workplaces or other public spaces, and connections to or the care of friends and family.[4] Maps also provide a cross-sectional view that can obscure historical and structural causes of identified disparities.

Others have advocated a "relational" analysis of food access[5] or replacing the food desert framing with alternatives like food apartheid[6] or supermarket redlining[7] that foreground the economic and social processes driving disparities in access. This article builds upon that work by describing how the outsized role of maps in analysis of food access can limit the resulting research by obscuring social processes and root causes. We then suggest alternative approaches that put maps in their time and place, balancing geospatial analysis with other, more nuanced, research methods.

THE LIMITS OF MAPS

Geospatial analyses and the maps they produce have played an important role in analyzing the physical food environment as a key social determinant of health.[2,8] The US Department of Agriculture's Food Access Research Atlas is one prominent example, using data on poverty rates and proximity to supermarkets to identify low-income, low-access census tracts nationwide.[9] These areas, often also referred to as food deserts, have been targeted for interventions such as healthy corner store initiatives[10] or financial incentives for new supermarkets,[11] even though methodologies for defining proximity remain unstandardized.[12]

Measures of retailer proximity and neighborhood demographics can provide a useful snapshot of the food environment. Yet, by focusing primarily on physical distances and treating food sources as fixed and clearly categorized sites, these analyses can minimize other factors such as food quality, cultural acceptability, and residents' daily mobility patterns. A focus on the physical environment also obscures the experiences of traveling and shopping for food and how these differ across individuals' race, class, age, or gender.

Maps may also obscure the structural determinants of health, the "cultural norms, policies, institutions, and practices that define the distribution (or maldistribution) of [social determinants of health]."[13(p231)] A focus on structural determinants uncovers root causes of observed inequalities: systems of food production and distribution, patterns of land-use and residential segregation, transportation systems, wage disparities and social assistance programs, and social landscapes shaped by professional and personal connections between residents. Mapping can provide insight on these structural determinants, and we suggest a few methods for doing so later in this article. Yet, often maps are used to identify current disparities with little corresponding analysis of underlying causes.

We identify several common problems in geospatial analysis of food environments, described in the following text.

GEOGRAPHIC ACCESS IS MORE THAN PHYSICAL PROXIMITY

Maps of food access primarily use measures of physical distance to food retail sites as an analytical strategy, most often using supermarkets as a proxy for healthy food sources.[3] Yet "access" to food stores is multidimensional. A popular way of conceptualizing different dimensions of food access is by adopting a model of access to health care facilities proposed by Penchansky and Thomas, who outlined five dimensions relevant in the health care setting: accessibility, availability, affordability, acceptability, and accommodation.[14]

Geospatial analysis generally focuses on accessibility, measured as physical proximity to a food source. Accessibility may be closely tied to physical proximity, but daily travel patterns or reliance on informal ride-sharing networks may mean that the most proximate store is not the most accessible. Market basket studies may allow analysis for food availability, but whether foods are culturally acceptable can vary within neighborhoods by household on the basis of racial and ethnic backgrounds. A focus on accommodation would necessitate including store hours or authorization for Supplemental Nutrition Assistance Program or Special Supplemental Nutrition Program for Women, Infants, and Children benefits as key variables. Like quality, access is a complex concept that must be assessed on several dimensions, and no one of these dimensions is sufficient.[15] In a society that seeks to be egalitarian, equity is perhaps the most important measure of access to food, though this is also the most difficult dimension to operationalize and must include food acceptability or availability in addition to simple physical proximity to retailers.

THE FOOD ENVIRONMENT IS MORE THAN RETAILER POINTS

One of the main advantages of mapping grocery stores is that they have addresses that are public and relatively stable. Unlike other parts of the food access landscape, such as food pantries, community gardens, or even sites for foraging or food reclamation, the locations of grocery stores are easily obtained via the Internet. The exclusion of less easily mapped sites leads to blank spaces on the map that oversimplify the food landscape, ignoring other potentially vital food sources. Treating all grocers, even within a particular class of stores, as the same can also result in misleading conclusions. Supermarket chains can have quite different spatial distributions depending on their business models,[16] and the selection and quality of groceries available, as well as the shopping experience, may vary greatly.[4,17] In addition, residents' experiences of stores in specific neighborhoods differ based on both the store's internal design and the socioeconomic composition of its surrounding community.[4] Creating metrics of access based only on retailer locations and category while neglecting these other factors can result in misleading conclusions. This is not simply an issue of data availability, as factors such as subjective evaluation of store environments or identifying informal sites of food procurement require methodological approaches that explicitly value the lived expertise of local residents.

HOMES ARE NOT PROXIES FOR PEOPLE

Most conventional maps are not able to communicate how the complex interactions people engage in as they navigate their daily activities shape the geographies of food access. Instead, residential location is used to measure exposure, most often through the use of census data. Yet employment, childcare, and other responsibilities move people from place to place. Coordination with other household members (e.g., a partner or older children), trip chaining (linking multiple activities requiring travel together), and limited time budgets complicate things further and lead to varying levels of spatial exposure. Creating activity spaces based on observed daily mobility can provide a more holistic analytic for measures of food access, as well as be useful for geospatial analyses of exposure more broadly.

FOOD ENVIRONMENTS HAVE A HISTORY

Geospatial analyses of food access often measure the relationship between food retail environment and neighborhood socioeconomic conditions. While useful at highlighting present disparities, the cross-sectional focus common in these analyses makes it difficult to track the historical trends that create them. A 2017 review found that only 14% of geospatial analyses of food environments use longitudinal data sets.[3]

Multiple structural factors shape available food options across neighborhoods. In US urban areas, housing redlining, restrictive covenants, urban renewal, and gentrification influence where retailers are willing to go, the extent to which cities enter into public–private partnerships to increase the number of food retailers, and who benefits from supermarkets returning to the city after several decades of decline.[18,19] Maps of food deserts highlight neighborhoods with few retail options, and programs such as the Healthy Food Financing Initiative have funded a few new retail sites in these areas. However, these analyses provide little insight into the structural factors that create these gaps, and maps themselves can benefit from qualitative historical accounts that situate observed disparities.

PUTTING MAPS IN THEIR TIME AND PLACE

Despite these issues, mapping can still play a vital and constructive role in identifying both social and structural barriers to food accessibility. By incorporating longitudinal data on individual mobility and demographic shifts, geospatial analysis can begin to capture the dynamic and relational processes that shape available food options and individual and household-level shopping patterns. Through fashioning participatory methodologies that explicitly value the experience and expertise of residents, these analyses can develop a more sophisticated understanding of the food options available to individuals and the sometimes ambivalent role retailers play in local neighborhoods. These approaches are often mixed methods, combining geospatial analysis and mapping with qualitative research. In doing so, they draw on the strengths of both approaches, providing a richer and ultimately more productive set of insights that can better inform efforts to improve food access.

TRACING THE MOBILITY OF NEIGHBORHOOD RESIDENTS

New research is beginning to grapple with the dynamics of daily life by using technology with global positioning system hardware, which allows for precise trajectories to be mapped and individuals' activity spaces to be constructed.[20] While this research is an improvement on more static assessments of spatial access to food opportunities, knowing where somebody goes is not the same as knowing why they go there. Future work in this area must incorporate information about both mobility and motivation by using data collection tools like time-use diaries[21] or walk-along interviews.[22] Using these data provides much-needed context to food-related decisions by providing information about barriers and motivations. Time constraints are often racialized, including factors ranging from commuting times to job discrimination.[23] Analysis of geospatial data on daily mobility in tandem with qualitative methods can help reveal these barriers.

LONGITUDINAL ANALYSIS OF NEIGHBORHOODS AND FOOD OPTIONS

Longitudinal data, including demographic data as well as retailer location data, can play a key role in identifying structural determinants shaping food accessibility or incidents of supermarket redlining. The former is publicly available from US Census records or secondary databases such as National Historic Geographic Information System (https://nhgis.org), and historical retailer listings are available from several secondary sources (e.g., InfoUSA, Data Axle). Analyzed through panel models, these data can demonstrate the impact of policies driving economic and racial segregation on food retail.[16]

Linking food access to historical processes has been useful, because mapping these changes over time demonstrates the relationship between access, capital, health, and race.[19] Recent work using archival research, qualitative interviews, and ethnographic fieldwork has captured the lived experience of exclusionary policies, demonstrating that the "past" continues to have ripple effects in the present.[24] Historical analysis can reveal how racist practices such as redlining implicitly and explicitly continue to manifest in current food options, focusing on issues ranging from retailers' locational decisions through design and marketing decisions.[18] Such studies can also focus on the effects of neighborhood change, such as gentrification or demographic change, on food availability.

PARTICIPATORY MAPPING

Within geography, efforts to incorporate the experience and expertise of those outside academia into geospatial analysis have developed under several headings, including public participation GIS as well as qualitative, critical, and feminist GIS. Building on approaches from participatory action research and community-based participatory research, these methodologies actively include local residents throughout the research process, from problem conceptualization through analysis and publication. This ensures that local knowledge and experience informs analysis. In the case of research on food accessibility, that can include the addition of overlooked food sources, identifying errors in data from commercial providers, providing perspective on the quality, affordability, and safety of specific retailers; describing accessibility via transit systems; defining store types to be studied; or providing historical perspective. In market basket studies, participation can include assisting with the creation of the list of foods to be surveyed for price and availability at the stores, as well as data collection. Food access studies may also be used for advocacy. Data collection and analysis can become an occasion for community organizing, providing an opportunity for group mobilization.[25]

The growth of free and open-source tools for mobile data collection and visualization, including OpenDataKit and RStudio's Shiny platform, have become common tools to facilitate community-based research. They provide the potential for collective exploration of data and support community-based discussions over the trends they reveal, potentially leading to democratic and inclusive engagement and more effective policy solutions.

CONCLUSION

Mapping and geospatial analysis are powerful methods for identifying spatial disparities. The goal of this article is not to disparage their use but instead to explicitly acknowledge their limits for research on food accessibility. The alternatives we suggest here put maps in both their time and place, using temporal data on daily movements and neighborhood change to better understand the histories, policies, and experiences that shape everyday food procurement and neighborhood environments. In addition, qualitative methods such as archival records or participatory research design can supplement the insights of spatial analysis, highlighting the social processes behind observed changes, mobilizing community support, and providing grounded perspectives on analytical results. AJPH

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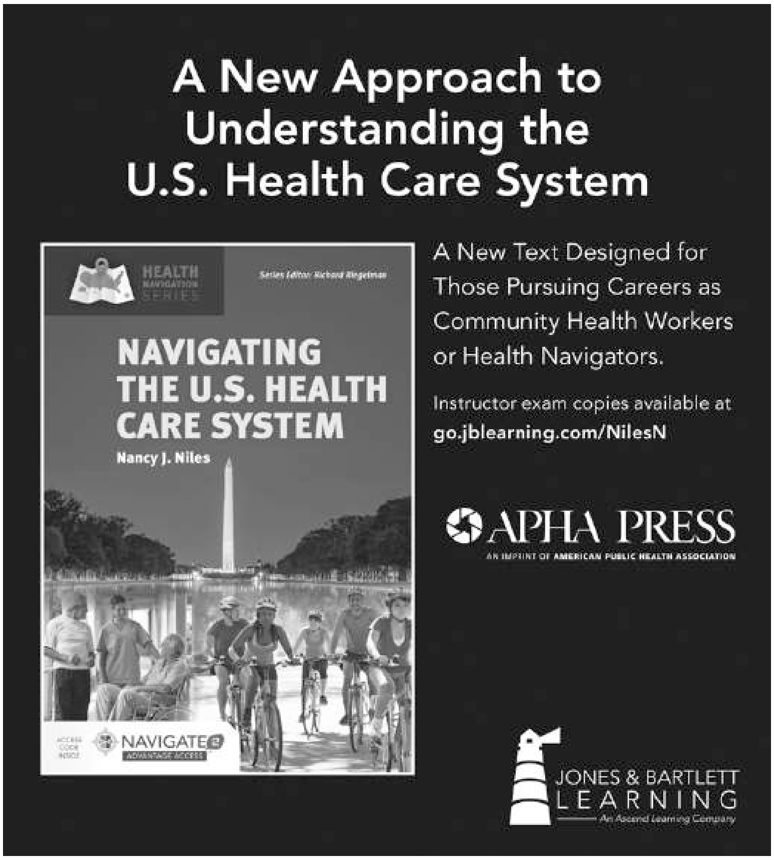

The Impending Eviction Cliff: Housing Insecurity During COVID-19

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The COVID-19 pandemic adds a layer of precarity to the current housing crisis, brought about by a series of social and economic policies that transformed housing for living into a commodity.[1] Amid economic slowdowns, business closings, and distancing restrictions, the pandemic exposes important gaps in housing policy.[2] Although the pandemic has affected homeowners, landlords, and renters, given the magnitude and severity of consequences for renters specifically, I raise evictions as a point of concern.

The housing system is complex, representing multiple stakeholders. I focus on those most likely to be affected by the pandemic to illustrate how the current system is failing lower-income tenants. This piece is not about the details of recent policies per se (e.g., the American Rescue Plan). Instead, I examine renter-focused initiatives to raise questions about whether current measures alone will ensure housing security for renters going forward. This is important because the majority of lower-income renters are (or were previously) employed in industries that have been disproportionately affected by the COVID-19 pandemic. Therefore, examining the impact of the pandemic on tenants experiencing financial distress may highlight lessons for improving housing policy going forward.

US renters are a diverse group. Single and single-parent households are common. Renters are more ethnically and racially diverse than homeowners; ethnic minority households are 39% of the rental market.[3] Generally, homeownership rates rise with age; however, significant racial gaps reveal disparities in owning versus renting, especially between Black and White households.[4] Among all renters, Black renters (53.7%) are the most cost-burdened, defined as “people who pay more than 30% of their income for housing.”[3] Since 1960, renter’s incomes have increased by 5%, whereas rents have risen 61%. Discrepancies between stagnant earnings, rising housing costs, and housing availability mean that 48% of renter households are severely cost-burdened, spending more than half of their income on rent and utilities monthly.[3,5]

Given gaps in homeownership and the profile of lower-income renters—the majority of whom are Black and Latinx, single mothers, and severely cost-burdened—it is worth considering how the pandemic has affected these renters. Lower-income renters, for example, are more likely to work hourly wage positions, be subject to layoffs, and to work in sectors most affected by the pandemic, including food services, entertainment, retail, and transportation.[6] Lower-income renters typically have little, if any, emergency savings and fewer people to rely on in times of need. Perhaps as a result, lower-income renters have experienced more difficulty paying rent and remain at greatest risk for eviction, compared with all renters.[3,7] Measures have been introduced to assist renters during the pandemic, but is it enough?

PROGRESSIVE OR PATCHWORK POLICIES?

In considering directions for advancing future housing policy, some limitations of COVID-19 housing initiatives are detailed alongside suggestions for developing sustainable and structural efforts for eviction prevention.

The American Rescue Plan

Scholars and policymakers differ on the best path forward to avoid a wave of evictions in the coming months. The American Rescue Plan, for instance, has been heralded for delivering a $1.9 trillion relief package, adding $35 billion to the $25 billion provided in 2020 to assist renters. Additional provisions included an extension of unemployment benefits, and individuals earning up to $75 000 (and couples earning up to $150 000) received direct stimulus payments of $1400 per person. Some scholars argue that this relief is sufficient to get renters back on their feet, stating that it “does more to address economic hardship . . . than any other rescue attempts in US history.”[8] Although this legislation was needed, whether it is sufficient is a matter of debate. The American Rescue Plan provides rental assistance and direct cash payments; however, as the name indicates, it is a *rescue* plan. Claims that it addresses economic hardship, rather than provide temporary relief for Americans in need, should be carefully evaluated.

Centers for Disease Control and Prevention Moratorium

On September 4, 2020, the Centers for Disease Control and Prevention (CDC) issued a declaration to halt evictions, following the expiration of eviction protections established by the CARES Act (Coronavirus Aid, Relief, and Economic Security Act; Pub L No. 116-136; §4024).[9] The measure was designed to contain the spread of COVID-19 by keeping residents "in place," diverting would-be displaced residents from overcrowded congregate housing (e.g., shelters).[7] The eviction moratorium applies to income-eligible renters who submit a signed hardship declaration to their landlords.[9]

The CDC eviction moratorium raised a number of legal questions. Some challenges, filed by landlords and corporate interest groups, allege that the moratorium violates constitutional rights. Some district courts have upheld the CDC's authority to issue such an order, whereas others have ruled in favor of landlords and other plaintiffs.[10] Beyond questions of legality, early evidence suggests that lower-income renters have not reaped the full benefits of protection under the moratorium.

For example, the moratorium does not supersede less protective local provisions, meaning that eviction risk can vary by state (e.g., eviction filings have continued in states with no local protections).[11] The moratorium does not prohibit landlords from charging fees for unpaid rent, nor does it forgive unpaid rent.[9] Moreover, because the federal order is not automatic, renters are only protected if they have knowledge of it and file the appropriate declaration. For instance, despite the order being issued in September 2020, evictions by corporate landlords rose significantly in the same month, evicting tenants potentially before they knew about protections.[12]

If and when tenants do submit a hardship declaration to landlords, to qualify for emergency rental assistance (ERA), a program designed to keep families affected by COVID-19 housed by providing rental assistance, they must provide proof of unemployment or demonstrate a risk of experiencing homelessness. Tenants or landlords can apply for financial support; however, funds are paid directly to landlords.[13]

Emergency Rental Assistance

Rental assistance is an important resource for tenants who would otherwise be unable to afford housing.[14] In response to the pandemic, the US Department of Treasury authorized ERA funding to support landlords and tenants, keeping many lower-income renters stably housed.[15] Nearly 450 ERA programs were created or expanded in response to COVID-19.[13] At the same time, these programs have limitations that reduce support for all who need it.

Most ERA programs, for example, have income-based eligibility limits, leaving out residents experiencing hardship but not meeting income thresholds. In addition, households may not receive any other form of housing assistance, must be legal US residents, must have insufficient savings to cover rent, and must have been current on rent before the pandemic.[15] Applicants also had to have experienced some form of COVID-19–related hardship, requiring documentation or proof of income loss.

Although, in theory, these restrictions aim to assist those with the greatest need, it is unclear whether this goal is fully realized, since some very low-income households fail to meet initial eligibility criteria, including those without legal status, people already behind on rent before COVID-19, and those without proof of economic hardship. For tenants able to document eligibility and apply for ERA funds, once approved, landlords must still agree to participate in the program.

In other words, receipt of ERA funds for tenant relief depends ultimately on landlord–tenant cooperation and landlord agreement that they will not evict tenants. Additional stipulations—such as agreeing not to evict tenants for a period of time, forgiving a portion of rent, and waiving late fees—are often required to receive federal funds. Landlords can decline the terms, opting not to renew a tenants' lease instead, which yields the same result as eviction.[13] In fact, landlords may cite other violations unrelated to rental payments (e.g., nuisance violations), evidenced by the surge of legal challenges to remove tenants across the country.[16]

Preliminary Lessons Learned

Although early evidence is scarce, the American Rescue Plan, eviction moratorium, and ERA programs have likely provided support to renters and reduced the spread of COVID-19. Reports find that policies limiting evictions and utilities shutoffs reduced COVID-19 infections by 3.8% and reduced deaths by 11.0%. Yet if all such policies had been adopted as federal policy during the early months of the pandemic (i.e., early March–November 2020), these measures could have reduced COVID-19 infections by 14.2% and deaths by 40.7%.[17] This suggests that policies—when used intentionally and effectively—can benefit everyone. Therefore, in discussing health and housing policy, two things can be true: (1) the American Rescue Plan can yield benefits for renters (temporarily) and still be insufficient; and (2) the CDC order, which has in fact lowered the number of evictions nationally, can have significant loopholes that make it less effective.

In addition, ERA, although necessary, has not reached all renters in need. An estimated 10 to 12 million renters will owe an average of $5850 in back rent and utilities once the moratorium ends, in addition to $50 per month in late payment penalties.[12] Renters in arrears before COVID-19 are among the most vulnerable; they are more likely to be unemployed, have less income, and live in high-cost areas in the Northeast and California.[2,12] If residents living in these areas are evicted, the likelihood of displacement is high. Therefore, the end of the moratorium may prompt a more severe housing crisis, including displacement, if additional action is not considered.

Taken together, these measures are stopgaps, rather than solutions. Moreover, beyond the pandemic, how do we use lessons learned to advance an equitable and just housing agenda that serves all renters, especially those at the lowest-income levels? Taking this perspective, the question becomes less about whether these policies have achieved some measure of success and more about what else can be done—from a fundamental cause perspective—to prevent negative outcomes associated with poor housing and evictions. There are no easy solutions; however, if stakeholders agree that housing is a right and that stable housing is necessary for good health, a global pandemic should not be required to prioritize health in all housing policy.

HEALTH IN ALL POLICIES

The American Public Health Association promotes a health in all policies approach as a collaborative way to address social determinants of health. Housing, and the lack of it, is a domain in which health in all policies is clearly relevant. Evictions, specifically, are closely tied to health and well-being.[14,18] Although there is no “causal” evidence, there are several studies showing strong associations between evictions and poorer health, particularly for Black and Latina women.[2,14,18,19]

Taking a critical approach to integrate health in all housing policies requires engagement with systems that structure housing as a privilege (rather than a right).[1] Moreover, specificity is required: which groups are most affected by patchwork policies that fail to engage with larger issues of housing and affordability? The pre–COVID-19 housing crisis is the result of historical legacies and structural racism that have created gendered, racial, and spatial disparities, giving rise to today’s segmented rental market.[1] Because the effects of discriminatory housing practices (e.g., redlining, racial covenants) are enduring, the groups most affected by these policies must be prioritized.[20] In that spirit, lower-income, Black single-parent–headed households should be highlighted as an especially vulnerable group, because Black single mothers face the highest rates of eviction overall.[14,19] Therefore, health in all policies work must be intersectional and intentional.[21] As Bowleg reminds us, “We—policymakers, public health officials, and all of us who care about public health—have a moral imperative to center and equitably address the health, economic, and social needs of those who bear the intersectional brunt of structural inequality.”[22(p917)]

PLUGGING THE POLICY GAPS

Federal and state moratoria, albeit incomplete, *are* working. New eviction filings remain higher in states without a moratorium; therefore, extending the federal order until vaccination efforts have reached the majority of the population can be effective.[12] In addition, improving data collection on evictions, building collaborative partnerships, and strengthening tenant protections nationally can help bridge gaps for renters long term.

Data Collection

More reliable metrics to track evictions and displacement are needed. There is no federal database tracking eviction filings and outcomes. Moreover, although useful, filings may not provide a complete picture because not all landlords file for eviction, and residents without formal lease agreements or evicted without a court order typically do not report being evicted.

Collaborative Partnerships

In addition to collecting data that would facilitate research on the impact of evictions, increasing public awareness about housing insecurity and building multilevel partnerships to bridge gaps between rental assistance and tenant need are necessary.[23] Eviction diversion programs and the civil right to counsel, for example, educate and protect residents at the local level, slowing the eviction process. Tenant education programs, legal aid, and landlord–tenant settlements have decreased the number of default judgments and orders of eviction in areas providing these services.[12]

Local Legislation

As an additional level of protection, states and jurisdictions can enact new legislation. Some state courts now request the presence of social service representatives at hearings and provide funds to incentivize settlements as well as rental assistance. In New York City, grassroots tenant organizing led to universal counsel for income-eligible tenants, preventing more than 22 000 evictions.[24] At the state level, New York issued stronger protections than the CDC moratorium, including a full 90-day ban on all eviction proceedings, increased renter protections, and enacting the COVID-19 Eviction and Foreclosure Act, which halted evictions and foreclosures through May 1, 2021. These efforts closed gaps left by the federal order, resulting in fewer evictions.[24]

Tenant Protections and Enforcement

Broadly, ERA programs can better meet tenant demand by expanding eligibility and easing the application process.[13] Other renter-focused policies include prohibiting evictions because of back rent accumulated during the pandemic, establishing rent repayment options, prohibiting late fees, allowing tenants to use a security deposit to satisfy back rent, preventing evictions from being reported to consumer agencies, and canceling rent and debt collections altogether. These efforts may help prevent evictions and keep families stably housed when moratoria expire.

Because enforcement of any policy remains a challenge, local–federal partnerships are key for protecting tenant rights. For example, there are fines for landlords violating the CDC moratorium (e.g., under 18 USC 3559, 3571)[9]; however, documenting violations (via coercion, illegal evictions, or harassment) is difficult to track and varies across states, and abuses may be egregious in areas where landlords and other real estate interests hold significant power.[16,24] In addition, reports suggest that some state court systems have issued separate guidance related to the moratorium specific to those states, indicating that courts have flexibility in the abatement of cases based on legal challenges to the CDC eviction moratorium.[25] In these instances, public opposition and legal advocacy may apply additional pressure.

Connecting Macro- to Micropolicies

Though not comprehensive, coordinated efforts across grassroots, local, state, and federal levels can begin to "plug" gaps and form the basis of a larger conversation about lower-income housing needs. In the long term, affordable housing and tenant protection require the sustained attention of researchers and policymakers. The drivers of the current crisis are extensive and will not be undone by temporary measures. Large-scale changes include a complete "re-envisioning of national housing policy."[4] Notably, remedying legacies of discrimination requires creating new tools to subsidize affordable development for lower-income households,[19] preserving existing affordable housing (e.g., via the National Housing Trust), using regulatory and tax incentives to promote private housing developments (e.g., opportunity zones) without displacement, revising zoning standards and repealing policies prohibiting new development (e.g., Faircloth Amendment), expanding housing choice vouchers and rental assistance, investing in Black and Latinx communities and land trusts, supporting homeownership education and counseling, providing down payment assistance, and broadening the availability and affordability of mortgage financing with the help of strong incentives.[5]

Combined with progressive social policy, such as raising the minimum wage, expanding unemployment benefits, and eviction court reform, significant gains can be achieved, especially for Black and Latinx renters and single mothers living in poverty. In a promising development, President Biden recently proposed a $9 billion (15%) increase to the US Department of Housing and Urban Development's 2022 fiscal year budget, as part of a larger effort by the Biden administration to invest in the country's housing infrastructure. If enacted, the increase would facilitate the largest single expansion of housing choice vouchers (a form of rental assistance) in the program's history, as well as provide substantial federal investments in affordable homes. The administration also proposes a $500 million increase in funding for homeless assistance grants to provide rental and other assistance to an additional 100 000 people experiencing or at risk of homelessness. President Biden and Secretary of the US Department of Housing and Urban Development Marcia Fudge propose these investments alongside the proposed $318 billion in housing investments included in the American Jobs Plan.

Clearly, solutions are not in short supply. Responsible housing policy going forward does, however, require political will, intentionally inclusive policies, and restructuring incentives that reclaim housing as a human right. AJPH

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Examining Facebook Community Reaction to a COVID-19 Vaccine Trial on the Navajo Nation

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See also Hammitt et al., p. 1431.

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On September 21, 2020, the Navajo Nation, the country's largest tribal nation, hosted a public Facebook townhall discussing their participation in the Pfizer-BioNTech COVID-19 vaccine trial, the first trial on an American Indian reservation. Townhall speakers included President Jonathan Nez and Vice-President Myron Lizer of the Navajo Nation, National Institute of Allergy and Infectious Diseases director Anthony Fauci, and Johns Hopkins associate professor Laura Hammitt.[1]

Before the video townhall, on September 11, the Navajo Nation announced that they would participate in the trial after receiving expedited approval from the Navajo Nation Human Research Review Board, a decision met with mixed community reaction. Although leadership noted interest from tribal members, there was a perception that the decision to participate was made without taking sufficient community input into consideration.[2] The townhall was designed to assuage some of these concerns and educate community members about the trial.

Despite the high-profile participation of Anthony Fauci (the country's top infectious disease expert), a large number of users expressed suspicion, skepticism, and concerns about safety, including whether tribal members were being used as "guinea pigs." Given the importance of ensuring diversity in clinical trials and the participation of communities disproportionately affected by COVID-19, we sought to characterize public Facebook user reactions to the townhall. We were interested in topics related to vaccine confidence, hesitancy, and misinformation to better understand the public health impact for American Indian and Alaska Native (AI/AN) communities.

USER REACTION TO THE FACEBOOK TOWNHALL

To date, there have been no in-depth analyses of user reactions and comments from this townhall. We collected comments and event reaction data (e.g., use of like, heart, angry, concern, haha, sad, and wow emojis) from the Facebook application programming interface from September 21 to October 7, 2020, for all participants and manually coded user-generated content for themes related to vaccine-related topics. At the conclusion of the event, we used Facebook's Most Relevant feature to identify and evaluate comments that had high relevance to the event (i.e., those with the most likes and replies and from verified profiles). We note that all data collected were available in the public domain (i.e., did not include any private or deleted messages or comments), we did not interact with any users, and any results are presented only in the aggregate and do not include any personally identifiable information that can be traced to an individual post or Facebook user.

To identify appropriate themes from user comments, we used a deductive coding approach based on the World Health Organization's Strategic Advisory Group of Experts (SAGE) Working Group Vaccine Hesitancy Matrix. We adopted SAGE themes for prevalent contextual, individual or group, and vaccine-specific themes focused on negative sentiment about vaccines or the trial, vaccine hesitancy, expressions of vaccine confidence, and any widely debunked misinformation (e.g., misinformation based on general antivaccination themes, including discredited, baseless, and false claims; alternative treatments; and clear falsehoods).[3] This resulted in a total of 744 reactions and 1577 comments from 515 unique Facebook users, with 53% of these comments relevant to SAGE themes of interest. Irrelevant comments included discussions between users not related to the trial or vaccines and comments from users who were simply welcoming the speakers. The majority of emoji-only reactions to the event itself were positive (82% were either a like or a heart).

By contrast to these simple emoji reactions, users who made comments about the event expressed much higher levels of negative sentiment, with 62% of these users expressing opinions associated with vaccine hesitancy and general concern about the trial. In comparison, only 29% of comments expressed confidence about the vaccine trial. Finally, about 10% of user comments consisted of misinformation, including false information about US Centers for Disease Control and Prevention–recommended preventive measures (e.g., claiming that the flu shot had the same efficacy as a COVID-19 vaccine and claiming masks do not work), mention of or links to COVID-19 conspiracy theories (e.g., to the "Plandemic" misinformation video), and misinformation about hydroxychloroquine's efficacy for treating COVID-19.

Other vaccine hesitancy themes observed in user comments included perceived politicization of the vaccine approval process by the Trump administration and trepidation as to why the Navajo Nation was one of the first tribes to test a novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) vaccine. We also observed user comments expressing concern about the lack of transparency and community consultation from the Navajo Nation Human Research Review Board regarding expedited ethics approval. We also observed comments referencing past injustices against AI/AN communities, with references to smallpox (colonizers providing blankets to Indians) and *Havasupai Tribe v. Arizona State University Board of Regents* (a case involving improper use of blood samples for genetic research) as reasons not to participate in the trial.

When examining user reactions to the "most relevant" comments, we observed that the highest number of reactions were related to decisions and rationales of whether a user would participate in the trial. Additionally, we observed negative reactions to these comments for themes related to distrust of pharmaceutical companies, such as stating that "Big Pharma" only cared about economic considerations.

MEANINGFUL ENGAGEMENT WITH TRIBAL NATIONS

With the Indian Health Service reporting record COVID-19 cases across the country, the pandemic is far from over. COVID-19 has already resulted in 1038 deaths from 28 544 positive cases across the Navajo Nation, with cases on the rise. With additional cases reported in close to 300 other AI/AN reservations, and now likely more, encouraging vaccine trial participation is crucial for these historically underresourced communities.[4,5] Although Fauci praised the Navajo Nation as a model for the country in adhering to infection prevention guidelines, we found that many individuals had concerns about the vaccine trial that could translate to broader vaccine uptake concerns now that Pfizer and Moderna have received an emergency use authorization from the US Food and Drug Administration and vaccines are being administered. The findings we describe should be validated, in partnership with the Navajo Nation Human Research Review Board, with surveys further assessing individual and overall community sentiment toward COVID-19 vaccines on and off the reservation.

Crucially, it appears that Operation Warp Speed has overlooked a troubled history between American Indians and biomedical researchers when engaging on Facebook.[6] This is especially evident as the Navajo Nation continues to hold townhalls with major stakeholders, most recently with Albert Bourla, CEO of Pfizer, on Christmas Eve. It should also be considered that many AI/AN reservations are located in rural areas, which has led to variable bandwidth and connectivity that may render social media–based streaming events insufficient for broader and inclusive community engagement.[7]

Although social media has great potential to reach a large audience, we found that the Facebook Live event failed to properly connect with the community in a meaningful way for purposes of encouraging community-based participatory research and addressing long-standing historical and contemporary concerns that American Indians have with biomedical research. Importantly, the speakers did not moderate or meaningfully address comments, which made this event much more informational than conversational.

CONCLUSIONS

This townhall presented an opportunity to engage with the largest of the country's 574 federally recognized tribal nations on a public health matter of utmost importance: confidence in a COVID-19 vaccine. Ultimately, 250 Navajo tribal members were recruited for the Pfizer-BioNTech vaccine trial. Moving forward, it is crucial that science and public health leaders swiftly address specific community concerns and engage with tribal nations in a manner that respects their stature as sovereign entities and brings medical resources to the Indian Health Service. AJPH

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M. Cai collected the data. All authors designed the study, analyzed the data, wrote the editorial, and approved the final version.

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HUMAN PARTICIPANT PROTECTION

In completion of this editorial, we did not conduct research with human participants that falls under the purview of the Navajo Nation and the Navajo Nation Human Research Research Code CO-106-95 (section 3251-3271).

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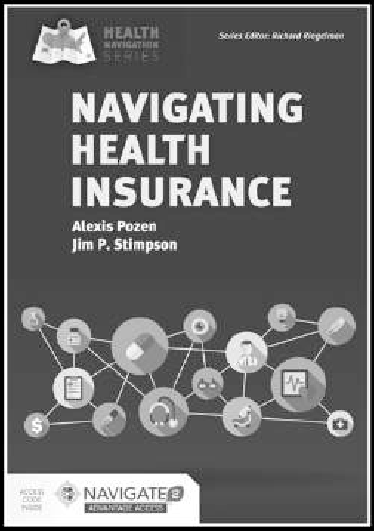

Tribal Sovereignty in Research and Community Engagement for a COVID-19 Vaccine Clinical Trial on the Navajo Nation: Beyond a Facebook Town Hall

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See also Calac et al., p. 1428.

The editorial by Calac et al. (p. 1428) provides an analysis of Facebook comments from participants in a Navajo Nation (NN) town hall on September 21, 2020, that featured Anthony Fauci, MD, and a brief overview of the Pfizer–BioNTech COVID-19 vaccine trial. The authors correctly assert that tribal communities should be cautious about research given past harms and abuses. We describe the larger community engagement process for this trial and clarify the NN research approval process. From a research standpoint, there are methodological issues with the social media analysis that readers should consider.

Community-based participatory research is not a uniform approach, and the COVID-19 pandemic has precipitated renewed dialogue about what constitutes adequate community engagement in times of crisis. We agree with Calac et al. that research on community engagement is merited. In respecting tribal sovereignty and Indigenous research ethics, we strongly encourage the engagement of Navajo scholars in study design, identification of eligible participants, coauthorship, and knowledge of Navajo research processes in future studies.

The COVID-19 pandemic hit the NN in March 2020, and NN communities experienced among the highest rates of disease in the country, driven by longstanding inequities.[1] When national news began to cover the start of COVID-19 vaccine trials, local health officials and community members began to inquire whether these trials would be available to Navajo citizens. In this context, the Johns Hopkins Center for American Indian Health (CAIH), which has worked in partnership with the NN for more than three decades, convened an ad hoc COVID-19 vaccine advisory group of Indian Health Service, Tribal Health Organization, and Navajo Department of Health leadership to consider potential COVID-19 vaccine trials. After reviewing data on vaccine candidates, the advisory group recommended that CAIH proceed with submitting the Pfizer–BioNTech COVID-19 vaccine trial to the NN Human Research Review Board (NNHRRB) for review. The NN Research Code established the NNHRRB in 1996 to review and oversee health research on the NN. Researchers must obtain resolutions for proposed studies from local chapters or agency councils before presenting them to the NNHRRB. However, in the spring of 2020, the NNHRRB waived this requirement for urgent COVID-related research because of pandemic-related closures.

The submission of the COVID-19 vaccine trial to the NNHRRB included letters of support from the leadership of the Navajo Area Indian Health Service, and all study materials were reviewed and culturally adapted by experienced Navajo research staff. The NNHRRB approved the Pfizer–BioNTech COVID-19 vaccine clinical trial on August 27, 2020. Combined with this community-level approval, the requirement for individual consent assures people the right to volunteer or refuse to participate. A complete list of the community engagement activities for the trial appears on the CAIH Web site.[2] Hundreds of community representatives have participated in discussions before and since enrollment began on September 25, 2020, expressing both positive and negative feedback about COVID-19 vaccine trials.

The key purpose of the September 21 town hall was to hear from Fauci, the country's foremost expert on the pandemic.[3] Because the NNHRRB had recently approved the COVID-19 vaccine trial, NN President Jonathan Nez invited the CAIH study lead, Laura Hammitt, MD, to join the town hall to provide a brief overview. Although this became a venue for comments on the trial, it was advertised as an opportunity to "hear remarks" from Fauci. The Facebook comments that were analyzed are a sample of social media users who had access to the Internet, joined the town hall, chose to comment, and were identified by the authors as having connections to Navajo communities from publicly available profile information. Although the analysis of publicly available data does not require consent, participants were not informed that their comments would be used by outside researchers (none of the authors of the editorial are Diné or affiliated with the trial) to characterize Navajo perceptions.

The COVID-19 crisis has highlighted longstanding inequities in this country. The inclusion of diverse populations in clinical trials can promote equity and ensure that candidate vaccines work in populations that need them the most. Sovereign Tribal Nations have the right to determine whether to provide opportunities for citizens to participate in clinical research. Simultaneously, all partners must strive to optimize transparency and engage communities about the research in a meaningful way. Clinical trials are essential to vaccine development, and vaccination is key to getting the pandemic under control. The NN is among the leaders in vaccine rollout and is on the path to community immunity.[4,5] AJPH

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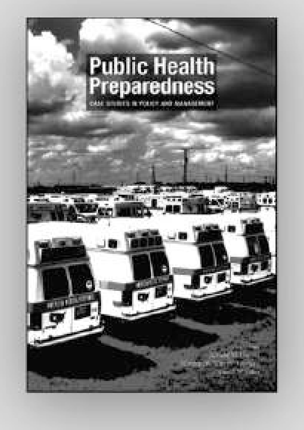

Addressing the Social Determinants of Health in the Aftermath of COVID-19: Lessons From the 2008 Great Recession

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In responding to the 2008 Great Recession, economists were split on whether to stimulate the world's economies or proceed down a path of austerity in the face of mounting debts.[1] From differences in countries' spending patterns, we learned that austerity may have caused not only poorer macroeconomic outcomes but also poorer health outcomes than prostimulus programs.[2] Antipoverty programs were particularly important for population health because low-income households suffered a disproportionate share of economic hardship and, therefore, a disproportionate burden of disease via the social determinants of health.[3] These lessons from 2008, combined with recent research, can provide real-world guidance on social policy investments to optimize the health and economic well-being of low-income Americans in the aftermath of COVID-19.

COVID-19 AND INEQUALITY

Low-income workers are disproportionately more likely to be exposed to COVID-19 and succumb to it, with age being the primary risk factor for death from the virus. Toxic, poverty-associated stress, which is prevalent among low-income workers, leads to rapid biological aging relative to one's chronological age,[4] potentially explaining why low-income minority communities have mortality rates up to six times those of higher-income, predominantly White, communities.[5] Low-income workers are also more likely to live in multigenerational households, potentially exposing vulnerable family members to illness and transforming social capital from an asset into a threat.[6] These problems may be further compounded by recent upticks in evictions and food insecurity.[7]

As COVID-19 transitions from a health emergency to an endemic disease leaving a "K-shaped" recession in its wake, the Biden presidential administration is focusing on income support strategies such as child tax credits. We draw on social policy lessons from the 2008 Great Recession and recent research to explore whether this approach could mitigate mortality from both the ongoing COVID-19 pandemic and economic hardship.

EVIDENCE-BASED POLICYMAKING

Spikes in suicide and substance abuse were most pronounced in nations that responded to the Great Recession with austerity, making the need for social investment clear.[3] However, social policies are not all created equal, as we see when weighing economic benefits and health impacts.[8] For example, a multicenter randomized-controlled trial of welfare work requirements showed that although they improve the average person's economic well-being, work requirements worsen population health[9]; those who cannot work are cut off from life-saving aid. Thus, it is crucial to ask which social policies will produce the greatest impact on both health and economic well-being. A recent review of social policies from the 1960s to the present provides data to support the results of cross-national studies of the 2008 Great Recession.[8] These include research studies evaluating interventions in employment, income support, housing, and early life and education.

Employment Programs

The Great Recession and the COVID-19 recession both led to high unemployment, peaking at 10.0% and 14.7%, respectively.[10] Many US welfare programs are conditional on employment, which is problematic when few jobs are available. As jobs return, novel methods must be developed to separate those who are able to work from those who are not—for example, because of caring for a large family or lacking access to transportation. A better means of identifying

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those who require Supplemental Security Income because of physical or mental disability is also needed. For example, much in the way that Google can predict individual characteristics with great accuracy, China's Targeted Poverty Alleviation Campaign attempts to predict whether a low-income individual is in need of employment or cash assistance and then delivers the requisite intervention.[11]

For those who can work, employment training can help. The randomized-controlled trial of JOBS II—a program that taught unemployed individuals at high risk for depression job-searching and problem-solving skills—found higher employment rates and fewer depressive symptoms after its two-year study period.[12] Job placement and training programs also offset increases in suicide during economic recessions.[2] Employment training can, then, be coupled with unemployment assistance, as more generous unemployment benefits were associated with improvements in overall health during the Great Recession.[13]

Income Supplementation and Protection

Income support and health insurance are associated with significant improvements in self-reported health.[8] For example, the Paycheck Plus Program tested a fourfold increase in the Earned Income Tax Credit benefit in one multicenter randomized-controlled trial targeted at single adults without dependent children. Overall, the program produced small increases in employment, earnings, and tax credits—less than $1000 per year because relatively few participants responded to the incentives. Yet, these modest gains in earnings produced measurable improvements in health-related quality of life among those who responded to the program most vigorously: women and adults who were paying child support.[14]

Both the Great Recession and the COVID-19 recession also saw declines in health insurance coverage.[15,16] At least 7.7 million people lost employer-sponsored insurance during the pandemic, a number that likely would have been higher had Medicaid been unavailable.[16] Quasiexperimental studies suggest that Medicaid expansion saves lives,[17] and randomized-controlled trial data suggest that it reduces clinical depression as measured by the Patient Health Questionnaire-9.[18]

Housing and Neighborhood Conditions

The Moving to Opportunity randomized-controlled trial provided rent vouchers to public housing residents to move into higher-income neighborhoods than those in which they were currently living. In theory, participants would be moved away from crime, food deserts, lead paint exposure, and many of the other health threats that tend to come with living in a low-income neighborhood. Physical and mental health benefits did appear, but only 10 to 15 years after randomization.[19] Few other research studies have shown health benefits.

Early Life Interventions

Investments in schooling may benefit both children and parents. For children, they may address educational disparities that have been exacerbated by COVID-19–induced school closures, which threaten to erase decades of educational progress for underserved children. Although only two, small randomized-controlled trials have been conducted, the bulk of evidence suggests that education quality in early childhood may be the most important determinant of adult health.[20] For parents, prekindergarten programs provide a break from intensive parenting and an opportunity to enter the workforce. Given that US welfare programs focus on employed individuals, any program allowing parents to work could produce population health benefits. Once the acute COVID-19 crisis is managed, governments should, therefore, consider expanding access to early education programs. These programs also have the benefit of paying for themselves in the long run with both health and economic returns.[20]

Families with older children at risk for dropping out of school may also benefit from education programs, as is demonstrated by the federal National Job Corps randomized-controlled trial.[21] This program provided low-income youths aged 16 to 24 years educational and job training programs. Overall, the program produced increased receipt of a general equivalency diploma, vocational certificates, employment, earnings, and self-reported health. It also produced decreased involvement in the criminal justice system and modest reductions in the receipt of public assistance over the study's four-year follow-up period.[21]

CONCLUSIONS

Lessons from the 2008 economic crisis and research on the health effects of social policies indicate that the Biden administration's approach for COVID-19 relief will be effective at addressing both poverty and health disparities. Research suggests that cash assistance should be combined with Earned Income Tax

Credit expansion, workforce training, and early education programs. However, for Earned Income Tax Credit expansion and workforce training programs to be effective, jobs must be available and accommodations must be made for those who cannot work. AJPH

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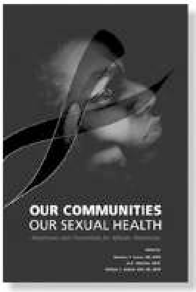

The Stimulant Crisis Intertwined With the Opioid Crisis: A Compassionate Response for Dyadic Health and Well-Being

Hendrée E. Jones, PhD, Jenna Nakagawa, MD, MPH, and Elisabeth Johnson, PhD, FNP-BC, CARN-AP

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In the January 2019 issue of *AJPH*, Admon et al. analyzed the National Inpatient Sample, a data set of hospital discharges in the United States (2008–2009 and 2014–2015) complied by the Healthcare Cost and Utilization Project, and reported an increased incidence in both amphetamine and opioid use, with an associated increased risk of adverse perinatal outcomes and higher health care costs compared with other deliveries. Compared with opioid-related deliveries and other hospital deliveries, deliveries among mothers who used amphetamine was associated with higher rates of preeclampsia, placental abruption, preterm delivery, and composite severe maternal morbidity and mortality. "These data," the authors write, "underscore the need for the maternal health community to direct attention not only toward opioids but also toward the use of amphetamines in the perinatal period."[1(p152)]

Although the United States has focused on the opioid epidemic, the stimulant crisis (which includes the use of cocaine, methamphetamines, prescription drugs, and other psychostimulants) has quietly expanded. Between 2011 and 2017, rates of stimulant overdose–related deaths in the United States quadrupled (0.9% to 3.7%), and use among individuals who also use opioids almost doubled (18.8% to 34.2%).[2–4] The rate of overdose deaths has accelerated during the COVID-19 pandemic, with synthetic opioids, methamphetamine, and cocaine overdoses increasing by 49%, 35%, and 30%, respectively.[5]

The challenges in addressing the stimulant epidemic are formidable and magnified in the perinatal patient population.[6] Despite examining 20 potential medications over decades, no medications have Food and Drug Administration approval to treat stimulant use disorder.[7] Behavioral interventions such as contingency management (i.e., the systematic reinforcement of drug-free behaviors and the withholding of reinforcement for drug-using behaviors) and the community reinforcement approach (i.e., adjusting the individual's environment to make drug-free behaviors more rewarding than drug use) show efficacy for cocaine or amphetamine use cessation.[8] For pregnant patients with opioid disorders, stimulant use disorders, or both, a tailored contingency management plus community reinforcement approach treatment has shown promise.[9] However, perinatal-specific treatment resources remain scarce. Access to evidence-based agonist treatment of opioid use disorder is limited, and comprehensive care is often prioritized for pregnant people with a history of intravenous drug use. Thus, pregnant women who use stimulants, other substances, or both nonintravenously may not receive or be connected to care as expeditiously.

Compassionate care of perinatal patients with substance use disorder (SUD) often occurs in an adversarial policy and reimbursement environment. Care providers and national organizations endorse nonpunitive and supportive policies, working to overcome access barriers, eliminate stigma and discrimination, and reduce the legitimate fears perinatal patients have of legal penalties and child removals. However, some current policy momentum is in direct opposition to this approach and discourages pregnant people from seeking prenatal care and addiction treatment. Moreover, the low level of and siloed reimbursement for integrated perinatal and SUD treatment deters innovative care provision.

We discuss strategies for supporting perinatal and parenting people as well as their children, considering stimulant use and other SUD when medications are not available for part of the treatment response.

SUPPORTING RECOVERY

Decades of research show that perinatal and parenting people with stimulant use disorders, opioid use disorders, or both have positive treatment outcomes when care is given in an integrated model, combining SUD treatment with medical care, housing security, and social support.[10] This approach displays insight into the role substance use plays in patients' lives, respects agency in health care decision making, and promotes changes to improve overall health and wellness. Treatment can lead to recovery and allow individuals to live to their full potential in the domains of physical and mental health, have a safe and stable home, find meaningful daily purpose, and connect to others, the community, and, for some, a higher power. For perinatal people, recovery also means meeting those criteria while withstanding the physiologic fluctuations in pregnancy and the puerperium.

DYADIC CARE

The stress of childbirth and parenting may be a trigger for substance use. It has been demonstrated that treatment outcomes are improved when mothers with stimulant use disorders bring their children with them to treatment.[10] Caring for the mother–infant dyad relies on therapy that is attachment informed and focused on the thoughts, feelings, and behaviors developing during early attachment experiences. Two randomized clinical trials support the intervention Mothering From the Inside Out's efficacy in improving the mother's ability to make sense of her own emotional stress, consider her child's emotional needs, exhibit more responsive caregiving behavior, improve child attachment, and decrease substance use.[11,12]

SYSTEMIC HEALING

For pregnant people and their children to live healthy and fulfilling lives, their surrounding systems must be supportive rather than punitive. Women with substance use disorders often have traumatic experiences with child protective services, and the variability between county and state thresholds for child removal further drives distrust. This issue is often amplified in Black and Native American communities, who are already disproportionately represented in the child welfare system.[13] Perinatal patients deserve anticipatory guidance and transparent communication to build trust with these social services. Critical communication between the mother's and infant's care providers, the mother, and child protective services is time intensive and requires adequate reimbursement to support the overall well-being of the mother–infant dyad. Regulatory bodies and policymakers should reject the urine drug toxicology test as a measurement of parenting skill and embrace the role of integrative services in securing child safety and realizing a parent's potential.

EXPANDING ACCESS

Incarcerated perinatal people are disproportionately affected by substance use, mental illness, and multiple barriers to health care access. Opportunities exist in the carceral system to provide integrated medical care, SUD treatment, and care coordination and then bridge these services upon reentry. States could quickly reduce maternal morbidity and mortality by providing automatic enrollment in Medicaid before release.

Admon et al. also identify a higher prevalence of SUD among rural residents "in the poorest national income quartile."[1(p150)] These disparities have been exacerbated by the COVID-19 pandemic, which precluded pregnant women from accessing outpatient treatment for opioid use disorder.[14] Moreover, with non-Hispanic Black and Hispanic women significantly less likely to access opioid use disorder treatment medications compared with non-Hispanic White women, there is an urgent need to address racial and ethnic discrimination in treatment during pregnancy and to understand the extent to which this discrimination occurs for stimulant and other SUD treatment.[15] Together, these facts highlight the importance of increasing resources and reducing Medicaid and legislative barriers to providing services to incarcerated persons, rural populations, and People of Color.

THE WAY FORWARD

The decisions of individual care providers and their institutions must be consistently driven by patient-centered goals and intentions, especially in regard to biological matrix drug toxicology testing, service referrals and coordination, and resource allocation to critical hospital-based perinatal SUD interventions. Both have an obligation to use person-first and recovery-focused language to honor patient dignity and avoid any implicit or explicit role as moral authority or a law enforcement extension. At the state and local levels, policymakers and enforcers should not support laws that single out perinatal people when creating penalties for SUD. Instead, policies must be evidence based and patient informed. Federally, policies must support research in and implementation of successful intervention strategies for perinatal SUD as well as the elimination of systemic payment barriers that limit creative care approaches. To so many families, a failure to take positive action would be devastating. The twin stimulant and opioid crises are costing mothers' lives and causing unneeded child and family suffering. We must act now to eliminate the individual and systemic barriers that impede the health and well-being of perinatal patients with SUD and their children. AJPH

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Improving the Food Environment in Washington State–Run Correctional Facilities: The Healthy Commissary Project

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Improvements to correctional facilities' food environment can provide healthier food and beverage options for incarcerated individuals, a population disproportionately affected by chronic disease. This article describes efforts to increase healthy options in the commissary program at Washington State correctional facilities from 2017 to 2019, and the role of a multidisciplinary collaboration between the state's Department of Corrections, Department of Health, and Statewide Family Council. Through the development, implementation, and promotion of nutrition standards, the nutritional quality of foods and beverages in the commissary program improved. (*Am J Public Health*. 2021;111(8):1439–1442. https://doi.org/10.2105/AJPH.2021.306292)

Food environments in correctional settings can affect incarcerated individuals' diet and potentially mitigate or exacerbate chronic disease.

INTERVENTION

The commissary at correctional facilities functions as a store for incarcerated individuals to purchase products, including foods and beverages. The Washington State Department of Health (DOH) facilitated a work group to plan, implement, and evaluate the Healthy Commissary Project (HCP), with the goal of improving the nutritional quality of foods and beverages for sale in 12 Washington State correctional facilities' commissaries. The work group included representatives from the Washington State Department of Corrections (DOC); Correctional Industries (CI), the business arm of the DOC that operates commissaries; and the Statewide Family Council (SFC), consisting of incarcerated individuals' family members. The SFC advises with the DOC to improve the quality of life of those incarcerated.[1]

The HCP improved the nutritional quality of commissary foods and beverages by (1) creating nutrition standards for products available for sale in commissaries; (2) identifying, procuring, and offering products that met nutrition standards; (3) disseminating educational material for incarcerated individuals about healthier commissary offerings; and (4) monitoring product sales to ensure their sustainability in the commissary.

PLACE AND TIME

The work group convened monthly from February to May 2017 for project planning, and CI identified products that met nutrition standards and could be sourced through distributors. CI formally adopted commissary nutrition standards in June 2017; products meeting nutrition standards were added to the commissary program in all 12 Washington State–run correctional facilities the same month. No products were removed as a result of the HCP. Meetings held in August 2017 and February 2018 helped monitor and evaluate the HCP's progress.

PERSON

On average, 16 950 incarcerated individuals in Washington State correctional facilities had access to healthier commissary products on any given day during the HCP (June 2017–May 2019). State data show that incarcerated individuals were on average 39 years old during this time. The majority of incarcerated individuals were male (92%); 70% identified as White, 18% as Black, 14% as being of Hispanic origin, 5% as American Indian/Alaska Native, and 4% as Asian/Pacific Islander.

PURPOSE

Because food service in correctional facilities is primarily a closed system, incorporating healthier options has the potential to positively affect the health of incarcerated individuals,[2] a population shown to have a higher burden of chronic medical conditions than the general population.[3,4] Foods and beverages available in commissaries are generally of poor nutritional quality.[5] The purpose of the HCP was to increase the availability of healthier products in Washington State's correctional facilities' commissaries and assess the uptake of healthier products through sales analyses.

IMPLEMENTATION

During the first work group convening, the DOC, CI, DOH, and SFC identified shared goals for improving the nutritional quality of commissary products; reviewed products offered in the commissary and CI's operating procedure used to evaluate product healthfulness; and agreed to a timeline for implementing changes. At subsequent meetings, members discussed security and logistic considerations (e.g., foods packaged in tin cans present a security hazard) and opportunities to increase communication to incarcerated individuals about healthier products (e.g., flyers detailing healthier products available).

Outside of work group meetings, the DOH, DOC, and CI updated CI's operating procedure for determining which products were healthy. The work group decided that because of limitations in commissary offerings (e.g., products must be nonperishable, which excludes many healthy foods like fresh produce), a more accurate descriptor than "healthy" would be "best choice" for products that meet specific food component and nutrient guidelines. The DOH and CI agreed to align the "best choice" products with the US Department of Agriculture's Smart Snacks in School ("Smart Snacks").[6] An online tool was available for determining if products met Smart Snacks guidelines, which made identifying and categorizing products easier for CI.

The updated operating procedure categorized commissary foods, beverages, and condiments into one of three categories: "best choice," "better choice," and "limited" (Table 1). Limited products contained high amounts of fats, sugars, or salt (e.g., candy, chips, and soda). Better choice products were lower in sodium, sugar, and fat than limited products, but they did not meet best choice guidelines. Better choice was included as a category because CI's old operating procedure had three categories, and CI wanted to keep an intermediate category to demonstrate that it was offering products that met at least some nutrient guidelines.

EVALUATION

The main analysis compared sales of best choice foods and beverages versus all other foods and beverages (i.e., better choice and limited), to allow for better comparability to other studies, and because these products met established nutrition standards. Condiments were not included in the analysis

TABLE 1— Nutrition Standards Developed Through the Healthy Commissary Project Used to Categorize Foods and Beverages in Washington State's Correctional Facilities' Commissary Program: June 2017–May 2019

Category	Foods	Beverages
Best choice	Meet Smart Snack[6] food component guidelines (i.e., contain whole grains, fruits, vegetables, dairy products, or protein foods) and nutrient guidelines for calories, sodium, total fat, saturated fat, trans fat, and sugar (with the exception that these nutrient guidelines are per serving vs per package, unlike the Smart Snacks guidelines, which calculate nutrient guidelines by package). See Smart Snack guidelines for specific food component and nutrient requirements and exemptions.	Meet Smart Snack guidelines, and include plain or carbonated water; flavored or unflavored nonfat and 1% milk and milk alternatives; and 100% fruit juice with no added sugars. Although condiments are not a stand-alone product listed in Smart Snack guidelines, they are products offered in the commissary.
Better choice	Meet Smart Snacks food component guidelines and all but one of the nutrient guidelines (e.g., the product can be high in sodium and still meet this categorization).	Low- and no-calorie (under 60 calories), which includes diet soda.
Limited	Meet none of the guidelines outlined in the best choice and better choice categories.	Meet none of the guidelines outlined in the best choice and better choice categories.

because of their small contribution to sales and calories. Sales data were plotted over time from approximately two years prior to the HCP (the pre-HCP period, beginning July 2015) to two years following initial implementation of the HCP (the post-HCP period, ending May 2019), and an interrupted time series analysis[7] was conducted to account for seasonal variations and other factors that might affect purchases. Total calories sold, by product type (i.e., food, beverage) and category, was calculated by multiplying the calories per serving times the total servings sold before and after the HCP. Best choice beverages made up a greater proportion of beverage sales after the HCP compared with before the HCP (63% vs 58%, respectively; Figure 1). Overall, data showed a 7.5% increase (95% confidence interval = 7.2%, 7.9%; $P < .001$) in sales of best choice beverages in the first month of HCP implementation (June 2017), indicating that individuals were replacing better and limited choice beverages with best choice beverages. Sales of best choice beverages showed an overall 2.6% increase in the post-HCP period, corresponding to 7.2 million fewer calories from beverages sold after the HCP compared with before the HCP. There was no significant or meaningful change in best choice food sales after the HCP compared with before the HCP. Among all foods and beverages (combined), there was a slight (though not significant) increasing trend in sales of best choice products, from 12% sold in July 2015 to 14% sold in May 2019.

ADVERSE EFFECTS

The HCP targeted commissary products, not meals or other foods and beverages available in correctional facilities. Not all incarcerated individuals can access the commissary, because of lack of money or security concerns; therefore, the HCP only affected those who used the commissary.

SUSTAINABILITY

Overall, the proportion of foods and beverages for sale that met best choice

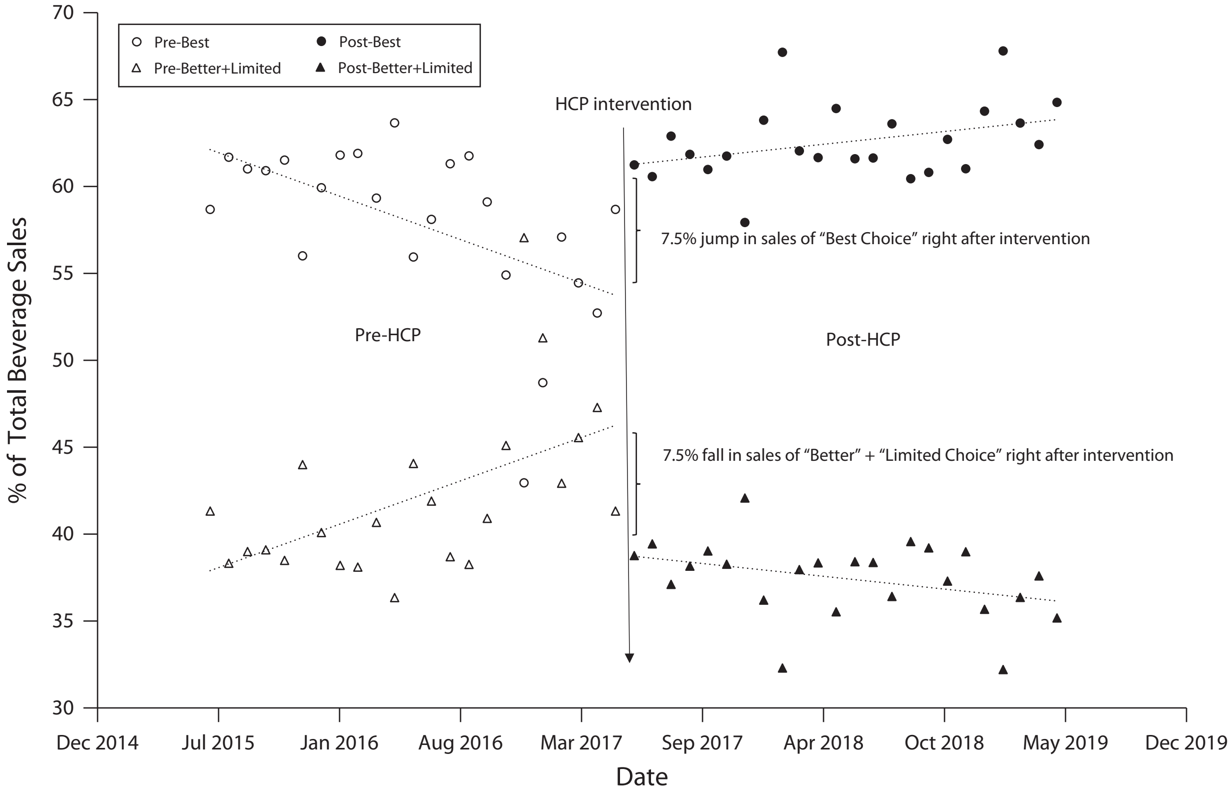

FIGURE 1— **Sales of Best Choice vs Better Choice and Limited Beverages, as Percentage of Total Quantity of Beverages Sold During (July 2015–May 2017) and After (June 2017–May 2019) the Healthy Commissary Project: Washington State**

Note. HCP = Healthy Commissary Project. Dashed line represents linear trend as assessed through an interrupted time series regression analysis[7] (model fit $R^2 = 0.82$).

criteria increased from 13% before the HCP to 19% after the HCP. Best choice products continue to be offered more than three years after the HCP was first implemented, and CI and the DOC continue to promote healthier commissary products through posters and newsletters.

The HCP showed how government agencies can collaborate to improve the food environment in correctional facilities. This approach can be replicated in other correctional facilities across the country that have commissary programs. CI's operating procedure can be translated to other commissary programs regardless of size. As a result of the HCP's success, the DOH, DOC, and CI continued collaboration in 2018 to address meals, which affect most incarcerated individuals.

PUBLIC HEALTH SIGNIFICANCE

Correctional facilities provide an exceptional opportunity for implementing public health nutrition interventions because of the controlled nature of the food environment. Research suggests that many incarcerated individuals gain excess weight while incarcerated and experience higher rates of chronic medical conditions compared with the general population.[3,4] Nutrition interventions are therefore especially important to implement in the correctional setting.

The HCP demonstrates the feasibility of partnerships between health departments, corrections, and advocacy organizations to implement effective nutrition interventions in correctional facility commissaries. This project also serves as a model for implementing nutrition interventions in additional food service venues, such as mealtimes, to further increase access to healthy food and beverage options. AJPH

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The authors have no conflicts of interest to report.

HUMAN PARTICIPANT PROTECTION

The Washington State institutional review board deemed evaluation activities exempt from review.

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Heat-Health Behavior Change During Summer 2020 in African American Alabama Residents

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To investigate how heat-health behaviors changed in summer 2020 compared with previous summers, our community–academic partnership conducted telephone surveys to collect data on cooling behaviors, safety concerns, and preferences for cooling alternatives for 101 participants living in Alabama. Participants indicating they would visit cooling centers declined from 23% in previous summers to 10% in summer 2020. The use of cooling centers and other public spaces may be less effective in reducing heat-related illness because of safety concerns amid the COVID-19 pandemic and police brutality. (*Am J Public Health*. 2021;111(8):1443–1447. https://doi.org/10.2105/AJPH.2021.306365)

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The ongoing COVID-19 pandemic may lead to an increased risk of heat-related illness. Heat-related illness risk mitigation strategies before the COVID-19 pandemic—the use of cooling centers and public outdoor recreational areas (e.g., swimming pools, lakes, water parks)—may be used less because of closures and the perception of an increased risk of contracting COVID-19.[1] Additionally, police brutality cases in 2020 may have changed people's perception of the safety of visiting public cooling spaces and of seeking medical attention if experiencing heat-related symptoms, potentially increasing the risk of heat-related illness.[2] Although staying at home may reduce the risk of contracting COVID-19 and alleviate safety concerns, the lack of at-home air conditioning, high electricity bills, or heat-related electrical blackouts may hinder people from staying cool at home in hot weather.[1,3] Loss of jobs, supply chain disruption, increased isolation, and restricted health care access during the pandemic may also increase the risk of heat-related illness.[1,3,4]

INTERVENTION

As part of our community–academic partnership—ENACT (www.enactalabama.org)—Friends of West End and West Central Alabama Community Health Improvement League conducted telephone surveys in an urban location (City of Birmingham) and a rural location (Wilcox County) in Alabama to determine how residents' heat-health behaviors changed in summer 2020 compared with previous summers and to relay heat-health mitigation strategies before forecasted extreme heat events.

PLACE AND TIME

We conducted the telephone surveys in the City of Birmingham and Wilcox County, Alabama, in July through September 2020.

PERSON

We recruited and enrolled participants from the established networks of Friends of West End and West Central Alabama Community Health Improvement League. Forty-nine urban participants and 52 rural participants completed the baseline survey, and 48 of the 49 urban participants and 52 of the 52 rural participants completed the follow-up telephone survey. The mean age of participants was 52 years, 84% identified as female, and all identified as Black or African American (Table A, available as a supplement to the online version of this article at http://www.ajph.org). The high proportion of female participants reflects our established networks from previous studies, in which females were more willing to participate.[5]

Rural and urban participants were comparable in age, sex, education level, annual household income level, and general health conditions. Participants generally reflected reported US Census demographics in the 2 sampled locations based on age and education (percentage who were aged 65 years and older and percentage with high school diploma or higher among persons aged 25 years and older) and overrepresented persons identifying as Black or African American and female and having lower household income (Table B, available as a supplement to the online version of this article at http://www.ajph.org).

PURPOSE

The purpose of the telephone survey was to mobilize our established community–academic partnership to examine whether and how participants' heat-health behaviors changed because of COVID-19 and recent police brutality in summer 2020 compared with previous summers and to relay pandemic-safe heat-health strategies before a forecasted extreme heat event.[6,7]

IMPLEMENTATION

We designed the initial and follow-up surveys based on Centers for Disease Control and Prevention and World Health Organization heat-health guidance.[6,8] Friends of West End and West Central Alabama Community Health Improvement League completed telephone calls using a script (https://bit.ly/3w28WsG). In the initial survey, participants self-reported the use of 8 heat-health mitigation strategies in previous summers and their anticipated use of those same strategies in summer 2020. We conducted follow-up surveys when weather forecasts predicted "danger" or "extreme danger" heat index categories by the National Weather Service over the upcoming week, and we asked participants to report their willingness to use each of the 8 heat-health mitigation strategies during the upcoming forecasted heatwave. We completed the initial telephone surveys in June and July 2020 and the follow-up telephone surveys through September 2020.

EVALUATION

Table 1 reports the key results on heat-health behavior change, with each participant serving as their own control. Fewer participants reported that they would use air-conditioned public spaces (e.g., malls, stores, libraries, recreation centers, churches) in summer 2020 compared with previous summers (23 participants [23%] in previous summers vs 10 participants [10%] in summer 2020; $P = .02$). Most participants reported that they had used or would use fans, close curtains or blinds, and check in with friends and family on hot days in previous summers and would do so in summer 2020. In urban participants only, a higher percentage of participants reported that they would open windows to cool down the house in summer 2020 compared with previous summers. In summer 2020, 77% of participants reported that they would seek medical attention if feeling too hot or dehydrated. A significantly higher percentage of urban participants reported that they had used or would use, if open, cooler air-conditioned public spaces, public swimming pools, or recreational areas compared with rural participants in previous years and 2020. It is important to note that most parks, recreation areas, and swimming pools were closed during survey implementation and, for example, City of Birmingham swimming pools are still closed as of early June 2021. A higher percentage of rural participants reported fan use compared with urban participants in previous summers (43 rural participants [83%] vs 25 urban participants [51%]; $P \leq .001$).

A total of 25 rural participants (48%) and 18 urban participants (37%) reported that the recent cases of police brutality had changed their perception of safety for visiting public spaces or recreational areas (Table C [available as a supplement to the online version of this article at http://www.ajph.org]). Forty-three participants (43%) felt less safe. One participant explained, "[I am] afraid that something bad might happen, and I might get caught up in it." Thirty-nine participants (39%) reported that the recent cases of police brutality changed their trust in local emergency management or health care providers. One participant explained, "[The police brutality] seems like it has gotten worse." Another said, "[It] depend[s] on how ill the person is. It's danger[ous] going to [the] ER at night. I would do my best to figure out what to do in case of an emergency at night." Two participants (2%) reported that their or their family's or friends' health was affected by other aspects of the recent cases of police brutality. One participant explained, "[I have a] lack of trust for . . . police officer[s]. [There have been] too many unsolved death(s) that have occurred from the hand of police officers." We did not find urban–rural differences in these safety concerns.

Most participants (95%) in both locations felt that they had been able to stay cool so far in summer 2020 upon completion of the initial survey. However, during the follow-up survey conducted through August and September 2020 before particularly hot weather was forecasted, 21 rural participants (40%) and 17 urban participants (35%) had concerns that they would not be able to stay cool in upcoming hot weather that had been forecasted. Uncertain air-

TABLE 1— Participants' Heat-Health Behaviors in Previous Summers and Summer 2020

	Participant No. (%) Reporting Use in Previous Summers	Participant No. (%) Reporting Use in Summer 2020	P^a
Use cooler air-conditioned public spaces (e.g., malls, stores, libraries, recreation centers, or churches)			
Both rural and urban	23 (23)	10 (10)	.02
Rural	6 (12)	2 (4)	.27
Urban	17 (35)	8 (16)	.06
P^b	.01	.047	. . .
Use public swimming pools or outdoor recreational areas (e.g., lakes, rivers, water parks)			
Both rural and urban	17 (17)	13 (13)	.56
Rural	2 (4)	3 (6)	> .99
Urban	15 (31)	10 (20)	.35
P^b	≤ .001	.04	. . .
Worry about not being able to keep cool owing to high cost of air conditioning			
Both rural and urban	45 (45)	43 (43)	.89
Rural	22 (42)	21 (40)	> .99
Urban	23 (47)	22 (45)	> .99
P^b	.69	.69	. . .
Open windows to cool down the house			
Both rural and urban	20 (20)	32 (32)	.08
Rural	9 (17)	12 (23)	.63
Urban	11 (22)	20 (41)	.08
P^b	.62	.09	. . .
Use fans to keep cool			
Both rural and urban	68 (67)	73 (72)	.54
Rural	43 (83)	42 (81)	> .99
Urban	25 (51)	31 (63)	.31
P^b	≤ .001	.07	. . .
Close blinds or curtains during hottest part of the day			
Both rural and urban	81 (80)	82 (81)	> .99
Rural	42 (81)	43 (83)	> .99
Urban	39 (80)	39 (80)	> .99
P^b	> .99	.8	. . .
Check with friends and family during hot days			
Both rural and urban	89 (88)	91 (90)	.82
Rural	43 (83)	44 (85)	> .99
Urban	46 (94)	47 (96)	> .99
P^b	.12	.09	. . .

[a] *P* values were obtained between response in previous summers vs summer 2020 in the same location in the Fisher exact test.

[b] *P* values were obtained between response in the urban location vs the rural location concurrently in the Fisher exact test.

conditioning capacity (e.g., not enough air-conditioning units, air-conditioning window unit only), financial concerns (e.g., high electricity bills owing to air conditioning, limited income), extreme heat (e.g., participants said, "[The weather is] too hot," "The heat was abnormal"), and housing types (e.g., mobile homes) were the reasons for the concerns reported by 13 (33%), 10 (26%), 4 (10%), and 2 (5%) of the 38 participants, respectively. These results

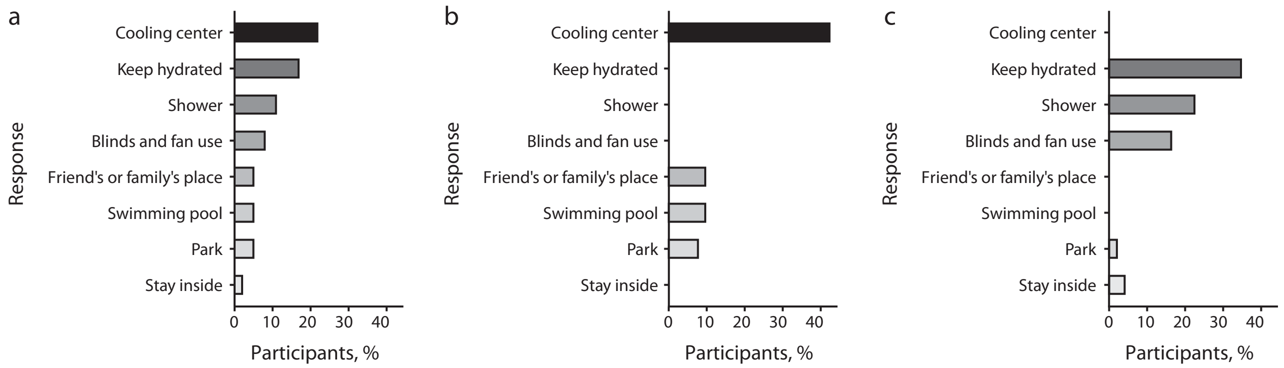

FIGURE 1— **Methods Participants Reported They Would Prefer to Use to Keep Cool in an Upcoming Heatwave Forecasted in Summer 2020 for (a) Both Wilcox County and Birmingham City, AL, (b) Wilcox County Only, and (c) Birmingham City Only**

Note. A total of 36 participants (69%) in Wilcox County and 34 participants (69%) in City of Birmingham reported they would use a method, if available (5 participants reported 2 methods).

emphasize the importance of low-cost cooling alternatives in homes.

A total of 70 participants (69%; 36 rural participants and 34 urban participants) reported that they would use a recommended method or methods to keep themselves and friends and families cool during the forecasted upcoming heatwave. Going to cooling centers (if accessible and open), keeping hydrated, and showering were the top 3 reported methods (Figure 1). Rural participants responded that using cooling centers would be the preferred method, whereas keeping hydrated was the preferred method for urban participants. Twenty-nine (29%) participants reported that they would not use any of the recommended methods, and “COVID-19” (14%) and “stay inside (avoiding methods requiring participants to go outside to keep cool)” (8%) were the top 2 reasons reported by participants not using recommended methods from both locations (Figure A [available as a supplement to the online version of this article at http://www.ajph.org]).

In conclusion, participants were less likely to use public cooling centers or other public spaces in summer 2020 compared with previous summers because of the COVID-19 pandemic and recent police brutality. Uncertain air-conditioning capacity and financial concerns were the top 2 reasons behind cooling concerns when a heatwave was forecasted.

ADVERSE EFFECTS

No adverse events were reported.

SUSTAINABILITY

Community–academic partnerships can offer a sustainable method to create and maintain the networks needed to rapidly assess and respond to emergent public health threats.

PUBLIC HEALTH SIGNIFICANCE

Systemic racism is a leading public health concern, and police brutality cases, COVID-19, and high temperatures were dangerous concurrent challenges for public health in summer 2020.[2] Before 2020, there was limited access to swimming pools and other public cooling spaces because of redlining and the resultant disinvestment in Birmingham and Wilcox County. This study illustrates the feasibility and fast responsiveness of a previously established community–academic partnership in reaching out to residents, collecting information on heat-health behaviors, and sharing heat-protective information in urban and rural locations amid the COVID-19 pandemic and high-profile police brutality cases in summer 2020. Our results provide evidence on how heat-health behaviors may be changing because of the pandemic and cases of police brutality, and this information may be helpful for future heat mitigation intervention development. AJPH

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CONTRIBUTORS

S. Wang performed the data curation, formal analysis, validation, and visualization and wrote the original draft of the article. E. Johnson and S. Tyson acquired the data. E. Johnson, S. Tyson, and J. M. Gohlke conceptualized the study. J. M. Gohlke was the project administrator and supervised the study. All authors contributed to the methodology and investigation and wrote, reviewed, and edited the article.

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CONFLICTS OF INTEREST

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HUMAN PARTICIPANT PROTECTION

This study was approved by the Virginia Tech institutional review board (protocol 15-761).

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COVID-19 in Marginalized Communities: Shifting From Descriptive to Interventional Research

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See also Borrell and Kapadia, p. 1366, and the Social Justice for Marginalized Communities section, pp. 1448–1472.

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The fact that COVID-19 has had a disproportionate impact on communities lacking power, agency, and social protections is no longer controversial. Throughout mainstream political and medical discourse in the United States, it is widely acknowledged that people who have been unable to shelter in place or work from home, those who work in industries characterized by worker disenfranchisement and dangerous working conditions (e.g., meatpacking), and those living in crowded facilities with inadequate infection control or even the individual agency to escape confinement (e.g., nursing homes, prisons) have been disproportionately at risk for infection and death. As these vulnerabilities in the United States are patterned on top of structural racism against Native American, Black, and Latino populations in particular and atop economic policies that disenfranchise rural workers, women, immigrants, and laborers, it comes as little surprise that COVID-19 has mirrored and augmented our societal disparities, as did so many previous disease epidemics.

A veritable industry of publication has arisen to detail COVID-19 rates among vulnerable populations and the disparities between them and their more resource-advantaged counterparts. A recent analysis notes, for instance, that Black–White disparities in COVID-19 intrahospital mortality disappear after adjustment for age, sex, health care insurance, neighborhood deprivation and resource-related comorbidities, and site of care.[1] Such analyses are critical to document a disparity, draw attention to its underpinnings in societal choices rather than genetic predispositions, and highlight the need for action.

But the role of public health researchers during COVID-19 must move well beyond the provision of descriptive statistics and regressions stratified by sex, race/ethnicity, and socioeconomic status. The experience of COVID-19 in the United States cannot be easily separated from the historical movements of Black Lives Matter and its countervailing and violent White supremacist campaign epitomized by the attempted insurrection at the US capitol. The visibility of these movements in the time of COVID-19 has indelibly framed pandemic parlance, so that describing disparities in COVID-19 infection and death is in vogue—and that is precisely why it is dangerous: it may be considered sufficient to define and describe the problem and then tweet about it.

Acknowledging that our public health community has largely failed in this pandemic—that COVID-19 incidence and mortality in the United States has exceeded that of any other nation despite our cumulative wealth and resources, or perhaps precisely because of our unequal accumulation of wealth and resources—requires us to contemplate how we will change our field to address our failure. A commonality among editorials that describe COVID-19 among marginalized communities in the United States is that they focus on descriptive statistics of disparities and then end with glittering generalities of what must be done in the future: end structural racism, expand health care access, address social determinants of health, and the like. These are widely accepted, oft-repeated, and ultimately meaningless recommendations—as they are too vague to be actionable.

How may we proceed to improve our recommendations to provide actionable insights? Our field can investigate the very specific policies and interventions that deserve more rigorous research from us to address COVID-19 among marginalized communities, despite the methodological and logistical challenges of doing so.

First, the programs and policies most affecting marginalized communities have been relatively neglected by public health researchers. Why have unemployment insurance policies—observed to reduce chronic illness exacerbations and improve mental health during COVID-19[2]—been accessed less by Latino populations, and which strategies are effective in accelerating participation? Why has West Virginia been more successful than California at disseminating vaccinations,[3] despite the latter state's greater infrastructure and wealthier population? If nursing homes with unionized workforces have fewer infections[4] and those owned by private equity groups have more infections,[5] which specific regulations are most effective in protecting public health in nursing homes? As food security programs expand to the disabled, how much have they helped or failed to help reduce chronic diseases associated with such insecurity, and why? Policy analysis should not be left to economists alone if we expect public health outcomes to be affected by social and economic interventions.

Second, although observational natural experiments to assess public health–related policies are increasingly possible given heterogeneities among states and counties, the public health field can also execute randomized controlled trials, even during a pandemic. Randomization is particularly important to control for the endogeneity of more progressive policies being passed in left-leaning states and counties and their conservative counterparts in right-leaning locales. Researchers deploying mobile units to nursing homes have managed to test rapid interventions, including on-site enhanced disease control and mortality-preventing activities, versus standard protocols for outbreak control.[6] Similarly, new food security programs have been subjected to randomized trials to assess their relative benefit to marginalized communities before there is substantial public investment.[7] Just as health care entities participate in operations research for quality improvement, public health organizations can also identify which logistical strategies work better than others through randomized pilot deployment of experimental tools before widespread adoption; these include alternative software for deploying staff and ranking triage needs and alternative models for comparing policies and protecting different populations.

Finally, public health researchers can recognize that their data present not only an important research commodity but also a potential public good—that public health data analysis and sharing can be its own public health service. At a time when federal, state, and county COVID-19 testing infrastructure failed to reach many Americans, the collection and dissemination of information on testing options, positivity rates, and mass testing efforts were critically enhanced by crowd-sourced information (e.g., https://covidtracking.com), leading to increased knowledge of and response to the spread of infection. As vaccination efforts also began similarly in a decentralized fashion, data gatherers and analysts are again providing the vital public health service of identifying which vaccination sites are performing well and which poorly, among which populations, and to what effect toward herd immunity (e.g., https://vaccinateca.com). Understanding and sharing the logistics of such operations may be vital to the building of future infrastructure in a country that has so long spent disproportionately on specialized health care over societal public health resources.

Although the need to address COVID-19 among marginalized populations remains in an acute emergency phase of infection control, the fact that the same populations have been consistently marginalized by other diseases and conditions means that the public health community must transition from running a marathon at a sprint's pace to taking stock of our efforts and the future implications of repeat failures for our longer-term research. The implications of COVID-19 on unemployment, associated mental health, and continuing substance dependence epidemics and chronic disease exacerbations are likely to keep our community busy with evidence of rising disparities and increased suffering.

Here is a clarion call for us in this environment: we can choose to move beyond the documentation of injustice alone to understanding more precisely what actions to take, among whom, and with what anticipated effect. Specifically, we can move away from the comfortable liberalism of merely describing disparities and shift toward the messy, political, and humbling work of evaluating interventions to identify the small set that may make a positive difference for those systematically marginalized in this pandemic and others.

This will likely require us to continue developing a willingness to intrude into the space of sociologists and economists and political scientists. We must specifically evaluate the health effects of welfare policy, employment policy, housing policy, environmental policy, city planning, and regulatory authority. We must assess the health impact of changes at local, state, and federal levels in the programs that influence income generation and loss, the conditions of labor, and the quality and environment of homes. And, perhaps most of all, we must assess the ability of those we label "vulnerable" to become less vulnerable, more powerful, and able to advocate and win advocacy efforts to protect their health. AJPH

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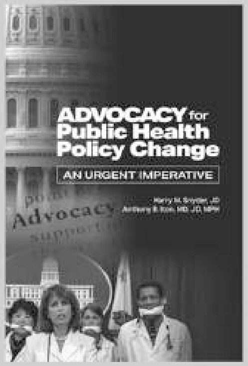

Post–COVID-19 Health Care System: A Call for Community-Based, Person-Centered, and Primary Care–Driven Care

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See also Borrell and Kapadia, p. 1366, and the Social Justice for Marginalized Communities section, pp. 1448–1472.

It has been seven months since the beginning of New York State's emergency response to the COVID-19 pandemic. As of this writing, there have been 7.7 million COVID-19 cases and 214 000 deaths in the United States.[1] SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) and COVID-19 represent an unprecedented threat to the lives and livelihoods of our community—globally, nationally, and locally. It has become clear that COVID-19 is not the great "equalizer" but quite the opposite, magnifying and bringing to the fore the detrimental, unignorable impact of long-standing systemic inequities. To focus beyond the disparities in COVID-19 fatalities and the disproportionate burden on hospitals and critical care, we must think about equitable strategies to address the longer-term health and socioeconomic impact.

Here we tell the story of our fractured primary care system, an extension of long-standing structural inequity, the further-exacerbated health inequities laid bare by the pandemic,[2] and the perpetuating impact of deferred care. We also discuss the potential power of community-based care ecosystems with patients at the center.

PRE–COVID-19: A BROKEN HEALTH CARE ECOSYSTEM

Despite the highest per capita spending, various authorities have consistently ranked the US health care system the worst among developed countries.[3] Poor performance in access, equity, and efficiency results in poor patient care experiences, poor health outcomes, and uncontained costs. Rather than overtaxing clinicians to deliver comprehensive solutions through isolated treatments, we must address the needs arising from deeply embedded social factors and, ultimately, drive improvements in access, equity, and efficiency. People who are high utilizers of health care services often have complex medical, behavioral and social needs.

Social determinants of health—the conditions in which we are born, grow, live, work, age, and worship, which shape our health trajectories—drive more than 80% of health outcomes. Yet, up to 88% of the US health care budget is devoted to providing medical services, leaving many patients' needs unaddressed as they remain caught in a cycle of requiring more clinical care.[4] These inequities have been decades in the making. Across the United States, racism is built into the politics and structure of the health care system, public health infrastructure, and perceptions of the social safety net.[5]

Primary care includes the specialties of adult internal medicine, pediatrics, and family medicine. It is intended to be the first place that people go when seeking health care, whether to treat symptoms of illness or prevent illness. Well before the pandemic, emergency rooms and urgent care centers had become preferred "first places" to seek care. This is in part because our health care ecosystem is fractured (Figure 1) and in part because we have a sick-care culture, not a preventive-care culture. In 2016, preventive care was the reason for a visit only one third of the time, even in the case of children.[6]

The general disregard for the value of preventive care is due to a mismatch between perceived benefit and the unaffordable level of effort required to access primary care. This problem worsens for our marginalized populations: both rural and low-income inner-city areas suffer from increased difficulty accessing primary care.[7] Moreover, even in low-income inner-city areas where the ratios of patients and primary care physicians (PCPs) are comparable, social determinants of health (e.g., transportation and scheduling issues, lack of child care or paid sick time, Medicaid reimbursements that do not allow

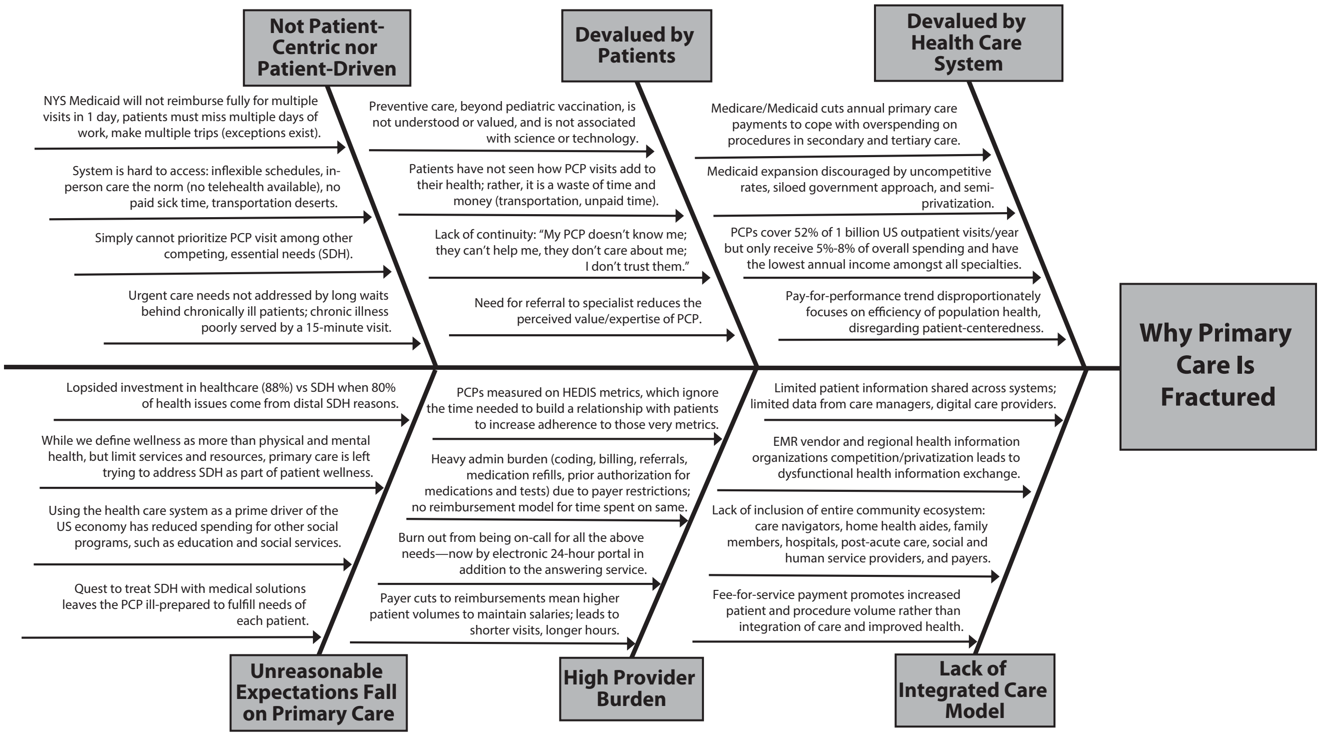

FIGURE 1— **Fishbone Diagram: Broken Primary Care System**

Note. EMR = electronic medical record; HEDIS = Healthcare Effectiveness Data and Information Set; NYS = New York State; PCP = primary care physician; SDH = social determinants of health.

multiple doctors' visits in one day) dictate true accessibility.

The system then reinforces itself: because health insurers devalue and underfund primary care, our too few, overencumbered PCPs overbook their schedules, creating longer waits for an appointment. Patients then wait further at the appointment, as the allotted one-size, 15-minute visit does not actually fit all. Their health problems are often unresolved, recognized too late, or met with further barriers of test and medication authorizations. The vicious cycle of waits and delays is reinforced, and patients' trust in primary care erodes further without continuity and without faith that the PCP can actually help their complex needs.

Although divestments from primary care attempt to cope with overspending on medical procedures and tertiary care, the health care system still receives significantly more governmental funding than community-based organizations, which are better suited to address social determinants of health, the fundamental causes of much illness. When pediatricians see children failing to thrive because of inadequate nutrition, hunger becomes a health care problem, and as long as the solutions to social problems require health care providers to intervene, the problems of long patient waits and overburdened PCPs continue. In this way, primary care for marginalized populations is made much harder to deliver. Thus, inequities in health care and social determinants of health grow.

DISPROPORTIONATE IMPACT OF COVID-19

As of October 10, 2020, the United States accounted for 21% of the world's COVID-19 cases and 20% of the world's COVID-19 deaths,[1] despite accounting for only 4% of the world population. With no effort toward swift containment and severe inadequacies in testing and personal protective equipment, the United States missed the mark for containment by the time New York became the epicenter. Tried and true epidemiological methods (isolation of infected individuals, quarantine of contacts, and contact tracing) have not been effective. Moreover, evidence-based prevention measures (universal mask wearing, use of personal protective equipment, physical distancing, and hand hygiene) continue to encounter significant resistance.

Black and Latinx Americans are consistently overrepresented among COVID-19 hospitalizations and deaths,[8] and Black and Latinx patients hospitalized with COVID-19 present with more comorbidities—specifically obesity, hypertension, and heart disease[9]—greatly increasing the risk for COVID-19 fatality. The pandemic also highlights the disproportionate economic burden on people of color, especially in states that have rejected Medicaid expansion.[10] People in marginalized racial/ethnic groups are overrepresented in racially and economically segregated communities with substandard housing conditions, unsafe or limited water, and crowded housing, all factors that make public health prevention measures extremely difficult if not impossible.[2,5,11]

When the COVID-19 pandemic hit New York, officials did not turn to primary care because our contingency plans for emergencies include only emergency rooms. PCPs were ill equipped to deal with a pandemic filled with conflicting information and a health care system in disarray. Health insurers quickly approved full payments for televisits and waived Health Insurance Portability and Accountability Act requirements so that PCPs and patients could communicate over nonmedical platforms. Although PCPs quickly adopted new systems for televisits, many patients were still left out as a result of technology gaps, scheduling issues, or lack of awareness about teleservices.

A different system design may have allowed PCPs to respond more quickly and to a broader population at a vulnerable moment. In this particular pandemic, an initial myopic focus on hospitalized patients prevented outpatient health care providers from early participation in basic COVID-19 education and close monitoring of individuals at high risk of both exposure and fatality. A lack of understanding of the asymptomatic state and contagion contributed to patients' fears of seeing their PCP and other outpatient specialists (e.g., cardiologists, oncologists, psychiatrists), which led to more disenfranchised, disengaged patients with worsening health.

During the peak of the pandemic, about 41% of US adults avoided medical care because of COVID-19 concerns.[12] New York City had the highest level of deferral of health care services, a peak reduction of 70%.[13] The highest rates of deferred medical care were found among Black and Latinx adults, people with disabilities, and those with two or more underlying conditions.[12] In a comparison of January through April 2019 and 2020, vaccine tracking systems reveal a significant decrease in childhood vaccinations beginning the week after March 16, 2020.[14] Average weekly screenings for breast, colon, and cervical cancers dropped by 94%, 86%, and 94%, respectively, relative to the averages before January 2020.[15] Combined diagnoses for breast, colorectal, lung, pancreatic, gastric, and esophageal cancers during the peak of the pandemic fell by 47%. These delays in diagnosis will likely lead to presentation at later stages and more fatal outcomes.[16]

To date, the largest drops in health service spending over 2019 have been in outpatient care centers,[15] where patients are both screened and treated for diabetes, chronic obstructive pulmonary disease, hypertension, heart disease, and asthma. During the pandemic, there have been reductions in care for these conditions ranging from 7% to 38%.[17] Delaying screenings and treatment of chronic disease patients can lead to increased complications, which often require critical care management and are associated with significant health care costs, morbidity, and mortality.[18,19] This deferred care has resulted in excess deaths relative to prior years (a "death gap") beyond those directly caused by SARS-CoV-2 infection: from March 1 to April 25, 2020, the United States had more than 87 000 excess deaths, of which only about 65% were attributed to COVID-19.[20]

In addition, with SARS-CoV-2 infection, we are seeing that many recovering patients have chronic cough, fibrotic lung disease, and bronchiectasis.[21] Activating primary care would mean reaching out to patients for routine disease screening and treatment instead of hoping they remember to come in (or prioritize doing so) and ensuring that primary care is accessible to patients with persistent postinfection respiratory symptoms.

POST–COVID-19: REIMAGINING OUR CARE

The term "community-driven care ecosystem" describes a team-based health care model that includes primary care, care navigators and other lay workers, home health aides and family members, hospitals, postacute care, social and human service providers, accountable care organizations, and managed care organizations—based in and owned by the community—working in a concerted and coordinated manner to promote the physical, mental, and social well-being of the whole person. In most primary care models, a medical team led by the PCP drives care, expects the patient to respond, and is largely separate from community-level support. In a community-driven care ecosystem, patients drive their care toward self-management, and community-based sources of support join the PCP to meet patients where they are.

In the past decade or so, there have been promising practices in terms of care bundles and value-based payments in partnership with payers at either the individual practice or the municipality level.[22] In addition, larger scale state-level reform endeavors for Medicaid populations, including in New York, have renewed attention to primary care, integrating primary care and behavioral health and prioritizing social issues confronting patients. New York State funded coordinated networks, reflecting the belief that delivery system reform will occur only if hospitals and clinical providers work together with community-based partners to change care delivery. The funding algorithm rewarded networks for breaking barriers to collaborating and contracting with community-based providers serving large numbers of Medicaid beneficiaries, which necessitated that clinical and social service providers build new partnerships with one another and find ways to strengthen joint efforts. These networks are one form of an ecosystem. Next, we expand on two critical tenets of the community-based care ecosystem.

Team-Based Care

The primary care system in New York City is already well positioned to respond to future pandemics: PCPs now test their patients for SARS-CoV-2 and are active in COVID-19 education. But the burdens are too great for the current fractured and siloed system to bear; it is unrealistic to expect medical providers to attempt to implement universal testing, care for COVID-19 patients, and reach out to care-deferring patients while responding to patients' food insecurity. Successful examples of community-based care models must be deployed to stretch the care team beyond the medical model. One example involves PCPs alerting community health workers of cases of uncontrolled asthma among their patients. The community health workers then visit the patients' homes—in person or, now, virtually—to ensure they understand how to use their inhalers and peak flow meters and evaluate their homes for evidence of roach and rodent infestation (known asthma triggers).

When the major receiver of funds is the hospital, the hospital remains the power broker for health care. Health care payers such as Medicaid, Medicare, and commercial insurers should contract directly with community-based service organizations, rather than hospitals and large clinical practices only, to transfer power and thereby elevate their capacity. If our goal is to increase preventive care and promote self-management, we need to elevate community-based preventive care and testing and a community-driven care continuum for chronic disease. Then ambulatory care can partner with community-based organizations to deliver care to people where they are. This requires workforce development and training to make primary care emergency ready. Moreover, it requires paid sick leave and other appropriate benefits for all members of the workforce and complete compensation and reimbursement for all care, face to face or otherwise.

Telemedicine and Technology

Health care must overcome its inertia and continue to nimbly adopt innovative approaches to improving equitable care. For example, telemedicine had been blocked for years by regulatory barriers until those barriers "magically" disappeared: the number of Medicare fee-for-service beneficiaries receiving telehealth services nationwide, including audio-only visits, virtual check-ins, and video visits, increased from 13 000 per week before the pandemic to almost 1.7 million in the last week of April 2020.[23] New York City Health + Hospital's 500 monthly televisits increased to 57 000 within three weeks of the outbreak.[24] Despite uncertainties about payment models, many PCPs are maintaining their telehealth appointments to better respond to the next wave.

Moreover, basic technology and infrastructure have allowed for teleservices beyond billable telemedicine. Services range from tele-education and virtual visits with asthmatic clients and patients with uncontrolled diabetes to remote release planners for soon-to-be-decarcerated individuals to provide substance use support and video assessments and telephonic shelter intakes for homeless individuals. Community-based organizations have seen a noticeable rise in engagement with their clients, including hard-to-reach and previous unreached clients. These virtual means also allow staff members to stay safely employed, with more uninterrupted focus on their clients.

Still, enabling these services equitably will require powerful level setting. We must break the digital divide by providing devices and broadband connections to patients who lack them and culturally responsive education toward virtual and digital health care access.

CONCLUSIONS

What does our society's post–COVID-19 era look like? Data show that since the beginning of the outbreak in New York (March 2020), about 80% of all COVID-19 patients have not been hospitalized, and about 95% have not required a ventilator and have not died.[25] This means that well over 90% of COVID-19 patients have recovered in the community and emphasizes the paramount need to invest in community-based, person-centered, person-driven care. Data on non–COVID-19 fatalities and deferred care warn us to act now to prevent another wave of health care crises. Currently, our system is driven by hospital-based health care, a semiprivatized economy feeding on structural inequity and inequitable distribution of consumer technology. We must take this opportunity to examine our current unbalanced, inequitable public health and health care system and build and bolster a community-based care structure in a holistic, humane, and equitable way.

COVID-19 is not spreading over a level playing field, nor do affected individuals recover and sustain equitably. By highlighting the most vulnerable spots in our community, the pandemic underscores new opportunities for longer-term preparation to prevent further deepening of health inequities. Some of these "new" opportunities are not actually new but have seen chronic underinvestment. Our marginalized communities have not observed meaningful investment in their health and well-being. This pandemic may be due to a novel virus, but curtailing the prolonged human-made disaster of inadequately addressing our marginalized communities' needs is in our control. As much as primary care is part of and suffers from structural inequity, it can also be part of the effort to break down such structures and contribute to population wellness in the post–COVID-19 era. AJPH

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Farmworkers and COVID-19: Community-Based Partnerships to Address Health and Safety

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See also Borrell and Kapadia, p. 1366, and the Social Justice for Marginalized Communities section, pp. 1448–1472.

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As COVID-19 spread rapidly throughout the United States, among the population's most disproportionately affected were those on the front lines of the food system. The majority of the estimated 2 million farmworkers in the United States, who have worked through the pandemic as "essential" workers to ensure the functioning of US food systems, are Latino/a, immigrants, and those with low incomes; nearly half lack authorization to work in the United States.[1] Despite their essential status, farmworkers were left vulnerable to COVID-19 because of the lack of workplace protections overlayed with numerous occupational and social factors.[2] Amid the pandemic, however, new partnerships and community initiatives between farm employers and clinicians, advocates, and public health authorities serving farmworkers made unprecedented efforts to support the health and safety of farmworkers and their families in the absence of sufficient government response.[3]

Farmworkers and their families are frequently subject to overlapping and amplifying occupational risks and adverse social and structural determinants of health, which in turn affect their underlying health and increase their risk of COVID-19. Farmworkers lack many of the basic occupational protections afforded to other workers, which may favor the employer but intensifies cycles of poverty and poor health among farmworkers. Farmworkers have been historically excluded from basic labor laws, such as the right to organize, minimum wage, and paid sick leave, although these rights vary by state. Without these protections, farmworkers who are ill may feel forced to work because of the fear of lost wages and the lack of a workplace safety net.

Additionally, farmworkers have been systematically excluded from health and safety regulations that are afforded to other workers. The Occupational Safety and Health Administration, for instance, is prohibited from using federal funds for occupational safety enforcement on farms employing 10 or fewer workers and not providing housing, leaving many farmworkers unprotected. These longstanding occupational and health and safety exclusions, matched with low wages, intermittent work, and frequent migration, lock farmworkers and their families into poverty and reduce their access to health care. Further, rural locations, limited access to transportation, language and cultural differences, and fear of exposing immigration status reduce farmworkers' ability to seek care even when struggling with acute pain or chronic conditions.[4]

As the pandemic struck the rural United States, this lack of basic federal workplace protections, compounded by poverty and poor access to care, sharpened. In June 2020, several months into the pandemic, the Centers for Disease Control and Prevention offered recommendations to employers on how to protect farmworkers from COVID-19. Employers were not required to carry out these suggested protections. The Occupational Safety and Health Administration, typically the lead agency to enforce worker health, remained silent on worker, including farmworker, protection from COVID-19. As of June 2021, no federal emergency standards for farmworkers have been issued, and only 14 states have adopted emergency protections for essential workers to require basic protections such as physical distancing, mask wearing, sanitation, and the provision of personal protective equipment.[5]

With few financial resources and limited housing opportunities in rural locations, many farmworkers and their families rely on employer-provided housing, which is frequently communal and often substandard, and employer-provided transportation to the farm, which may be crowded and poorly ventilated, further increasing the risk of contracting COVID-19. Most farmworkers speak English as a second language, and many have limited levels of formal education, erecting language and literacy barriers to information on the rapidly shifting COVID-19 situation, including ways to stay safe. The political rhetoric on Latino/a immigrants under the Trump administration further jeopardized the health of immigrants. Some have shown distrust of the US government during early phases of the COVID-19 vaccine rollout, and many prefer to stay silent over workplace abuses or personal health concerns rather than expose their immigration status or risk losing their job.

Unsurprisingly, these multiple levels of failures to protect farmworkers have resulted in farmworkers suffering higher rates of COVID-19 infection than the overall population.[6] COVID-19 has been conclusively tied to occupation and employment circumstances, whereby a lack of COVID-19 protections, such as masks, physical distancing, and sanitation, are made more dangerous by the many disparities farmworkers face. This has been largely contrary to rhetoric from government and business officials throughout the pandemic attempting to blame cultural "differences" for the spread of the virus. Research confirms that COVID-19 spread has likely been a result of workplace conditions[7]—not cultural preferences and not only multigenerational housing. Workplaces continue to operate without sufficient protections, and workers are carrying the virus back to their homes.

Farmworker advocates, clinicians, community health workers, and outreach staff work directly with farmworker communities to address some of the many factors that endanger their health. These clinicians and advocates have been at times considered adversaries by employers, who may have liability, safety, or other concerns related to health provision at the farm or farmworker housing or who may fear exposure of farm practices to outside scrutiny. However, farm employers feared COVID-19–related labor shortages and public response to outbreaks, both of which could cause large-scale disruption of farm operations. Community health centers and health departments, in doing outreach during the early weeks of the pandemic, discovered that some employers were less reluctant to partner than they were before the pandemic; other employers were eager to have health authorities assist them in determining the best manner to protect their workers from infection.[8]

New coalitions and partnerships quickly developed early in the pandemic. In Monterey County, California, a new farmworker coalition of advocates, clinicians at the health department and at a community health center, county government staff, agricultural industry representatives, academics, and others worked to call on the California government to provide masks to farmworkers.[8] In Maine, where clinicians and employers had time to prepare before the late spring influx of migrant workers, Maine Mobile Health Program, a community health center, partnered with the state's health department, state laboratory, and other state officials to support employers by testing workers as they arrived and providing quarantine and isolation housing accordingly, preventing potential outbreaks.[9]

These partnerships may have longevity. Some coalitions have shifted focus to ensure that farmworkers have access to the COVID-19 vaccine, despite barriers to accessing health care and limited supply. Additionally, many clinicians and advocates are hopeful that these partnerships have benefits beyond the COVID-19 pandemic, providing important communication conduits and building trust to reduce long-standing exploitative practices and improve farmworker health. Nonetheless, those on the front lines underscore the importance of meaningful federal and state regulations on safety and health measures to prevent workplace illness and injury, including from COVID-19. They are critical for not only protecting farmworker health but also supporting and guiding the efforts of these partnerships to ensure that such regulations are put into action.

Food system outbreaks of COVID-19 have demonstrated that basic worker protections such as minimum wage, paid sick leave, and safety precautions on the job are not "worker benefits." They are basic public health policies to keep our food systems stable; to protect the health of all community members; and to ensure that workers do not have to choose between basic economic survival and exposure, infection, and, possibly, death. Partnerships like those in Maine and California provide a template for community-based, localized approaches by inviting diverse voices to join together, including those who may have been adversaries before the pandemic; finding common ground and building trust on early wins; and keeping an eye on postpandemic priorities to maintain the relationships. Such community-level, diverse partnerships must be prioritized and then bolstered by COVID-19 regulations to protect farmworkers from occupational exposure while they perform their "essential" contributions to the US food system. Additionally, government officials must recognize and address the underlying weaknesses in farmworker protection that existed before COVID-19 to ensure that, in the future, farmworkers are provided safe and healthy workplaces.

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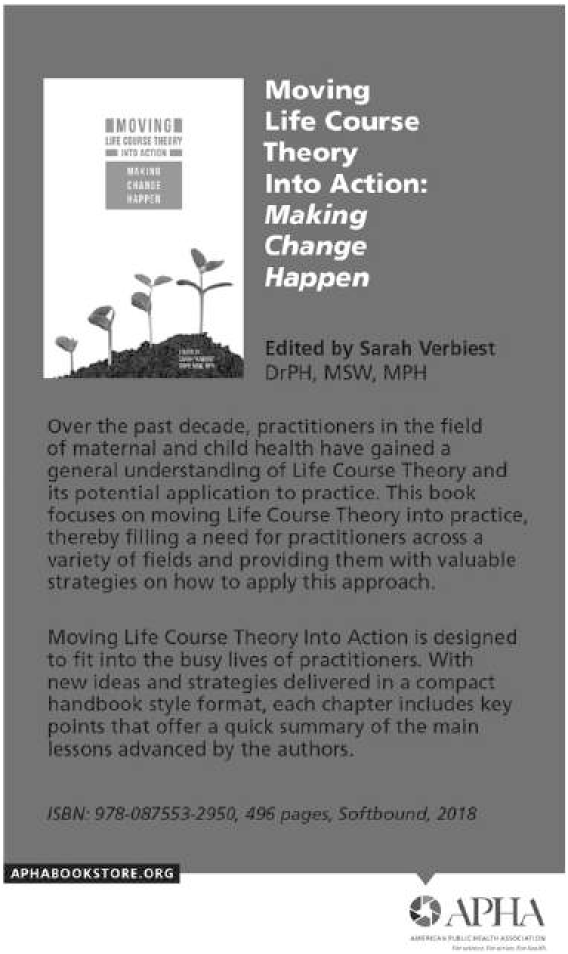

Health Inequity and the Unfair Impact of the COVID-19 Pandemic on Essential Workers

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See also Borrell and Kapadia, p. 1366, and the Social Justice for Marginalized Communities section, pp. 1448–1472.

The COVID-19 pandemic has laid bare our country's widespread economic and health disparities—most acutely in large, urban cities. Decades of systemic and institutional racism in policies and practices, such as redlining and biased lending policies, perpetuate inequity, leaving communities of color, specifically Black and Latino communities, vulnerable to worse health outcomes. In New York City (NYC), Black and Latino individuals are approximately twice as likely to be hospitalized and die of COVID-19 as White individuals.[1] Although underlying health conditions contribute to these higher COVID-19 morbidity and mortality rates, individuals from Black and Latino communities are also more likely to be essential workers, limiting their ability to physically distance and increasing their exposure risks. Recent work supports the concept that exposure opportunity is driving racial/ethnic disparities in COVID-19 outcomes.[2]

Black and Latino individuals are overrepresented in food- and customer service–oriented occupations and must put themselves at risk for their personal job and financial security and to keep the economy going by providing critical services. In NYC during the initial months of the pandemic, data gathered by the NYC Department of Health and Mental Hygiene showed that 26% of Black and 22% of Latino adults reported exclusively working from home, compared with 44% of White New Yorkers. Black and Latino New Yorkers were also more likely to use public transportation than were Asian/Pacific Islander and White adults during the peak of the pandemic (New York City Health Opinion Poll [NYC HOP] wave 7, fielded from March 26–March 31, 2020, unpublished). Furthermore, at a national level, Black and Latino individuals are more likely to live in multigenerational households. Thus, their continued exposure because of their essential work roles placed both individuals and their families and loved ones at increased risk of infection. These structural risk factors leave essential workers, and the communities of color they are part of, unfairly vulnerable to COVID-19.

INEQUITIES EXACERBATED COVID-19 IMPACT

Fear and mistrust—coupled with lack of information—may result in delays in seeking necessary health care among essential workers and their communities. Immigrants, who are also overrepresented in the essential workforce, face rising anti-immigrant rhetoric in the United States, which escalated in the months preceding the pandemic. The federal public charge rule, implemented in 2019, restricted access to governmental services, including housing assistance, nutritional support, and other public assistance to residents without documentation. Mistrust of the health community may also lead to delays in seeking health care. In the Black community, mistrust stems from years of treatment bias, neglect, and unethical practices by clinical providers and biomedical researchers. Further inequities exist by age, race/ethnicity, education, and income in access to the technology necessary to access information and resources that can protect and support people through times of crisis. These factors all may play a role in the impact of COVID-19 on the essential workforce.

Essential workers are often the lowest paid: they comprise almost half of the workers that make less than $15 per hour.[3] Low-wage workers are more likely to have limited sick leave benefits and inadequate health insurance, leaving them to choose between working while sick or earning income. Black and Latino essential, non–health care workers were four times as likely to report no health insurance coverage as their White counterparts.[4] In NYC, residents from poorer neighborhoods reported avoiding care for symptoms related to COVID-19 because of potential cost (NYC HOP wave 8, fielded from April 16–April 23, 2020, https://on.nyc.gov/3y8WYhM). These disparities exacerbate the impact of COVID-19 and are unjust, especially considering the lifesaving role of essential workers during the pandemic.

IMPACT OF PUBLIC HEALTH RESPONSE

Against this backdrop, the public health response to COVID-19 has been complicated and uneven. Early in the pandemic, there were uncertainties about virus transmission and limited COVID-19 testing. Mitigation efforts, including mask usage and social-distancing guidance, evolved throughout the initial phase of the pandemic, and protective supplies were limited. As stay-at-home guidance was implemented, essential workers had to navigate going to work safely amid these changing circumstances. Furthermore, efforts to obtain complete data on COVID-19 cases, hospitalizations, and deaths were hampered by missing or limited data on race and ethnicity and occupation. Such data limitations restricted the ability to fully characterize the relationship between essential work exposure, COVID-19 transmission, and the adverse outcomes.

The complicated COVID-19 vaccine rollout has presented similar challenges for essential workers. Although older adults were prioritized to reduce deaths and serious health outcomes, the prioritization of essential workers was less consistent across the country. The initial limited vaccine supply combined with high demand for vaccine appointments has resulted in disparities in vaccination rates. As vaccination is now more widely available and more older adults are vaccinated to prevent the most serious health outcomes, essential workers should continue to be prioritized in vaccine access and uptake strategies.

As policymakers and public health practitioners work to reduce the long-term impact of the COVID-19 pandemic, equity and the role of the essential worker should be front and center. Some lessons can be learned from the NYC response: in NYC during the initial phase of the pandemic, algorithms were developed to ensure that hospitals workers had equitable access to personal protection equipment. Wraparound services, including access to health care providers, hoteling, mental health support, and food support were provided to COVID-19–positive residents who were not able to social distance, many of whom were essential workers. Additionally, localized approaches were used to ensure that COVID-19 testing and other resources and supportive services were focused on the hardest hit communities. Engagement with community organizations, many of which serve essential workers, has also been critical to promoting the public health messages and equitable distribution of vaccine.

ENSURING ADEQUATE PROTECTIONS

The pandemic has demonstrated a reliance on essential workers, but the wage gap does not reflect the value of their work. Early in the pandemic some companies provided hazard pay as a temporary form of relief. The proposed HEROES Act (Health and Economic Recovery Omnibus Emergency Solutions Act) was intended to make hazard pay for essential workers a federal law. Even with the availability of hazard pay, the federal minimum wage rate, which has not changed since 2009, needs more sustained change. Recent efforts to include raising the federal minimum wage to $15 per hour as part of the COVID-19 relief bill were defeated. Changing the federal minimum wage to at least $15 per hour would allow many essential workers across the country to earn a living wage.

Beyond hazard pay, essential workers must also have access to affordable health care, paid sick leave, and safe and healthy workplaces. Although the HEROES bill outlined provisions for hazard pay, the Essential Worker Bill of Rights goes further by extending provisions to include personal protection equipment, COVID-19 testing, health care, paid leave, and hazard pay. The Biden administration's recent executive order[5] and the COVID-19 relief bill may offer more support and protection to essential workers. However, state and localities should continue to pursue protections for the well-being of their essential workforce.

The dual pandemics of COVID-19 and racism have exposed unacceptable inequities in our country. Essential workers reflect the communities in which they live, and they have experienced the brunt of the COVID-19 pandemic. As a society, we must continue to ensure adequate protections and address pay equity. As a public health community, we must prioritize and integrate equity into our programming and planning for COVID-19 and other public health threats to ensure that essential workers and their communities are protected. AJPH

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Ensuring Progress Toward Ending the HIV Epidemic While Confronting the Dual Pandemics of COVID-19 and Systemic Racism

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See also Borrell and Kapadia, p. 1366, and the Social Justice for Marginalized Communities section, pp. 1448–1472.

In early 2019, the Trump administration announced Ending the HIV Epidemic: A Plan for America (EHE) with the ambitious goal of ending the HIV epidemic in the United States by 2030.[1] The plan, modeled after several other jurisdictional initiatives, focuses on four main pillars: HIV prevention, diagnosis, treatment, and outbreak response. Before the COVID-19 pandemic, the overall number of new HIV diagnoses in the United States had been declining yearly; however, new diagnoses among Black and Latinx men who have sex with men and transgender women had plateaued and, in some cases, increased.[2] The current pandemic has the potential to reverse hard-fought progress toward ending the HIV epidemic as well as worsen existing HIV-related inequities. At the same time, entrenched systemic racism, if not addressed, remains a potent barrier to ultimately ending the HIV epidemic. The pandemic, along with the recent killings of Black people by police and subsequent social uprisings, have increased attention to systemic racism and magnified persistent health inequities, compelling dozens of states and local jurisdictions to declare racism a public health issue.[3] As we grapple with the dual pandemics of COVID-19 and systemic racism, the following recommendations may help to ensure continued progress toward EHE's goal.

First, although health care for all should, undoubtedly, be an ultimate goal, short of that, implementing Medicaid expansion in states that have yet to do so would help to advance EHE's goal. As of June 2021, 39 states had adopted Medicaid expansion under the Affordable Care Act (ACA).[4] The ACA has led to an increase in the number of people with HIV (PWH) who are insured, a change driven primarily by Medicaid expansion.[5] Repeal of the ACA or substantive changes to its key provisions by the Supreme Court would undoubtedly undo these gains and doom EHE. The South, the current epicenter of the HIV epidemic in the United States, has been hit hard by COVID-19. Yet, many Southern states still have not adopted Medicaid expansion.[4]

Unsurprisingly, the very same populations at risk for HIV and COVID-19 are more likely to be uninsured. In particular, queer and transgender people of color have been more likely to lose jobs during the pandemic, which often translates to loss of employer-based health insurance.[6] This coupled with impending mass evictions places many Americans, especially those who are Black and Latinx, at risk for poor HIV- and COVID-19–related health outcomes. Medical mistrust, the current political climate, and concerns about the public charge rule make it less likely that uninsured or underinsured people, especially immigrants, will access HIV and sexual health services. Comprehensive health coverage such as Medicaid would help to ensure that PWH and those at risk have ready access to HIV prevention and treatment services.

Second, to reach communities most affected by HIV, we must implement innovative approaches that use partnerships with community-based organizations (CBOs) that are uniquely poised to reach those most in need. HIV testing is the gateway to HIV prevention and treatment; however, physical distancing requirements during the COVID-19 pandemic limited the ability of many CBOs to reach clients. During my time leading the New York City Health Department's Bureau of HIV, we launched a successful program to provide free home delivery of HIV self-test kits. The program built on existing relationships with clinical and nonclinical CBOs. The same approach could be used for home-based testing for other sexually transmitted infections and hepatitis C. CBOs should be involved in COVID-19–related public health efforts, including educating community members about prevention, testing, contract-tracing efforts, and available resources in a structurally competent manner. In so doing, CBOs can also help to address mistrust, misinformation, and concerns regarding the public charge rule, stigma, and even a potential vaccine.

Third, EHE funding must directly support housing and employment opportunities for PWH and persons at risk. Several federal programs offer funding for PWH to secure safe, stable housing, including the Department of Housing and Urban Development's Housing Opportunities for Persons with AIDS program and the Health Services and Resources Administration's Ryan White HIV/AIDS Program (RWHAP). Earlier in the pandemic, RWHAPs across the United States received supplemental funding under the Coronavirus Aid, Relief, and Economic Security Act; in New York City, we used part of our award for short-term rental assistance and housing programs and emergency financial assistance for RWHAP clients. Given the massive job losses and impending evictions owing to the pandemic and preexisting affordable housing crisis, enhanced funding to address employment and housing needs as well as other social determinants of health (e.g., food insecurity) would help to ensure EHE's success. Such an effort would require coordination across multiple executive branch agencies and could be bolstered by a presidential memorandum similar to the one issued by President Obama at the launch of the National HIV/AIDS Strategy in 2010, which mandated that these agencies work in a coordinated fashion to address the structural and social factors most affecting PWH and persons at risk.[7]

Lastly, and perhaps, most importantly, systemic racism, a potent driver of HIV and COVID-19 inequities, must be explicitly called out and addressed. Notably, in the EHE plan, there is a lack of focus and attention to addressing the structural factors, such as racism and other systems of oppression, that drive HIV-related inequities. In response, the Black AIDS Institute issued We the People: A Black Plan to End HIV, which calls for dismantling racist policies and practices that negatively affect the health of Black communities and for investing in resources to mitigate the social and structural factors that worsen health outcomes in Black communities.[8]

In the spirit of the Black AIDS Institute's plan, the Biden administration has the opportunity to provide substantial new EHE funding to support efforts to dismantle structural racism in HIV prevention and treatment programs, surveillance, and research. This investment could include financial support for the development, retention, and advancement of Black and Latinx leadership within the HIV arena; for Black and Latinx-led and -serving grassroots CBOs, many of which have been indispensable partners in working to end the HIV epidemic; and for the development of equity-focused metrics, such as the Bureau of HIV's pre-exposure prophylaxis equity index and systems to track and respond meaningfully to these metrics.[9] EHE funding to jurisdictions could be made contingent, in part, on their developing plans to address structural racism within their own organizations and in their engagement with the communities they serve. In this same vein, the New York City Health Department has had success with implementing agency-wide health equity training for its staff, offering antiracism training to RWHAP community-based providers, and using tools such as the Government Alliance on Race and Equity's Racial Equity toolkit to help operationalize racial equity.[10]

The COVID-19 pandemic and increased attention to systemic racism's impact on health have brought a new sense of urgency to ending the HIV epidemic. Although new tools such as long-acting HIV treatment and pre-exposure prophylaxis are on the horizon and have the potential to transform the epidemic, they are insufficient without meaningful policy change. To help reach EHE's goal, we must ensure a health care safety net for the most vulnerable, use partnerships with grassroots CBOs, create meaningful housing and employment opportunities, and work toward dismantling systemic racism. AJPH

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Confronting Legacies of Structural Racism and Settler Colonialism to Understand COVID-19 Impacts on the Navajo Nation

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See also Borrell and Kapadia, p. 1366, and the Social Justice for Marginalized Communities section, pp. 1448–1472.

At the time of writing, the United States remains the global epicenter of the COVID-19 pandemic with mass vaccination efforts still months away from completion. Unsurprisingly, the spread of COVID-19, an infectious disease caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), is not distributed equally. Legacies of structural racism and violence, specifically within settler colonial contexts, continue to manifest in contemporary examples of social and economic disparity for Black, Indigenous, and other People of Color populations. American Indian populations, in both rural and urban locales, face exceptional public health challenges. These inadequacies deprive American Indians of fundamental human rights including access to quality health care, clean water, and adequate living conditions.

Analyzing the impacts of COVID-19 on the Navajo Nation offers an important case study for examining the settler colonial origins of health inequities laid bare by COVID-19. Rather than viewing these conditions solely on the basis of racial inequality,[1] we contend that histories of settler colonialism (e.g., dispossession of Indigenous lands, forced assimilation into Indian boarding schools, and the disproportionate burden of toxic exposure from resource extraction[2]) are crucial to understanding the impact of the current COVID-19 health crisis in tribal nations today.[3] In this commentary, we present an overview of broader social and historical factors for understanding public health disparity in Diné (Navajo) communities, the role that Diné-centered knowledge has and continues to play in efforts to confront infectious disease, and how we can imagine new approaches to Indigenous-framed public health interventions.

DIK'OS NTSAAÍGÍÍ-19 (COVID-19) ON THE NAVAJO NATION

The first confirmed case of *Dik'os Ntsaaígíí-19* (literal translation in the Diné language is "big cough-19") on the Navajo Nation was on March 17, 2020, and was linked to a large church gathering held in the Diné community of Chilchinbeto, Arizona.[4] From that point forward, the disease began to quickly spread to other Diné communities. Within a couple of months, the Navajo Nation would become a pandemic hotspot—far surpassing per-capita infection rates of more populated areas such as New York and New Jersey.[5]

At a time when understanding infection vectors was still uncertain and a coordinated national public health response was lacking, the Navajo Nation instituted its own infection control measures such as stay-at-home orders, weekend lockdowns, and provisions for local business operation.[6] The Navajo Nation emergency response was officially activated on February 25, 2020, before any confirmed cases on the reservation.[7]

Despite these precautionary measures, American Indian and Alaska Native persons are 1.9 times more likely to contract COVID-19, 3.7 times more likely to be hospitalized because of COVID-19, and 2.4 times more likely to die from COVID-19 complications compared with non-Hispanic White persons.[8] We have palpably felt the reality of these statistics in our Diné communities, families, and extended kin networks. Furthermore, we contend that such high rates of hospitalization and death are not fully accounted for within existing social determinants of health alone. According to the most recent census, the total population of tribal members residing

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on the Navajo Nation is 173 667.[9] As of early February 2021, there were a total of 29 386 (16.9%) confirmed cases across the Navajo Nation, reaching the highest daily positive count of 400 on November 21, 2020. In total, 1127 (0.6%) Diné tribal members have died from COVID-19.[10] In addition, the burden of COVID-19 is likely underestimated because of inadequate testing and discrepancies of data sharing across overlapping tribal and state jurisdictions in addition to the miscounting of Diné tribal members who reside in off-reservation border towns. The total counts reported may seem minor relative to more dense urban areas; however, these proportional data reveal a starker picture about the severity of this disease for Diné communities. Though public health control measures may have helped keep cases lower, they can only do so much to mitigate the ongoing outbreak in light of a longer history of settler colonial violence and structural racism.

SETTLER COLONIAL VIOLENCE AND HEALTH IMPACTS TODAY

The incursion of American settlers into Diné Bikéyah, the name of our original ancestral homelands, began in the 1850s with military expeditions, land surveys, and the establishment of trading posts. In 1863, Lt. Colonel Christopher "Kit" Carson began a violent scorched earth campaign by burning dwellings, slaughtering livestock, and poisoning water sources as the US military sought to seize Diné territory. During this process, more than 10 000 Diné were forcibly marched hundreds of miles to a concentration camp in New Mexico in an act of attempted genocide now known as The Long Walk.[11] At Fort Sumner, Diné prisoners of war were forced to adopt Christianity, English language and education, the Euro-American cultural value of individualism, and a foreign diet of commodity foods such as flour, lard, and coffee. During their internment, one in every four Diné died because of deprivation, starvation, and disease. Following what the military determined to be a failed experiment, the signing of the Treaty of 1868 ended their incarceration and allowed surviving Diné to return to their homelands, albeit to a drastically reduced land base that was established as the Navajo Reservation. The historical context of settler colonial violence is necessary and crucial for understanding health and economic disparity on the Navajo Nation today.

Specifically, present-day inequity in socioeconomic position, food, and water security on the Navajo Nation underscores the impact of settler colonialism. Compared with the United States, the Navajo Nation population has lower education (25% vs 12% less than a high-school education) and annual household income (23% vs 6% less than $10 000), and greater unemployment (56% vs 6%) and poverty (36% vs 12%).[12] Furthermore, the Navajo Nation only has 13 grocery stores, which serve the 27 000-square-mile area roughly equivalent to the area of Massachusetts, New Hampshire, and Vermont combined.[13] Moreover, water insecurity remains a prominent problem in a region drastically affected by human-driven climate change, the perpetuation of colonial era laws that prioritize settler claims to water over tribal sovereignty, and the ongoing toxic contamination of water sources from decades of resource extraction.[14] According to recent estimates, more than 40% of Diné tribal members lack running water in their households and must rely on hauling water for household consumption.[15] While the average American uses 88 gallons of water per day, most Diné use fewer than 10 gallons per day.[16] A comparative study of water access on tribal nations found a higher incidence of COVID-19 infection rates in households that lack indoor plumbing.[17] Therefore, water insecurity is directly related to health disparities that are further exacerbated during this pandemic.

Access to reliable health care remains a challenge for Navajo and other tribal nations. The Indian Health Service, operated by the US Department of Health and Human Services, provides health care to the 574 federally recognized Native American Tribes and Alaska Native people throughout the country. As of 2017, it has an annual operating budget of $5.9 billion to fund 26 hospitals, 59 health centers, and 32 health stations. Out of this total, the Navajo Area Indian Health Service—composed of seven tribally run service units, five Indian Health Service–run units, and one urban health center in Flagstaff, Arizona—delivers health services to a population of more than 244 000 Diné across the reservation and beyond.[18] Yet, the delivery of care is fragmented and limited because of severe underfunding. Under conditions of COVID-19, every hospital bed and ventilator is a precious and limited resource. On the Navajo Nation, across all service units, there are only 259 hospital beds, 26 ICU beds, 58 negative-pressure rooms, 74 ventilators, 313 nurses, and 285 providers (Jill Jim, online presentation at the Emerging Infection and Tribal Communities virtual conference, February 19, 2021).

During periods of heightened rates of infection, the number of COVID-19 patients requiring hospitalization often exceeded available resources. During a recent visit at Tséhootsooí Medical

Center accompanying her elder relative to an appointment, coauthor T. M. heard a particularly emotional narrative from a doctor who described how at one point patients needed to be airlifted off the reservation “almost every hour.” The hospital simply did not have enough beds to accommodate all of the oxygen-compromised patients. He described the horror of witnessing those who “couldn’t breathe” and how several “didn’t make it.” As we have seen in numerous other hospitals across the country through news and social media, these stories are not isolated. The psychological burden of this contemporary moment also conjures memories of previous traumas and previous pandemics.

LESSONS FROM THE 1918 FLU

> After we had moved away from the Place of the Reeds and resettled ourselves for the winter, for a long time whenever my father talked to the People, he’d talk about that terrible sickness and how it had spread so fast and killed so many of the People all over the reservation. He tried to use consoling words in his talks, and he used his big loud voice, so everybody could hear what he was saying. He talked about those things to all of us here in the family, too, almost every day, for a long time after that. He kept saying we should learn from what happened during that time. That showed nobody ever really knows the things that are going to come their way as they move along with their lives. He said we needed to learn life could be hard, that hardships and suffering were part of what we would experience while we were living. And he kept telling us we needed to be prepared for whatever was coming our way.[19]

This excerpt is an English translation of an oral history story told in the Diné language by Rose Mitchell to anthropologist Charlotte Frisbie.[19] Born in 1874, Mitchell narrates her memories of a great sickness that caused many Diné to perish. This illness has been called many names such as *Ts’ii nidooh da iighã’yęę daa*, meaning, roughly, “during the time the flu killed.” In English, it was known as the Spanish Flu, though its association with Spain is a misnomer as there is no consensus as to where it first spread to humans. What is known is that between 1918 and 1919 it infected more than 500 million people worldwide, approximately one third of the world’s population at the time, and killed an estimated 50 million people.[20]

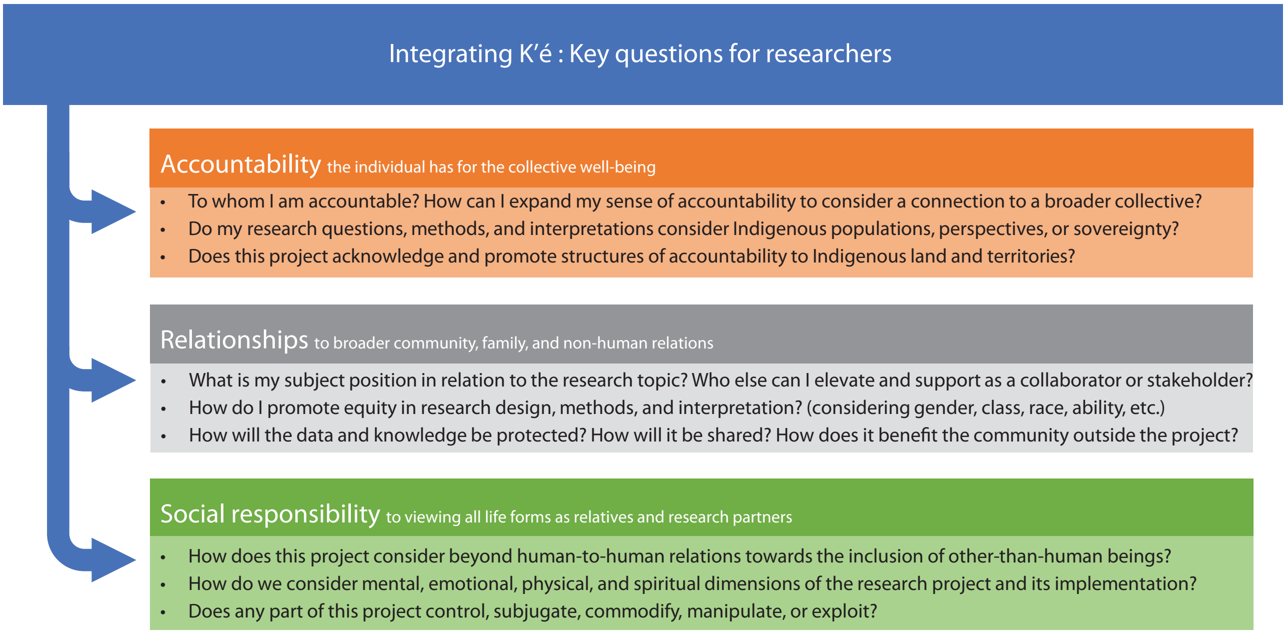
Accounts of the illness in Diné communities, recorded by missionaries, anthropologists, and Indian Agents,[21,22] identified risk factors for mortality including age and gender, socioeconomic status, the availability of resources, immunity related to health status and previous disease experience, social distancing, and community organization and communication infrastructure.[23] It is not surprising that communities that successfully quarantined and who had greater access to food and health care fared better.

Several historic accounts analyzed Diné cultural norms as a medical liability, such as the common practice of intergenerational living in a single-room hogan (traditional Diné dwelling) or the use of traditional Diné medicine to treat symptoms of influenza.[21] However, describing greater mortality rates as a consequence of the failed incorporation of Western medicine discounts the crucial role that Diné ontologies of *k’é*—an ethic of relational care and kinship with human and nonhuman beings—can play in confronting trauma and crisis, both historically and today. Therefore, current analyses of COVID-19 on the Navajo Nation must not fall into a common trap of recycling deficit narratives that frame cultural knowledge as an impediment to Western health care measures. In fact, successful contemporary approaches to health care in the Navajo Nation incorporate both Western medicine and Diné knowledge. Consider, for example, the Navajo Epidemiology Center, whose mandate is to “empower Diné People to achieve Hózhó (harmony) through *naalniih naalkaah*.”[24] This italicized phrase in the Diné language is used to describe epidemiology as disease surveillance. This is but one example of how Diné communities and Navajo tribal health programs are incorporating Diné language and knowledge into culturally appropriate public health interventions (see also Image A, available as a supplement to the online version of this article at http://www.ajph.org).

INDIGENOUS FRAMEWORKS OF RELATIONAL CARE

Centuries of settler colonial ideologies and practice have led to deteriorated well-being and environmental destruction through attempts to replace Diné language, lifeways, and ceremonial practice. Nevertheless, we draw attention to the ways that Diné knowledge based on kinship and relationality has persisted through community-based systems of care to confront these enduring social and health inequities.

Recent grassroots mutual aid efforts guided through the Diné relational ethic of *k’é* have formed in response to COVID-19 on the Navajo Nation. For example, the Navajo and Hopi Families COVID-19 Relief Fund, led by nine Diné women, was



Integrating K'é : Key questions for researchers

Accountability the individual has for the collective well-being

- To whom I am accountable? How can I expand my sense of accountability to consider a connection to a broader collective?
- Do my research questions, methods, and interpretations consider Indigenous populations, perspectives, or sovereignty?
- Does this project acknowledge and promote structures of accountability to Indigenous land and territories?

Relationships to broader community, family, and non-human relations

- What is my subject position in relation to the research topic? Who else can I elevate and support as a collaborator or stakeholder?
- How do I promote equity in research design, methods, and interpretation? (considering gender, class, race, ability, etc.)
- How will the data and knowledge be protected? How will it be shared? How does it benefit the community outside the project?

Social responsibility to viewing all life forms as relatives and research partners

- How does this project consider beyond human-to-human relations towards the inclusion of other-than-human beings?
- How do we consider mental, emotional, physical, and spiritual dimensions of the research project and its implementation?
- Does any part of this project control, subjugate, commodify, manipulate, or exploit?

FIGURE 1— **A Relational Approach to Research Based on the Diné (Navajo) Concept of *k'é*, a Philosophy of Being That Integrates Kinship Relations, Social Responsibility, Inclusivity, Unity, Compassion, and Cyclical and Perennial Life**

initially established in March 2020 via crowdfunding to provide Diné and Hopi families with food, personal protective equipment, and supplies to help them safely self-quarantine. As of February 2021, the group has supported more than 30 000 households on the Navajo Nation and Hopi Villages. Similar practices of relational care are at the heart of Indigenous grassroots relief efforts and mutual aid organizing.

To provide readers with actionable suggestions for integrating a relational approach to research, we share a framework of Diné-oriented guidelines (Figure 1 and see recommended reading list in materials available as a supplement to the online version of this article at http://www.ajph.org) for potential application in considerations of health policy, environmental stewardship, and disaster preparation. This relational approach to research based on traditional Diné knowledge begins with an introduction to *k'é*, a philosophy of being that integrates kinship, responsibility, inclusivity, unity, compassion, and cyclical life. This Diné concept considers relationships to broader community, family, and nonhuman relations. In addition, it considers the accountability the individual has for the collective well-being and views all life forms as relatives and research partners. Identifying self in the research process gives clarity to questions, methods for knowledge gathering, and interpretation of data. Indigenous and non-Indigenous scholars alike can learn from frameworks that prioritize Indigenous relational approaches to our health and environment. Relying exclusively on Western epistemologies and methods often will result in interpretations entangled with hierarchical frameworks that continue to uphold notions of individualism, secularism, positivism, patriarchy, and fragmented, rather than holistic, understandings of self and kin relations. Diné relational philosophy, like many other kinship-based Indigenous knowledge systems, is an expression of interdependent ontology that guides how and for whom our work is made meaningful. This approach can radically transform how we understand health, environmental, and social justice issues as intrinsically interrelated.

In conclusion, analyzing contemporary public health and environmental contamination issues as part of a longer trajectory of colonial violence is necessary to creating appropriate and useful responses to infectious disease. Racial determinants alone do not adequately describe health inequities in Indigenous contexts. Furthermore, we encourage inclusive participation of our public health colleagues who can benefit from learning and applying relational philosophies of care into their own research practice and pedagogy. In imagining the future of public health, we need to name, acknowledge, and understand the legacy of settler colonialism's systemic impact in the context of

COVID-19 as well as Indigenous framing of social determinants of health as a valid, sovereign, and useful means of interventive knowledge production. AJPH

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Combating Anti–Asian American/Pacific Islander Racism Through Local Health Departments and Schools of Public Health

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See also Borrell and Kapadia, p. 1366, and the Social Justice for Marginalized Communities section, pp. 1448–1472.

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In the early months of 2021, accounts of attacks on Asian Americans/Pacific Islanders (AAPI) in the United States provoked renewed distress and outrage. Indeed, hate crimes against AAPI, especially AAPI women, youths, and older adults, have soared in the past year. Stop AAPI Hate, a group that tracks racist incidents among this population, noted nearly 3800 instances of harassment and violence between March 2020 and February 2021.[1] A survey of almost 700 US Asian Americans in fall 2020 indicates that since the beginning of the pandemic, approximately one third of Asian Americans have experienced verbal harassment, one quarter have experienced workplace discrimination, and 12% have experienced physical assaults.[2]

This violence and discrimination is rooted in the long and intricate histories of distinct AAPI populations in the United States and in White supremacy. And yet few, including within and across AAPI populations, know these histories well. As one example, we were shocked—as highly educated Asian women—to only recently learn about the Page Act of 1875 (https://bit.ly/34K8QtH), this country's first piece of racist immigration legislation. Among other actions, the Page Act effectively prohibited women from "China, Japan or any Oriental country" from entering the United States under the assumption that they were immigrating for "the purposes of prostitution" and, as a result, were diseased and dangerous.[3] This legislation illuminates racist notions of Asian women's exotic foreignness and the threat that White Americans perceived Asians to present.

These and other racist and discriminatory ideas about AAPI populations, unfortunately, persist to this day. Although this history is disturbing in that it makes visible what we across distinct AAPI populations suspect and fear, becoming aware of the historical context for contemporary racism facilitates our collective work against these forms of oppression.

As public health professionals, we were spurred by these realizations to consider how we can more actively contest anti-AAPI racism in our professional lives. We know that extensive work demonstrates the impact of racism on health.[4] Across AAPI groups, racism has been linked to pain conditions, cardiovascular conditions, and other chronic health conditions.[5] Problematically, however, AAPI subpopulations are seen as a monolith, despite a wide variety of experiences and health needs. But the ability to look at racism's role in the health status of distinct AAPI ethnic groups has been limited by small sample sizes.[6] Research has revealed differences in health outcomes among Chinese, Vietnamese, and Filipino populations after experiences of racism. For instance, everyday discrimination is associated with negative cardiovascular outcomes in Vietnamese and Chinese populations but not in Filipino populations.[5] Many of the studies in this area have emphasized the importance of disaggregating AAPI subpopulations to identify vulnerable groups.

With the hidden histories and diversity of the AAPI population in mind, we ask the following question: how can health departments and schools of public health—our professional homes—more intentionally and vigorously work to combat anti-AAPI racism as well as oppression more broadly? Local health departments do the day-to-day work of public health; schools of public health train people who staff and lead health departments and who work in a wide variety of other organizations advancing public health goals. Both health departments and schools of public health are thus critical engines of change in our field.

Among local health departments, the New York City Department of Health and

Mental Hygiene has been at the forefront of centering the impact of structural racism on health. The department has implemented an internal initiative, Race to Justice (https://on.nyc.gov/3fMQpe6), that has three aims: (1) educating and training staff members in how racism and other systems of oppression can affect health care, (2) studying how racism has affected the department's past work and creating new policies to lessen that impact, and (3) collaborating with local communities to search for more ways to counter systemic injustices. A toolkit to implement Race to Justice that can be used by other health departments or agencies is publicly available. Specific to AAPI health, the department recently published an Epi Data Brief examining health disparities across AAPI subpopulations.[7]

Local health departments can do more to address the impact of racism on AAPI populations. We recommend that health agencies collect demographic information to identify distinct AAPI subpopulations. Vital records, such as birth and death certificates, incorporate a nationwide standard that corresponds to census data, making it easier to calculate rates for AAPI subpopulations. The format could be used for surveys and administrative data.[6]

Also, these agencies should oversample AAPI subpopulations when implementing community-wide surveys,[6] such as state-specific Pregnancy Risk Assessment Monitoring System surveys. Some jurisdictions already oversample for low birthweight or by zip code in these surveys. Given that funds are often limited for locally run surveys, AAPI subpopulations (as well as Latina/o/x/e and Black subpopulations) could be oversampled in alternating years.

Finally, health agencies should use the Race to Justice toolkit to intervene in internal practices that reinforce racist policies. In particular, health departments have promoted individual behavior change at the expense of addressing structural racism. Without acknowledging the deleterious impact of structural racism, public health interventions could reinforce stereotypes and inherently racist policies.[4]

In schools of public health, we can better prepare public health practitioners to do this work in health departments and elsewhere. In recent years, academic public health has recognized racism as a core determinant of population health and has sought to integrate this understanding into public health pedagogy. In 2016, for instance, the Council on Education for Public Health, which accredits all schools and programs of public health, adopted a new competency addressing racism: "Discuss the means by which structural bias, social inequities, and racism undermine health and create challenges to achieving health equity at the organizational, community, and societal levels (https://bit.ly/3wWDfRn)." Although this is an important start, the events of the past year underscore the inadequacy of such a competency. Those of us working within schools of public health should further commit ourselves to learning and teaching about how public health problems are racialized, gendered, and shaped by multiple oppressions and histories; how we can study this complexity; and what we can do about it.

Specifically, we recommend that schools and faculties place greater emphasis on (1) teaching and learning about intersectionality, particularly the multiple marginalization that individuals and populations can experience, by infusing appropriate syllabi with literature from the social sciences and history, including histories of AAPI populations; (2) teaching and learning research methods that allow for analysis of the experiences of smaller samples (e.g., AAPI subpopulations) and intersected samples (e.g., samples grouped according to race/ethnicity, gender, or age), including highly collaborative community-based participatory research methods; (3) offering opportunities to learn from activism and social movements centered on the health of communities of color, including AAPI communities; and (4) ensuring that AAPI members of school communities are included as partners in efforts to address racism.

These are ambitious but doable actions that we hope to take up with our colleagues and others. We applaud the Centers for Disease Control and Prevention's recent recognition of racism as a serious public health threat (https://bit.ly/3ckLa30) and take inspiration from the growing movements for Black lives and racial justice, which nurture solidarity across communities of color. The steps we recommend further amplify our field's work against racism while intentionally incorporating the experiences of AAPI communities whose oppressions have been invisible for far too long. With these actions, we will strengthen public health's infrastructure and workforce to better protect and support those most marginalized by structural inequities. AJPH

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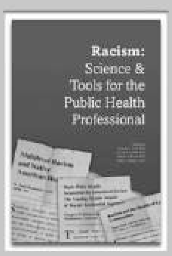

Of Mice and Schoolchildren: A Conceptual History of Herd Immunity

David Robertson, MA

See also Jones, p. 1376.

This article explores a tension at the core of the concept of herd immunity that has been overlooked in public and scientific discussions—namely: how can immunity, a phenomenon of individual biological defenses, be made relevant to populations? How can collectives be considered "immune"? Over the course of more than a century of use of the term, scientists have developed many different understandings of the concept in response to this inherent tension. Originating among veterinary scientists in the United States in the late 19th century, the concept was adopted by British scientists researching human infectious disease by the early 1920s. It soon became a staple concept for epidemiologists interested in disease ecology, helping to articulate the population dynamics of diseases such as diphtheria and influenza. Finally, though more traditional understandings of the concept remained in scientific use, in the era after World War II, it increasingly came to signal the objective and outcome of mass vaccination. Recognizing the complexity of scientific efforts to resolve the paradox of herd immunity may help us consider the best distribution of immunity against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). (*Am J Public Health*. 2021;111(8):1473–1480. https://doi.org/10.2105/AJPH.2021.306264)

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During the COVID-19 pandemic, no scientific term has been the subject of more dispute than "herd immunity." Debate over the concept has taken the appearance of a disagreement over the scientific viability and ethics of achieving herd immunity via infection.[1] This appearance, however, has obscured a deeper intellectual tension at the heart of the concept: how can immunity, a condition constituted in the biological defenses of the individual, be attained by a population? How can collectives be thought to have become "immune"? While scientists and historians have long discussed the centrality of the analytic of self-other in immunology,[2] herd immunity points to the ongoing problem of articulating the immunological defenses of collectives. Some recent examples make clear that different solutions to this core conundrum are resulting in the term being used to denote very different phenomena during the ongoing pandemic.

Invoking a relatively recent understanding as it pertains to disease elimination via vaccination, one virologist recently wrote that herd immunity has "never been achieved through naturally acquired infections and is only possible at global population scale through mass immunization."[3] Yet, drawing on an older but equally widespread understanding of the concept as the point at which an epidemic subsides and a new pathogen becomes endemic, another virologist suggested that 10 previous influenza pandemics, including that of 1918–1919, ended "most likely, by a herd immunity mechanism, when at least 30% of the population had been infected."[4] To add further confusion, the term is sometimes deployed in a nonspecific sense, with one prominent British scientist recently stating that London has "quite a lot of herd immunity."[5] These few examples demonstrate some of the ways scientists have conceptualized immunity as an attribute of populations. This article suggests that the long history, beginning in the late 19th century, of scientific efforts to think of populations as immune may offer insight into the relevance of the concept to the ongoing pandemic.

EARLY RUMINATORS

The earliest use of the concept uncovered by an extensive literature review was in 1894 by America's first doctor of

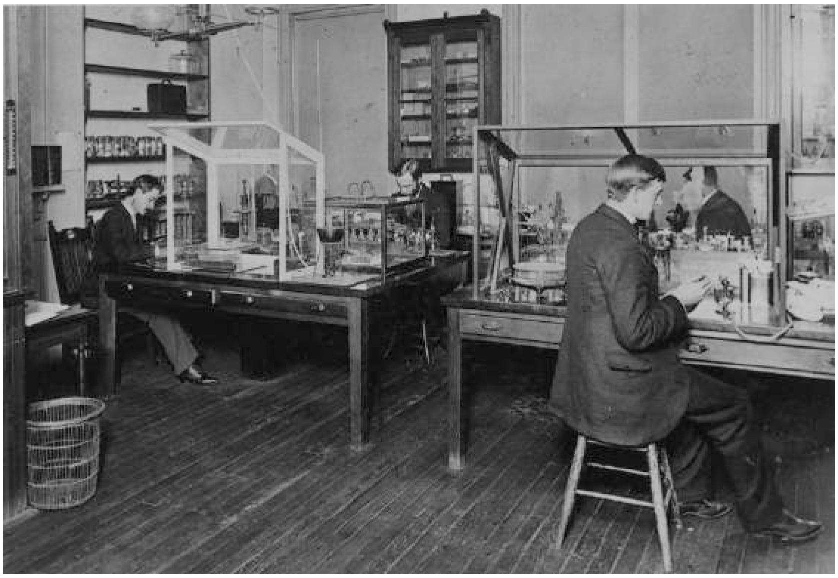

FIGURE 1— Inside the Laboratory for Animal Pathology at the Bureau of Animal Industry, 1894, Washington DC.

Note. Depicted from left to right: medical illustrator W. S. D. Haines and bacteriologists and pathologists C. F. Dawson, R. Stewart, and Veranus Alva Moore.
Source. Courtesy of Special Collections, USDA National Agriculture Library (https://www.nal.usda.gov/exhibits/speccoll/items/show/8226). Published with permission.

veterinary medicine and the first director of the US Department of Agriculture's Bureau of Animal Industry, Daniel Elmer Salmon. In that year, Salmon, after whose research *Salmonella* was later eponymously dubbed,[6] used the term in a report on animal nutrition given to the American Veterinary Medical Association. Salmon reported that, in addition to the selective breeding of animals, their "hardiness and vigor . . . may be aided by intelligent care and by scientific feeding." He frowned upon the "exclusive feeding of corn so largely practiced in hog-raising," which led to the "abnormal development of the animal body" and weakened its "powers of resistance and predisposes to disease." Experience of disease outbreaks in swine fed a poor diet and those fed a more nutritious diet demonstrated that the former were far likelier to succumb to disease. "These facts show something besides individual immunity," Salmon reported. "They demonstrate the possibility of obtaining herd immunity." Though there remained "much still to learn about this subject," he believed that "with hygienic surroundings, proper exercise, proper food, and by practicing the principles of breeding already enumerated," farmers could develop "animals with more than ordinary power of resisting both sporadic and epizootic diseases."[7] In what appears to be the earliest published use of the term, "herd immunity" indicated the "powers of resistance" against disease in general attained through good breeding, sanitary conditions, and scientific nutrition.

Salmon's understanding of immunity was very different from that held by scientists today, a fact he articulated in 1886 when he criticized none other than Louis Pasteur. Scorning the Frenchman's extrapolations from the laboratory to life in the field, Salmon insisted that the "body is very different from a culture flask to which nothing gains entrance and from which nothing is eliminated. . . . Immunity is probably never absolute, but simply relative" and because of the "vital resistance" of cellular life, even "the tissues of the most susceptible individuals are not suited to the growth of microbes when the functions of the cells are normally performed." Problems for the organism arose when "the resistance of the tissues is in some way overcome, the microbes multiply and the disease is produced."[8] His subsequent description of the concept of herd immunity reflected his understanding of immunity as the vital resistance of cellular life to agents of disease, a vitality that could be cultivated by proper scientific management.

Further reference to herd immunity does not seem to appear in publications for another 20 years. However, the fact that later reference to the term came from within the same bureau of which Salmon had been director suggests it was probably used privately within the organization across this period. In a recent history, Jones and Helmreich discussed use of the term by two veterinarians in the bureau beginning in 1916. Researching brucellosis among cattle, a disease also known as "contagious abortion" because of the miscarriage it caused, scientists George Potter and Adolf Eichhorn suggested overturning the practice of destroying infected heifers in favor of isolation until they had recovered and could be reintroduced into the herd.[9] Experiments suggested that cattle recovered from the disease usually developed immunity to future disease. As a degree of immunity seemed to be passed on to future calves, the pair suggested that "a herd immunity seems to have developed as the result both of keeping the aborting cows and raising the calves."[10]

While Potter and Eichhorn evidently thought of immunity to brucellosis as a more specific quality than Salmon's "powers of resistance," their understanding of the concept did not appear to be limited to inherited, partial immunity. They often emphasized the role of breeding and sanitation and wrote of resistance as more than immunity. In 1920, Potter insisted that "the mode of living" of the range cow gave it "greater resistance to ward off the effects of the disease" than the dairy cow, the latter living in a less salubrious environment and "subjected to the weakening influence of the artificially stimulated function of milk production." Resistance was more expansive than acquired or inherited immunity, and farmers were encouraged "to build up herd immunity through the selection of prolific, resistant and immune cows and their offspring."[11] Nurturing immune herds entailed more than simply raising the calves of heifers recovered from the disease.

THE ECOLOGY OF HERD IMMUNITY

As other historians have noted, the first to use the term with a bearing upon human infectious diseases were British bacteriologists William Whiteman Carlton Topley and Graham Selby Wilson.[12] Crucial to their understanding of the concept was its irreducibility to the sum of individual immunities within a population. In 1923, they described findings from experimental epidemics they had conducted on caged mice populations. Unsurprisingly, these experiments showed "a decreasing mortality with an increasing proportion of immunized mice." However, the pair insisted that immunity in collectives was not merely the sum of the number of immune individuals and that "the question of immunity as an attribute of a herd should be studied as a separate problem, closely related to, but in many ways distinct from, the problem of the immunity of an individual host."[13] As historian Olga Amsterdamska clarified, Topley approached epidemics "as events affecting collectives rather than individuals" and insisted that they "could not be reduced to individual cases of disease."[14]

For Topley and Wilson, herd immunity described an uneven, nondetermined formation of resistance across a population operating to restrict disease transmission. The notion of resistance captured a gradation of immunity to infection and disease. Within any given population, individuals did not fall into the simple binary of immune or susceptible but were positioned along a continuum of resistance itself conditioned by the distribution of resistance in the surrounding population. As Topley explained in 1935: "With herds, as with individuals, there are, of course, all gradations between complete immunity and complete susceptibility."[15] The resistance of the individual was intimately enmeshed in the resistance of its "herd," and the resistance of that herd was greater than the sum of its parts. The pair clarified the implications of this insight for public health when they asked:

> Assuming a given total quantity of resistance against a specific bacterial parasite to be available among a considerable population, in what way should that resistance be distributed among the individuals at risk, so as best to ensure against the epidemic spread of the disease, of which the parasite is the causal agent?[16]

In later years, they understood the spread of disease to be conditioned by a population's "herd structure," which included its "spatial relationships," "as well as all those environmental factors that favor or inhibit the spread of infection from host to host."[17] Attempting to capture the nature of immunity at the population level, Topley and Wilson deployed the concept of herd immunity to understand how populations might best prevent the spread of disease. This interpretation arose from the unfortunate fact that, for most diseases, there were no vaccines, forcing public health strategists to consider the most effective use of natural immunity.

Precisely how and when the term crossed from American veterinary science to British bacteriology and epidemiology remains unclear. Epidemiologist Paul Fine claimed that Wilson told him in 1981 he first heard the term from Major Greenwood, an influential British physician and epidemiologist.[18] Perhaps Greenwood had encountered the term when he studied outbreaks of swine fever in herds of pigs in the early 1910s.[19] Greenwood, however, does not appear to have used the concept in a publication before 1925, when he and Topley complained that in "immunological, as in clinical studies, the great majority of investigators have been so occupied with the individual that they have neglected the herd." Echoing Salmon's criticism of Pasteur's laboratory studies four decades earlier, the pair were critical of the work of "modern experimenters in the laboratory" who, though having "elucidated many particular problems of immunity and susceptibility," had "not given a bird's-eye view of the course of events in an epidemiological unit, a herd."[20] Irrespective of precisely when it was adopted, the concept of herd immunity was embraced by British scientists to close the gap between immunological studies of the individual and epidemiological research on populations.

In the interwar era, the problem of immunity in collectives became particularly appealing to British epidemiologists attracted to an ecological interpretation of disease. Historian J. Andrew Mendelsohn demonstrated that, in the early 20th century, notions of equilibrium came to challenge the often myopic focus of bacteriology on pathogens.[21] Similarly, historian Warwick Anderson notes that during this era "an ecological perspective on infectious diseases sought a means to relate *micro*biological processes to larger environmental or biological forces" thereby capturing "the interactive, dynamic relationships between host and parasite and physical milieu."[22] In the context of an emergent interest in the ecology of infectious disease, herd immunity was often drawn upon to articulate the equilibrium of host, parasite, and environment.

The most prolific scientist to advance an ecological vision of herd immunity was the British Surgeon Commander Sheldon Francis Dudley. Professor of Pathology and Lecturer in Tropical Diseases at the Royal Naval College, Greenwich, Dudley, born of a Quaker family, was attracted to the term because it suited his ecological approach to studying disease.[23] In 1929, he argued that "the ecological point of view" conceptualized "epidemics as manifestations of a loss of balance between the mutual adjustment of host and parasite." He envisioned public health as a form of "applied ecology . . . based on the study of the mutual relationships between man, other living organisms, and the environments they occupy, and the way these relationships affect human health."[24] Elsewhere he argued that the "amount of disease in a community is a function of the herd immunity, the type of infecting parasite, and the character of the environment."[25] By 1936, he was declaring that "scientific epidemiology is medical ecology."[26] For scientists deploying the concept in the interwar period, herd immunity captured the dynamic, unstable equilibrium between humans and other organisms in an unavoidably shared environment.

Emerging in an era before widespread vaccination, retention of the word "herd" signified more than a linguistic relic from the concept's days in the paddock. It captured the disease burdens facing specific subgroups of the population, making it possible to think of collectives as having acquired "immunity," understood to be a balance between host and pathogen. Foreshadowing similar concerns voiced today, Dudley pointed out that "the term 'herd' has been criticized as out of place when applied to human beings," yet he defended its use because it was not coterminous with the population at large but identified subgroups for targeted interventions. "When we pass from the family to the institution, ship, or barracks," he wrote, "it becomes more obvious that the primary duty of the herd doctor is to keep his herd in as high a degree of health as possible." A seaman seemingly recovered from tuberculosis, for example, was best isolated from the rest of the crew (his "herd"), as it would not be wise "to let him return to the mess decks and risk his relapsing and infecting others."[27] Dudley regularly utilized the concept in his studies of diphtheria among British schoolchildren,[28] probably the most common social group to have this term applied to them in the interwar era.

Speaking before the British Medical Association in 1927, physician Graham Forbes discussed his research on diphtheria among schoolchildren. Paradoxically, Forbes argued that, among poorer schoolchildren, overcrowded housing conditions could mitigate the damage caused by diphtheria, keeping its transmission "in check by the degree of herd immunity maintained by repeated exposure to small doses of infection." This was only the case, however, up to a certain point, as "the more crowded the rooms, the greater the risk of close contact with massive infection capable of overcoming acquired partial immunity."[29] In Forbes's analysis, the environment shaped the degree and intensity of exposure to a pathogen, conditioning the group's resistance to serious disease. Other physicians speculated that a common test for immunity to diphtheria—the Schick test—elicited temporary immunity, which, when prevalent among enough schoolchildren, could confer partial immunity in an otherwise susceptible group.[30] For these scientists, herd immunity signaled an equilibrium preferable to the likely outcome of having a group of children entirely susceptible to diphtheria, a condition conducive to an epidemic. Herd immunity did not mean that outbreaks would not recur; nor did it describe a specific quantity of immunity. Rather, it underlined an ecological balance struck between host and pathogen, a balance that was dependent on some degree of continued population exposure.

This ecological vision of herd immunity as an equilibrium reached between a host and a pathogen sharing an environment came to inform decades of research on influenza. As early as 1929, the *Chicago Daily Tribune* paraphrased Dudley's interpretation of the 1918–1919 influenza pandemic as "a by-product of the more than 4 years of world war" during which time "the infection gained virulence and the mass of people lost herd immunity."[31]

In 1951, Irish virologist Patrick Meenan, who would soon collaborate with Albert Sabin and Jonas Salk on their polio vaccines, and coauthor M. Clarke attributed the recent influenza epidemic in Ireland to the diminished "degree of herd immunity" following more than a decade without an epidemic.[32] Two years later, British virologist Christopher Andrewes, then head of the World Influenza Center overseen by the World Health Organization, noted the relationship between the capacity of influenza to rapidly mutate and the adaptability of its host population's immunity:

> Over a period of years, variations may be played upon one antigenic theme, but after some time the possibilities will be exhausted (the herd will be generally resistant to closely related variants), and the introduction of a new motif will be necessary to keep things alive.

An important determinant of influenza outbreaks was "the immunity-level of the population," and it was "doubtless a rise in this which determines the end of an outbreak."[33] Later that decade, during the so-called "Asian flu" pandemic of 1957, the American microbiologist Maurice Hilleman explained to the *Baltimore Sun* that, following mutation of the influenza virus, "there is a loss of 'herd immunity' because the population has not encountered this virus, nor anything sufficiently similar to it, to develop immunities."[34] Nearly half a century later, following an illustrious career in which he helped develop several vaccines,[35] Hilleman noted that "Influenza viruses travel rapidly and induce herd immunity, requiring the virus to mutate and change its antigenic specificity to continue to infect."[36] Continuing to think of herd immunity as an ecological equilibrium, scientists in the second half of the 20th century advanced the concept to explain the interaction between the evolutionary adaptations of influenza, the development and fading of host immunity, and seasonal outbreaks.

MASS VACCINATION AND THE PROBLEM OF HETEROGENEITY

As is clear from the careers of scientists like Hilleman, the concept of herd immunity was not irrelevant to diseases for which immunizing agents existed. By the early 1930s, Topley was investigating the contribution of naturally acquired versus artificially induced immunity among his unfortunate mice populations, and Dudley referred specifically to the value of smallpox vaccination among naval "herds."[37] The analysis of herd immunity arising from infection was sometimes crucial to understanding the viability of vaccination. A 1948 article in *The Lancet* argued that if natural immunity to an influenza strain "lasts only a few weeks," as suggested by animal studies, then "artificial immunization must be relatively hopeless." If, on the other hand, "the duration of immunity for a human herd is really as long as 4 years, possibly because herd immunity is far more complex than the summation of individual host resistances, then there is some hope for artificial immunization."[38] Indeed, recognition of the collective benefits of herd immunity arising from low-level diphtheria exposure was leveraged by British public health experts advocating state-funded immunization in the 1920s.[39]

The expansion of mass vaccination as a public health strategy following World War II produced further diversity in formulations of herd immunity. As vaccines against diseases such as whooping cough (1940s), polio (1950s), and measles (1960s) were developed, and mass vaccination became a crucial pillar of the public health landscape, the concept came to indicate a targeted percentage of immunity induced within a population.[40] Jonas Salk captured the rising optimism for vaccination and its implications for the concept of herd immunity when, speaking before the Royal Society of Health about his polio vaccine in 1959, he claimed that emerging vaccines "will make it possible to bring under effective control . . . many of the viral pathogens." Reporting Salk's speech, the *Daily Boston Globe* suggested that "Salk Expects Herd Immunity From Vaccine."[41]

In fact, Salk does not appear to have used the term herd immunity but, rather, suggested that "application of a vaccine to a sufficient segment of the population should induce what is usually referred to as a herd effect."[42] Obviously not the first use of the term, an extensive online search only turned up one earlier reference to "herd effect" pertaining to human infectious disease. This was a comment by Salk himself in relation to vaccination during the 1957 influenza pandemic.[43] Herd effect indicated the indirect protection conferred to those remaining susceptible in a population of increasingly immunized individuals. Salk expanded on the concept in 1963, noting that vaccines "brought about protective effects beyond those attributable to the number of persons who have been vaccinated." He wondered if "in a given population, the number of seedings can be reduced to a point approaching conditions for extinction."[44] Though he formulated this effect as a byproduct of herd immunity, the two terms soon became regularly conflated.[45]

In 1970, dean of the London School of Hygiene and Tropical Medicine

Charles Edward Gordon Smith published a simple model in which the rate of transmission of a pathogen—its *R0*—determined the percentage of immunity required for local elimination.[46] As other scientists quickly highlighted, however, the model entailed a simplification of the population.[47] In Smith's model, individuals were designated as either immune or susceptible, an understanding that was very different from earlier notions of "resistance." Moreover, the model did not address differences in the social interactions of individuals, meaning it did not account for variations in an individual's contribution to transmission.[48] While it offered clear guidance for vaccination strategies against known diseases, it was not intended to articulate the population dynamics of immunity acquired through infection, a field of research that continues to draw upon older formulations of herd immunity.[49]

As global vaccination programs expanded in the 1980s and 1990s, the conceptual connection between herd immunity and vaccination tightened. Research in the field modeled the complexity of the effects of vaccines in heterogenous populations. Two of the most prolific scientists in this field, Robert May and Roy Anderson, designed complex mathematical models incorporating such considerations as

> the demography of the host population, the duration of acquired immunity and maternally derived protection, age-related changes in the degree of intimacy of contacts among people, and the prevailing levels of genetic, spatial and behavioural heterogeneity in susceptibility/resistance to infection.

The heterogeneity of different populations meant it was "not necessary to vaccinate everyone within a community to eliminate infection; the level of herd immunity must simply be sufficient to reduce the susceptible fraction below the critical point."[50] As mass vaccination aided global efforts to control infectious diseases, scientists again strove to fashion notions of immunity that could account for the variation of human populations.

CONCLUSION

For more than a century, scientists have struggled to formulate the individualistic concept of immunity as one pertaining to collectives. Responses to this tension have sometimes involved thinking of immunity as vitality or resistance. Other times, they have complicated the notion of population, conceptualizing a herd structure or modeling heterogeneity. Whether it was the triad of host–parasite–environment embraced by disease ecologists, or Potter's contrast of the "mode of living" of the range cow versus the dairy cow, accounting for the environment has always been important in scientific efforts to think of populations as "immune." This article has attempted to do justice to the depth of the concept. Much of the public discussion during the ongoing pandemic has focused on the merits of obtaining herd immunity via natural infection. Yet precise definitions of what that condition equates to are rarely being made explicit. This history suggests three ways such discussions may benefit by acknowledging the complexity of this crucial concept.

First, the ambiguous nature of the term is resulting in different, at times conflicting, applications during the pandemic. Scientists sometimes make opposing claims while not clarifying the precise understanding they are invoking, such as its meaning vis-à-vis mass vaccination and disease elimination[51] versus that pertaining to the process by which a novel pathogen becomes endemic.[52] As this article has demonstrated, throughout its history, the concept has referred to both of these formulations. The problem is not that some are using the term correctly and others not, but that precisely what understanding of an "immune" population is being invoked is not always being made explicit.

Second, the overwhelming focus of the public discussion on what percentage of immunity is required before herd immunity is attained has simplified the complexities of the concept, detracting from its possible insights.[53] Scientific efforts to analyze the role of population heterogeneity to the trajectory of the pandemic have received little public discussion.[54] From Salmon's emphasis on a wholesome diet to Anderson and May's efforts to model heterogeneity, scientists have long considered a population's resistance to disease as more comprehensive than a percentage of individuals with antibodies.

Lastly, while the arrival of vaccines may appear to make deeper consideration of the concept redundant, the distribution and delivery of limited resources raises the perpetual problem of herd immunity: how to realize immunity most effectively in a population. Should vaccines that were assessed in double-dose trials be given as single shots to twice the number of people?[55] Is wider dissemination of partial immunity preferable to that which is more robust, but less widely dispersed?[56] Should states vaccinate the portion of the population at greatest risk of serious disease[57] or focus on creating the greatest quantity of immunity in their population?[58] Recognizing the complexities of this concept may help us actualize the most effective and egalitarian distribution of immunity across the population. Ultimately, how we achieve this will define how our era resolves the ongoing conundrum of herd immunity.

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CONFLICTS OF INTEREST

The author has no conflicts of interest to declare.

ENDNOTES

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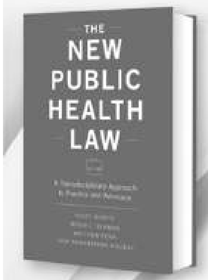

Incorporating Health Equity Into COVID-19 Reopening Plans: Policy Experimentation in California

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California has focused on health equity in the state's COVID-19 reopening plan. The Blueprint for a Safer Economy assigns each of California's 58 counties into 1 of 4 tiers based on 2 metrics: test positivity rate and adjusted case rate. To advance to the next less-restrictive tier, counties must meet that tier's test positivity and adjusted case rate thresholds. In addition, counties must have a plan for targeted investments within disadvantaged communities, and counties with more than 106 000 residents must meet an equity metric.

California's explicit incorporation of health equity into its reopening plan underscores the interrelated fate of its residents during the COVID-19 pandemic and creates incentives for action.

This article evaluates the benefits and challenges of this novel health equity focus, and outlines recommendations for other US states to address disparities in their reopening plans. (*Am J Public Health*. 2021;111(7):1481–1488. https://doi.org/10.2105/AJPH.2021.306263)

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In March 2020, California became the first state to issue a stay-at-home order to reduce the spread of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus that causes coronavirus disease 2019 (COVID-19).[1] California lifted the order in May 2020, allowing each of its 58 counties to attest to its own readiness without necessarily meeting the state's benchmarks.[2] COVID-19 rates subsequently surged in many parts of the state, igniting criticism that the stay-at-home order had been lifted prematurely and leading to the reimposition of a statewide closure of many indoor activities.[3] Unfortunately, COVID-19 cases, morbidity, and deaths have been unequally distributed both between and within California's counties, largely correlated with measures of structural inequity and race/ethnicity: census tracts with the worst composite measures of community well-being, such as education, income, and health care access, are home to 24% of Californians but accounted for 40% of the state's COVID-19 cases.[4] As of May 2021, Latino/Hispanic people constituted 39% of California's population but 55% of its COVID-19 cases and 47% of confirmed deaths.[5]

Governor Gavin Newsom's second reopening plan, issued in August 2020, addressed variation in COVID-19 prevalence among counties.[6] The Blueprint for a Safer Economy (hereafter, Blueprint) classifies counties into 1 of 4 tiers based on test positivity rate and case rate per 100 000 residents adjusted for testing volume (Appendix, Exhibit 1, available as a supplement to the online version of this article at http://www.ajph.org).[6] As counties meet the successive benchmarks for these measures, they are progressively allowed to reopen businesses, schools, and other facilities.[6] To address population inequities and reduce within-county variation, an "equity focus" with 2 components was added to the Blueprint in October 2020 (Appendix, Exhibit 2). In addition to meeting the test positivity and adjusted case rate thresholds just described, counties must also show that they are addressing disparities by (1) planning targeted investments to interrupt disease transmission in disproportionately impacted populations and (2) meeting an equity metric for test positivity in the worst-off census tracts.[4]

California's policy, which explicitly incorporates health equity considerations into reopening decisions, is the first of its kind in the United States. The Blueprint aims to affirmatively address widespread concerns about the disproportionate impact of COVID-19 on underresourced communities and communities of color because of structural racism and social injustice. California is unique in many respects, such as its large size, the diversity of its population, and its public health governance structures; nevertheless, its example is instructive. This article evaluates the benefits and challenges of this novel policy tool, which illustrate the difficulty of designing and implementing policies to improve health equity, and makes recommendations for the ethically sound inclusion of health equity considerations in other states' reopening plans.

KEY FEATURES OF CALIFORNIA'S EQUITY FOCUS

California's Blueprint incorporates an equity focus. Advancing to the next less-restrictive tier requires counties to meet metrics on test positivity and adjusted case rates for the entire county, and also to work to reduce disparities in levels of SARS-CoV-2 transmission. The equity focus has 2 distinct components:

1. Targeted Investments

All counties are required to submit a plan to the California Department of Public Health that defines the county's disproportionately impacted populations, reports the percentage of COVID-19 cases in these populations, and outlines plans to invest at least a proportionate percentage of their federal grant funds for COVID-19 response to combat viral transmission in these populations.[4,7] Examples of targeted investments include testing, contact tracing, education or outreach, and support for isolation or quarantine. Plans must be submitted before counties can move to a less-restrictive tier.

2. Equity Metric

California's equity metric relies on the California Healthy Places Index (HPI). The HPI incorporates 25 community characteristics related to economic stability, education, the built environment, social and community context, and health and health care. Low HPI values correlate with marginalization and disadvantage. Each county's census tracts are divided into quartiles based on HPI. For a county to move forward into less-restrictive tiers, the test positivity rate in its lowest-quartile HPI census tracts must not substantially lag behind the county's overall test positivity rate. After pushback from counties, the state agreed not to use the equity metric to move counties backward into more-restrictive tiers.[7] Counties with 106 000 or fewer residents were excluded from the equity metric because test positivity cannot be reliably calculated by HPI census tract quartile; these 23 exempt counties have only a small fraction of California's racial/ethnic minority populations.[4,7]

BENEFITS OF INCORPORATING AN EQUITY FOCUS

California's state leaders have taken a bold step by explicitly incorporating an equity focus into reopening decisions, and some county leaders have taken steps to address health disparities (Appendix, Exhibit 3).[8] Doing so offers several potential benefits:

1. Core Value Definition

The incorporation of a health equity focus into the Blueprint has an expressive function: it sends a strong message that public health leaders place equity among Californians' aspirational values.[9] Moreover, going forward, failure to address the disparate impact of the COVID-19 pandemic on disadvantaged communities, often communities of color, will have tangible consequences for Californians. Thus, the equity focus reflects a leadership commitment that California's residents will rise or fall together.

2. Public Health Strategy

The Blueprint's health equity focus underscores how interrelated the fates of various communities are from an epidemiological perspective. COVID-19 "hot spots" will not stay contained; rather, they will eventually spread to other communities, increasing everyone's risk and straining the health care system's ability to respond. The health equity focus also provides incentives for COVID-19 reduction efforts to conform with evidence-based public health practices and data-driven epidemiological strategies. Public health best practice is to target resources where diseases are most prevalent by identifying individual- and community-level risk factors. Yet the populations and communities with the highest COVID-19 case rates have often received fewer resources and received them more slowly than other communities. For instance, multiple analyses of New York City data reveal that higher neighborhood rates of COVID-19 testing were associated with higher proportions of White people and higher-income families, despite those groups' lower rates of SARS-CoV-2 infection.[10,11] Meeting California's call to address disparities in levels of transmission will require counties to recommit to public health best practices.[12]

3. Recognition of Structural Drivers

By focusing the equity metric on structurally disadvantaged communities, California spurs counties to redouble their efforts to address structural issues, such as residential overcrowding and underresourced neighborhoods, that put populations at increased risk of SARS-CoV-2 transmission and COVID-19 mortality.[13] Expanding critical infrastructure and identifying safe housing options to quarantine patients with COVID-19 are examples of targeted resource utilization with potentially large returns on investment. Although robust structural change will require sustained commitment and will be challenging to achieve, the public health returns will extend beyond the current pandemic, given the strong association between these same structural factors and other health disparities.

4. Justice and Fairness

Questions of justice and fairness arise when health and threats to health vary across populations. California's inclusion of a health equity focus in the Blueprint not only potentially reduces disparities in COVID-19 prevalence and outcomes but also more equitably distributes the burdens and benefits of reopening businesses during the COVID-19 pandemic. Reopening imposes disproportionate risks on disadvantaged communities because of their representation in at-risk workforces. To highlight 1 example, people of color constitute 72% of California's restaurant workers.[14] Their risks of SARS-CoV-2 exposure and infection increase as restaurants increase on-site dining.[15] The Blueprint requires more affluent communities to acknowledge the risks borne by the marginalized workers who serve them and to address within-county disparities attributable to high COVID-19 case rates in marginalized communities as a condition of reopening.

CHALLENGES AND RECOMMENDATIONS FOR OTHER STATES

Understanding the challenges of incorporating a health equity focus into reopening may provide guidance for other states or localities considering equity-oriented reopening policies as well as those thinking about incorporating an equity focus into public health policies beyond COVID-19. Although state and local public health governance structures vary, many of the challenges encountered in California are likely to occur in other settings.

1. Unintended Educational Harms

Challenge. Under the Blueprint, schools in the most restrictive tier cannot reopen for in-person learning without a waiver. Once counties progress into the next tier—by meeting the test positivity and adjusted case rate thresholds and also by satisfying the equity focus—and stay there for 14 days, they can reopen schools.[16] Although it may be a powerful lever for inducing action, slowing reopening of schools involves foreseeable harms to marginalized communities. Not only does online K–12 learning appear less effective population-wide than in-person learning, but low-income students also disproportionately face learning barriers in online settings, such as lack of access to computers and Internet and crowded living conditions that impede focus.[17,18] Achievement gaps may widen further as more affluent families hire private tutors or adopt strategies like podding, in which households team up to allow children to learn with a hired teacher.[19] Children may also lose access to specialists and support services. For example, approximately one fifth of California's students are learning English as a second language, and online learning has struggled to adequately meet their language-instruction needs.[20] Prolonged school closures and unstable access to in-person schooling also affect family finances. With schools closed and affordable childcare in short supply, parents—in particular women of color—have had to leave the workforce to care for school-age children.[21–23] Low-wage workers may be especially likely to struggle with childcare affordability.

Recommendations. Because of the disproportionate benefits of in-person rather than remote learning for low-income children and their families, school reopening should be prioritized. Exempting schools from reopening requirements helps minimize the unintended burdens on disadvantaged communities while maintaining incentives for action. The relatively low rates of COVID-19 illness and death among children further support a carve-out for school reopening, as do the experiences of other countries that have reopened schools without significant outbreaks.[24–26] Because creation of the conditions for safe school reopening will require significant resources for COVID-19 testing and implementation of other strategies like physical distancing and ventilating facilities to reduce SARS-CoV-2 transmission, plans for resuming in-person instruction must, as the Biden administration has noted, incorporate equity considerations.[27,28] For instance, schools in marginalized communities may need additional financial and technical resources, as well as assistance, to plan and implement mitigation strategies. In addition, it is important to consider and address variations in family resource needs.

2. Unintended Economic Harms

Challenge. Extended closure of businesses that employ workers from disadvantaged communities could serve to compound the direct economic effects of the pandemic on Latino/Hispanic and Black workers—particularly women—who report being laid off or furloughed at higher rates than other workers.[21,22]

Recommendations. If prolonged business closures are to be used to incentivize counties to pay greater attention to health equity, they should be accompanied by targeted financial assistance to low-wage workers and small businesses, including unemployment benefits and programs such as loans and investments within structurally disadvantaged communities. Otherwise, equity metrics for reopening could disproportionately damage the economic security of the communities they are intended to help.

3. Unfunded Mandate

Challenge. California directs counties to make targeted use of federal grant funds to combat SARS-CoV-2 transmission in disadvantaged populations but provides no new funding.[4,7] Health inequities are multifactorial and pernicious and require multilevel strategies to mitigate them. Counties already facing budgetary strain because of the pandemic may struggle to find the resources to effectively address disparate COVID-19 prevalence and outcomes. California's approach implicitly acknowledges this problem, but at the expense of holding counties accountable: all counties are required to submit a plan for targeted investments, but there is no clear penalty for failing to implement that plan. One might argue that implementing the plan is necessary to satisfy the equity metric; therefore, the penalty for nonimplementation, albeit indirect, is not advancing to a less-restrictive tier. Yet, this is not necessarily the case. For counties with small disparities, whose numbers will not restrict reopening, performative efforts (e.g., submitted plans but no action, half-hearted efforts at quick distribution of personal protective equipment) may be the only product of including the targeted investment requirement in the Blueprint. In addition, many drivers of COVID-19 disparities—such as the need to work, lack of paid sick leave, and limited access to health insurance—are simply not within counties' control.[29] California has worked to address some of these issues statewide—for instance, by allowing special enrollment in the Covered California health exchange and expanding the state's supplemental paid sick-leave requirements.[30,31]

Recommendations. States that condition reopening on counties' demonstration of a health equity focus should provide additional resources to do so. Continued funding should be conditioned upon counties demonstrating robust efforts to implement their targeted investment plans and to measure progress against COVID-19. However, if funds are withheld, it could ultimately make implementation more difficult, so guidelines regarding when, how, and under what circumstances funding would stop and restart should be developed in advance. Given the consequences of delayed reopening, states should also consider how to assist counties by addressing those determinants of COVID-19 prevalence and outcomes that lay beyond counties' control. We admit that states face constraints in the help they can offer; only the federal government is free of the requirement to have a balanced budget. For this reason, the federal government, too, should play a role in redressing COVID-19 disparities. It is encouraging that the National Strategy for the COVID-19 Response released by the Biden administration calls upon "states to account for equity in their pandemic planning" and identifies federal resources to assist them in doing so.[27(p48)]

4. Perverse Rewards

Challenge. If equity metrics focus exclusively on within-county disparities, counties that have avoided becoming socioeconomically and racially diverse—for example, through residential redlining or exclusionary housing policies—are less likely to be held back from reopening. The weight of this concern will vary by state and depend on historical and political context; in California, the wealthiest counties tend to have greater disparities than poorer counties, but patterns may differ in other states.[32] Counties might also face counterproductive incentives to adopt testing strategies that underreport test positivity or case rates in the worst-off census tracts.

Recommendations. Equity policies could, if feasible, incorporate cross-subsidization to alleviate perverse rewards. For instance, a specified percentage of funds from affluent counties with high, relatively homogeneous HPI scores and low rates of COVID-19 could be designated for COVID-19 response in counties with lower HPI scores and high test-positivity and case rates. This would provide additional resources for struggling counties as well as opportunities for all counties to participate in statewide efforts to improve COVID-19 equity. In addition, states can try to limit gaming—for example, by adjusting case rates to reflect the number of tests performed. For this to be effective, counties would need to ensure that the number of tests administered, not just the number of positive test results, was being taken into consideration.

5. Public Backlash

Challenge. While many Californians have welcomed the Blueprint's equity focus, other residents in this large, diverse state have complained that "there is no justification for the governor to . . . restrict the most basic liberties of citizens for purposes of equity."[33] While such complaints have not ripened into litigation in California, litigation would be a possibility for other states that adopt an equity focus. Even short of this, if reopening is slower because of the equity focus than it would otherwise have been, those living in higher-quartile tracts may become angry or resentful, leading to stigmatization and policing of the behavior of those in the lowest-quartile tracts or to other forms of backlash.[34]

Recommendations. States should engage in a public process before incorporating a health equity focus into reopening plans. California engaged with county leaders to understand and address their concerns but did not conduct a public-facing deliberation process.[7] Public discourse increases transparency, which may partially allay objections. Because tensions between equity and liberty may invite hostility, however, it is important to ensure in public engagement that rules of civil discourse are enforced, marginalized voices are equally heard, and public preferences motivated by racism (which present not only ethical but also legal concerns) are not translated into policy. The goal of public engagement is to learn about community concerns and have those inform policy decisions, not dictate them.

Once an equity focus is implemented, public health education and messaging should promote community solidarity and cultivate buy-in. Emphasizing that addressing COVID-19 in vulnerable neighborhoods is in everyone's interest—for example, by minimizing transmission risks in community settings and through contact with workers—is valuable, as is communicating the message that public officials care about all of their constituents, including the most disadvantaged.

6. Designing Equity Metrics

Challenge. Crafting defensible health equity metrics is not straightforward. Numeric thresholds are needed to make metrics administrable, but those thresholds inevitably invite criticism. Other challenges relate to selecting the benchmarks used to assess disparities. It is not clear whether it is preferable to compare the test positivity rate in disadvantaged parts of a county to the county's overall test positivity rate (as California does) rather than to the most advantaged areas in the same county or to state averages. Each approach has limitations. For instance, if a county is doing poorly on COVID-19 across the board, no within-county difference might exist, but disadvantaged communities will still need help. By contrast, comparison with a state average fails to account for county-specific features that may be driving outcomes but are not amenable to improvement through county public health response, such as residential density, health insurance coverage, and occupational profile. Another issue is how great a disparity is tolerable. California's equity metric does not require that the lowest quartile HPI census tracts reach parity with other tracts; moreover, worsened disparities do not push counties backward into a more restrictive tier. Such choices reflect an acceptance of some degree of disparity. Insisting on absolute equality is not realistic, but tolerating any inequity undermines the expressive function of a health equity focus.

Recommendations. It is critical to engage leaders from marginalized communities and other key constituencies, such as workers' groups, to design equity metrics that minimize unintended consequences and have the best chances for success. It is possible, for example, that inclusion of diverse voices would have provided a counterweight to counties' efforts to prevent them from moving backward if COVID-19 disparities worsened. There is a tradeoff, however, between maximizing counties' incentives to act (i.e., using backward movement as a threat) and minimizing economic harm to the vulnerable.

A critical adjunct to the implementation of an equity focus is rigorous evaluation. Evaluation will require reliable tracking of COVID-19 testing rates, test results, case rates, and disease outcomes by race, ethnicity, socioeconomic status, and neighborhood, which does not consistently happen. States should assist counties in developing robust reporting processes to determine if the focus on equity is, in fact, addressing disparities in within-county COVID-19 prevalence and outcomes such as hospitalization and death. The federal government could also support this effort; the Biden administration's National Strategy highlights the need for increased data collection and reporting for high-risk groups.[27] States must incorporate what they learn through their evaluation processes to iteratively redesign the equity focus.

7. Defining Disadvantage

Challenge. California uses the HPI, a tool developed by the Public Health Alliance of Southern California (hereafter, Alliance) to measure disadvantage.[35] The 25 HPI indicators are organized into 8 domains: economy, education, access to health care, housing, neighborhoods, clean environment, transportation, and social environment. The Alliance, while acknowledging "the significant and well-documented role that race and ethnicity play in shaping health outcomes in the United States—including California,"[35] does not include measures of racial inequities at either an individual or a group level in the HPI. That choice reflects its interpretation of California's Proposition 209, which prohibits "preferential treatment to . . . any individual or group on the basis of"[36] race or ethnicity in "public employment, public education, or public contracting."[36] Nevertheless, the health disparities identified using the HPI "often stem from historical racism, including redlining in housing markets, education and employment discrimination, and racial bias in many other areas."[37] The Alliance has analyzed the HPI compared with a version of the HPI that includes race (the "race+ version") and concluded that "[a]dding the race domain primarily acts to partition the variance among the [other] domains rather than increase the predictive power of the HPI score."[38(p26)] Across the country, whether to explicitly include race in measures of disadvantage—and, by extension, in the allocation of resources—is currently being debated in the COVID-19 response.

Recommendations. States can choose among 3 strategies: (1) use race as an individual-level variable (i.e., providing resources to individuals based on their race), (2) include race as a neighborhood-level variable that indicates disadvantage, or (3) as California does, use neighborhood-level variables that indicate disadvantage, without including race among them. The first approach is unlikely to be legally viable and makes little sense in a population-level public health response, leaving the meaningful choice between the second and third approaches. That race—through structural racism—is such an important driver of COVID-19 disparities makes it appropriate for inclusion among the neighborhood variables used in a measure of disadvantage. Its use as a neighborhood variable has passed legal muster in other contexts, such as education, though policymakers must be sensitive to the details of applicable law.[39] If the choice is made not to include race as a variable, policymakers should nonetheless be aware of whether and how race tracks with the chosen variables.

In view of the stark racial disparities in COVID-19 outcomes and increasing public reckoning with the racism that underlies them, the use of race in states' health equity focus would be powerful. To clearly name "race" acknowledges the racial injustices that underpin disparities and signals a commitment to address structural racism's deadly effects on racial/ethnic minorities and to heal communities' emotional wounds. In this time of extreme polarization, explicitly mentioning race may heighten the risk of backlash, but we believe the benefits of recognizing racism as a root cause of COVID-19 disparities outweigh this concern.

CONCLUSION

The success of California's bold health equity experiment remains uncertain, but the Blueprint is a welcome step toward including equity in COVID-19 policy. The challenges we have identified are not objections to this important project but, rather, reflections of the degree of difficulty involved in implementing real-world policies to advance health equity.

Other states should follow California's lead. Some, including California, have begun including equity considerations in vaccine allocation.[40] The federal government could promote equity-focused policies by tying funding to efforts to reduce health disparities or earmarking funds to be used to achieve that end. We encourage states to consider the concerns and include the recommendations outlined here in the public debate and design of their own equity-based policies. Sound, just, and courageous strategies are essential for guiding the United States through the pandemic, and the Blueprint may serve as a template for broader development of public health approaches that center equity as a core value.

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M. M. Mello serves as an Advisor to Verily Life Sciences LLC on a product designed to facilitate safe return to work and school.

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This study was exempt from institutional board review because no human participants were involved.

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Toward a New Strategic Public Health Science for Policy, Practice, Impact, and Health Equity

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See also Brownson, p. 1389.

The COVID-19 pandemic and its social and health impact have underscored the need for a new strategic science agenda for public health. To optimize public health impact, high-quality strategic science addresses scientific gaps that inform policy and guide practice.

At least 6 scientific gaps emerge from the US experience with COVID-19: health equity science, data science and modernization, communication science, policy analysis and translation, scientific collaboration, and climate science. Addressing these areas within a strategic public health science agenda will accelerate achievement of public health goals.

Public health leadership and scientists have an unprecedented opportunity to use strategic science to guide a new era of improved and equitable public health. (*Am J Public Health*. 2021;111(8):1489–1496. https://doi.org/10.2105/AJPH.2021.306355)

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COVID-19 has exposed major unmet needs in our nation's public health system related to workforce, diagnostics, preparedness, health disparities, information systems, and response capacity. While there have been numerous calls for creating and sustaining a robust public health infrastructure and for prioritizing science, antiscience sentiments have also been widespread. Without a thoughtful, strategic approach to scientific research; rigorous evaluation of programs; and development of evidence-based public health policy and communication strategies, the United States will be underprepared again when the next pandemic occurs. Ensuring impactful science as the bedrock for decision-making will set a sound foundation for the future, and lessons from COVID-19 can provide direction for a strategic approach to public health science.[1]

Public health has a mandate to reduce morbidity and mortality and advance health equity at the population level. Metrics and frameworks used to rank the impact and value of public health science vary, often reflecting stakeholder perspectives. They frequently include a focus on tangible health benefits, concern about return on investment, interest in specific diseases, or prioritization of bibliometrics and scientometrics.[2,3] Retrospective metrics alone are insufficient to guide strategic science; effective action requires a prospective approach. We believe strategic science begins with a public health goal in mind, systematically identifies and then builds an evidence base to inform practice and policy, and ultimately results in improvement in health and equity outcomes. To optimize public health impact, high-quality strategic science addresses scientific gaps that inform policy and guide practice.

A prioritized strategic science agenda can help guide use of limited public health scientific resources to fill the evidence gaps that will have the largest impact on population health. Many examples of the impact of strategic science exist,[4] ranging from counterbioterrorism efforts informed by the smallpox research agenda,[5] smoke-free policies that protect millions based on research documenting adverse effects of second-hand smoke exposure,[6] increased vaccine coverage following implementation research, coordinated evidence-based actions to reduce antimicrobial resistance informed by surveillance,[7] and millions of lives saved by HIV antiretroviral therapy resulting from applied research on effective delivery strategies. A strategic pursuit of public health science that provides direction, has delineated measurable goals, and provides opportunities for stakeholders and affected communities to engage is needed more than ever. Developing and implementing an effective strategy is crucial for a new public health era.

The COVID-19 pandemic has illuminated at least 6 key themes that are central to a science strategy for improving public health: health equity science; data science and modernization; communication science; policy analysis and translation; scientific, including laboratory, collaboration; and climate science. With a US domestic focus, for each of these 6 themes, we first summarize related COVID-19 lessons. Second, we discuss their implications to help inform a strategic public health science agenda for a new era (Box 1).

HEALTH EQUITY SCIENCE

Structural racism, long-standing injustices, and neglect of factors that cause health inequities in the United States have worsened the consequences of the COVID-19 pandemic and resulted in substantial disparities in COVID-19 incidence, hospitalization, and mortality. Social determinants of health (SDOH) and vital conditions such as employment settings lacking employee protections and insecure or crowded housing have impeded the use of mitigation measures like social distancing and mask wearing. These factors contributed to 1.4- to 1.8-times-higher COVID-19 incidence, 2- to 3-times-higher hospitalization, and 3- to 5-times-higher mortality rates among Black and Hispanic/Latino persons compared with White persons.[8] In addition to elevated environmental exposure risk, racial/ethnic minority populations have less access to health care and higher prevalence of uncontrolled chronic lung, heart, kidney, liver, and metabolic conditions associated with more severe COVID-19 outcomes.[9] Race and ethnicity data have been incomplete, particularly in the beginning of the epidemic, and SDOH data were not widely leveraged, leaving the effects of structural racism, environmental injustice, and other socioeconomic factors largely unexplored. In addition, adverse impacts of the pandemic on employment, education, and other determinants of health could widen future disparities as well because Black, Hispanic/Latino, older, rural, and underinsured populations were more likely to experience unemployment and education setbacks.[10,11]

Future strategic scientific work can advance health equity by both building on existing recommendations and identifying new effective program and policy interventions. Rigorous evaluations of clinical, community, environmental, and policy interventions that link social determinants with health outcomes and assess impact on health inequities are essential.[12] To expand the evidence base, evaluation of real-world impact and the effect of interlocking contextual systems will be important to supplement experimental efficacy studies.[12] Expanding use of validated methods to document SDOH and assess social and environmental factors will be fundamental to this work.[13] This work can also elucidate how failure to address health disparities leads to less-effective preparedness and how health disparities can be exacerbated during a crisis. Research is needed to identify ways in which better data from modernization and innovation can be used to accelerate health equity.[14] Given how SDOH, structural racism, and health disparities contributed to the impact of this pandemic, implementation science should inform preparedness approaches that recognize health equity as a core pillar of future pandemic preparedness efforts.

DATA SCIENCE AND MODERNIZATION

Existing surveillance and data systems have proven inadequate for COVID-19 response efforts. Public health data systems have been historically undersupported and were unable to acquire, share, and transmit data efficiently. The lack of systematic data collection and automated linkages between laboratory-derived data, clinical data, and case investigation data has impeded COVID-19 response speed. Outdated policies and regulatory processes inhibit data collection and sharing at local, state, national, and international levels. Interconnectivity across a vast array of public–private sector systems in the United States has been nascent, slowing utilization of electronic health records in response efforts. While contact tracing can be an important public health tool to interrupt disease transmission, its application for COVID-19, particularly in the initial months of the pandemic and during spike periods, was largely inadequate. Data science could have greatly improved contact-tracing efforts by providing real-time information to those exposed to reduce transmission. Finally, the public health workforce has had limited expertise and access to new tools, policies, and approaches to data visualization, methods, and analytics including epidemiological modeling and

BOX 1— COVID-19 Lessons and Implications for Strategic Public Health Science

Themes	COVID-19 Lessons	Public Health Science Opportunities
Health equity science	• COVID-19 magnified and widened health disparities and other inequities. • Incomplete data on race, ethnicity, and SDOH limited some analyses. • Race/ethnicity interacted with causal SDOH factors and historical inequities. • Historic neglect of factors that cause health disparities resulted in worse pandemic outcomes.	• Assess how addressing health disparities is part of pandemic preparedness. • Document SDOH, including how they intersect to magnify risk. • Build evidence on intervention effectiveness. • Generate health equity evidence needed by policymakers. • Research how data modernization and innovation can accelerate health equity.
Data science and modernization	• Public health data systems were unable to acquire, share, and transmit data efficiently. • Lack of systematic linkages among laboratory, clinical, and case investigation data impeded response speed. • Outdated policies and regulatory frameworks inhibited data sharing at local, state, national, and international levels. • Public health workforce expertise was insufficient for data linkages and new analytic methods. • Public- and private-sector partnerships were nascent, slowing progress.	• Accelerate modernization to make public health science current. • Expand methods for use of multisectoral data sources, including environmental and climate, community SDOH, geospatial, genomic, and biomarker data. • Evaluate new surveillance and outbreak signal approaches. • Equip public health workforce with data science, genomics, informatics, and analytic skills. • Provide scientific leadership using public health data.
Communication science	• A COVID-19 “infodemic” occurred together with more than 90 million Facebook misinformation warnings • Misinformation and disinformation undermined public health messaging and response efforts. • Public trust in scientific integrity was undermined during COVID-19.	• Evaluate approaches to counter misinformation, such as engaging online influencers. • Expand communication science; assess impact of new technologies and social media. • Strengthen communication strategy as part of research planning. • Evaluate effective methods to amplify research dissemination. • Accelerate pace of science dissemination.
Policy analysis and translation	• Need for universal access to free testing, treatment, and vaccination for COVID-19 was evident. • COVID-19 made intersection of health and other sectors visible, raising plethora of policy issues (e.g., employment, housing, transportation). • Policy barriers hindered consistent mitigation approaches across jurisdictions, (e.g., mask, restaurant, and business opening policies). • Clear, consistent messaging was needed across all levels of policymakers. • COVID-19’s postacute health effects (cardiovascular, pulmonary, mental health, and neurologic) raised policy issues in other health care domains. • Telehealth expansion demonstrated both feasibility and need for attention to equitable access.	• Expand use of policy analyses to assess public health impacts. • Utilize strongest methods possible for public health policy research, including randomized and nonrandomized designs. • Leverage partnerships to accelerate dissemination and implementation of evidence-based policy options. • Assess core capacities, policies, and systems, and ethical frameworks needed for future preparedness and resource distribution during public health threats. • Assess incidence, duration, severity, and societal impact of long-term sequelae. • Evaluate approaches to address policy and resource barriers that ensure equitable access as telework expands.
Scientific collaboration	• SARS-CoV-2 sequence was published online in 72 h, setting precedent. • Proliferation of COVID-19 preprints and rapid publications accelerated pace of dissemination. • Community engagement was critical to build trust and mitigation adherence. • Data from multiple sectors and disciplines helped to identify risks and assess mitigation feasibility and effectiveness, including political science, behavioral science, and data science.	• Implement transdisciplinary and convergence research studies. • Pursue research innovation; develop novel methods, such as improving specimen collection or using host genomics to explain health outcomes and responses to treatments and vaccines. • Conduct community participatory research; use tools of collaborative implementation science to enhance public health outcomes. • Facilitate rapid sharing of applied laboratory advances.
Climate science	• Air pollution can aggravate underlying respiratory conditions that lead to more severe COVID-19 outcomes. • Extreme heat, fire, and severe weather complicated COVID-19 mitigation efforts. • New COVID-19 guidance was needed for climate-related emergency response. • Lockdowns and reduced mobility and travel rapidly improved air quality.	• Implement research focused on climate-vulnerable populations. • Leverage predictive analytics to forecast adverse climate effects and intervention needs. • Expand methods and routinely incorporate a climate lens into public health research. • Evaluate effectiveness and impact of interventions designed to mitigate climate change to build evidence base.

Note. SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2; SDOH = social determinants of health.

disease forecasting as a routine part of pandemic planning and response.[15]

As public health strives to keep pace with rapidly advancing technologic innovation, scientists are poised to benefit from advanced data analytic skills, including those for conducting natural language processing and leveraging machine learning and artificial intelligence. Strategic public health science coupled with innovative use of technology could help transform contact tracing methods for the future. Furthermore, development of, building consensus around, and utilization of new and nimble regulatory, legislative, and ethical frameworks for data collection, sharing, quality, and privacy are needed to reduce risks and maximize benefits associated with rapid modernization. Strategic public health science will require expanded scientific methods and analytic approaches for multisectoral data sources, including community SDOH, environmental and climate, genomic and bioinformatics, social media, and geospatial data. As transdisciplinary data scientists increasingly use public health data, public health scientific leadership is needed to establish core method, analytic, ethical, and policy approaches.

COMMUNICATION SCIENCE

The COVID-19 pandemic has called attention to the cultural, structural, and technological barriers that hamper dissemination and acceptance of accurate messages informed by science. Misinformation and disinformation have spread rapidly in social media. Facebook, for example, reported placing warning labels on more than 90 million pieces of content deemed COVID-19 misinformation.[16] COVID-19 misinformation undermined accurate public health messaging; greater exposure to misinformation was associated with lower compliance with mask wearing and social distancing guidelines.[17] Disinformation, defined as deliberately misleading or biased information, has been used to intentionally fuel anti-science views and sentiments, particularly among targeted subpopulations.[18] In addition, the sheer volume of evidence-based information and the speed and frequency with which information evolved made consistent and effective risk communication more challenging and led the World Health Organization (WHO) to declare an "infodemic" around COVID-19 in May 2020.[19] The inconsistency of clear COVID-19 messaging across public-sector authorities at local, national, and global levels further undercut mitigation efforts.

Strategic science can leverage community engagement, behavioral economics, and communications science to study the impact of new technologies and strategies to counter misinformation and antiscience disinformation, including engagement of online influencers and trusted messengers to provide a steady flow of evidence-based information.[20] Research to identify effective interventions can assist both health organizations and social media platforms as they work to counter misand disinformation.[21] Planning for strategic dissemination, monitoring audience knowledge and sentiment, and countering misinformation are standard practices for all public health scientists to incorporate into daily practice. Coupled with proactive, consistent messaging that employs sound risk communication principles, strategic science can help rebuild trust in public health.[22–24]

POLICY ANALYSIS AND TRANSLATION

COVID-19 has illuminated the potential of policy as a public health tool and impediment. For example, policy decisions to reduce economic barriers for vaccination and testing increased uptake.[25] COVID-19 has also raised a plethora of multisectoral policy challenges that have an impact on transmission risk, including workplace safety, housing density, and transportation. Inconsistent mitigation policies have hindered the response across sectors and jurisdictions, including mask mandates and restaurant, bar, and other business operating policies. Furthermore, the public has often been confused by inconsistent communications about the importance of mitigation policies. COVID-19 has had numerous collateral and lasting impacts, both at the societal and individual level. Public- and private-sector entities will be confronted with potentially millions of people with long-term cardiovascular, pulmonary, mental health, and neurological sequelae,[26] raising policy needs across health care domains.[27] One success has been the rapid expansion of telehealth[28]; policies to ensure equitable access going forward will be needed.[29]

Assessment of the positive and negative impacts of policies and use of mathematical modeling to predict future impacts are key tools for scientific inquiry. A component of this work will be the identification of the core capacities, policies, and systems needed for preparedness. This includes advance assessment of the epidemiological and ethical implications of policy approaches to distribute resources during public health emergencies. Characterizing overall COVID-19 collateral impacts will be an important research area to inform broader health care policy, starting with assessment and monitoring of the incidence, duration, severity, and societal impact of long-term sequelae. Translational science, which includes both implementation and dissemination approaches and moves knowledge to action by ensuring effective and widespread use of evidence-based policies, can leverage policy analysis and implementation research to accelerate action.[30] For example, policy analysis can be used to identify effective mitigation interventions to support those experiencing long-term impacts, assess SDOH, and achieve widespread impact by applying findings through implementation and dissemination strategies. Success of this policy research will depend on utilization of the strongest designs possible, including both randomized and nonrandomized methods.[12]

SCIENTIFIC COLLABORATION

Within 72 hours of the Chinese and WHO announcement of a novel coronavirus, Chinese researchers shared the full sequence for SARS-CoV-2 online, spurring a global effort toward vaccine and therapeutics development.[31] UNESCO accelerated Open Science efforts with 122 nations[32]; the Open COVID Pledge engaged patent holders and the private sector[33]; and more than 150 scientific institutions and journals reaffirmed their commitment to share data and expand open access during the public health emergency.[34] Peer-review timelines have shortened dramatically for COVID-19 scientific information, with rapid review processes and preprint postings.[35] Dissemination of COVID-19–related information exploded; more than 16 000 scientific publications, including greater than 6000 on preprint servers, were posted in just 4 months. Online and digital technologies supported low-cost and timely remote scientific collaborations.[36] Collaborative scientific innovation on mRNA technology greatly accelerated vaccine development,[37] and scientists in multiple settings worked rapidly to build the evidence base on the effectiveness of masking for both source control and user protection. The pandemic accelerated scientific collaboration and promoted new norms around transparency and sharing.

Sustaining a culture of scientific collaboration positions public health science to be enriched with innovation and cross-sectoral expertise, including with sectors outside of health.[38] Concerted effort by scientists will be needed to implement transdisciplinary and convergence research[39]; advance applied laboratory science; conduct community participatory research; pursue research innovation and develop novel methods, such as transdisciplinary environmental health disparities research[40]; and host transparent genomics studies to explain health outcomes and vaccine response.[41] Creative public health practice and academic linkages as well as transdisciplinary team-based research approaches could help drive innovation going forward, including laboratory advancements.[42,43] Improved laboratory capacities are foundational to enhanced public health science, including not only laboratory quality and safety but also advancements in specimen collection, pathogen inactivation, transport, and rapid characterization; multipathogen and point-of-care assays; and biomarker-based diagnostics. Collaborative sequence-based pathogen surveillance reinforced by a global network of reference laboratories can more swiftly identify new and emerging pathogens. Scientists can improve processes for rapidly posting sequences and early findings to accelerate evidence generation for diagnostics, program implementation, and policy development. Modeling the costs and benefits of reducing chronic disease burden before the next infectious disease outbreak could inform a new paradigm for preparedness. Scientists are poised to continue greater collaboration, which could be enhanced with local, national, and global leadership.

CLIMATE SCIENCE

Health threats from climate change are well-documented,[44] and the interplay between COVID-19 and climate and environmental factors is multifaceted.[40] Environmental determinants of health, including deforestation and increasing human presence in wildlife habitats, have fueled both climate change and emergence of zoonotic infections.[45] Climate change, especially changes in temperature and precipitation, can result in changes in the distribution, seasonality, and prevalence of infectious diseases.[46] Air pollution can aggravate underlying respiratory conditions that lead to more severe COVID-19 outcomes.[47] Extreme weather events, including fires and storms, complicated COVID-19 mitigation efforts[48]; in turn, COVID-19 complicated responses to these disasters.[49] COVID-19 also complicated the ability of local health departments to run climate-relevant congregate facilities, such as cooling centers and disaster shelters.[50,51] Lockdowns and reduced mobility and travel improved air quality, but these positive impacts rapidly eroded as mobility increased again.[52] Our collective response to COVID-19 has been described as "a rapid learning experiment about how to cope with climate change."[53] Indeed, COVID-19 and climate change mitigation share similar policy challenges, including the importance of speedy and decisive action to avoid global financial and public health impact, the difficulties of gaining public support for stringent mitigation policies given politicization of the issues, and the need to address health disparities and counter misinformation.[54]

A strategic public health science agenda creates the opportunity to identify effective approaches for these shared policy challenges. Other key priorities include expanding research on the relationship between climate and health outcomes and emerging pandemic threats and improving surveillance for climate-sensitive pathogens and vectors that identify locations and populations at greatest risk. In addition, use of predictive analytics and forecasting can help build an evidence base for early warning systems and for interventions that effectively counter adverse climate effects, particularly for populations experiencing environmental injustice,[55] such as migrant and refugee populations.[56] Given that climate impacts span across public health, from environmental health to chronic and infectious disease and mental health, an interdisciplinary approach can support scientists to expand methods and demonstrate the value of new mandates to routinely incorporate a climate lens in public health research.[57,58]

A NEW ERA OF PUBLIC HEALTH STRATEGIC SCIENCE

The COVID-19 pandemic and its impacts continue to grow, fueling the imperative to create a new era of public health guided by strategic science. The 6 themes emerging from COVID-19 experience discussed here—health equity science, data science and modernization, communication science, policy analysis and translation, scientific collaboration, and climate science—can help formulate a strategic public health science agenda that accelerates achievement of future public health goals (Box 1). To succeed, public health science should be grounded in scientific integrity and supported by a larger, sustained, well-trained, and innovative workforce. Workforce expansion, diversification, and development will be needed at multiple levels, including for epidemiologists, data scientists, and leadership.[59] This enhanced public health workforce could help break the cycle of panic and neglect that has characterized public health attention and resources for decades.[60] Given the impact of COVID-19, it is possible that public health will remain prominent, especially as vaccination coverage expands, other efforts to reduce community transmission continue, and researchers learn more about COVID-19's long-term effects. Public health leaders and scientists have an unprecedented opportunity to use strategic science to guide and implement a new era of improved and equitable public health.

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CONFLICTS OF INTEREST

The authors have no potential or actual conflicts of interest with the content presented in this article.

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This activity did not involve human participant research, was reviewed by CDC, and was conducted consistent with applicable federal law and CDC policy (see, e.g., 45 CFR 46; 21 CFR 56; 42 USC §241(d); 5 USC §552a; 44 USC §3501 et seq.).

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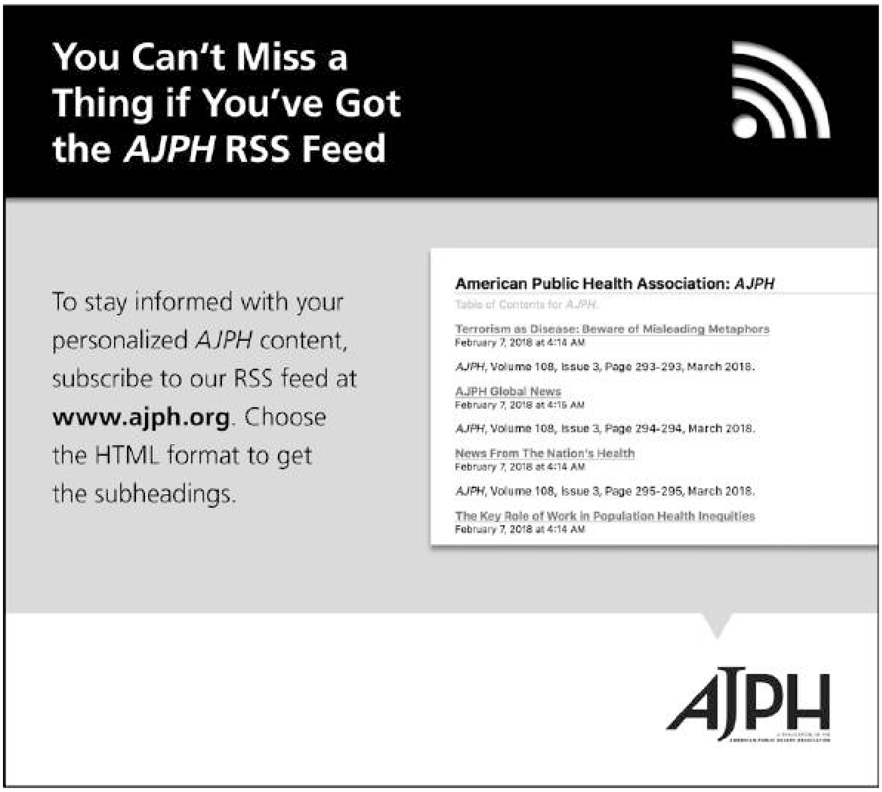

Immigration Detention in the United States: Identifying Alternatives That Comply With Human Rights and Advance Public Health

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See also Uppal et al., p. 1395.

Under international law, the United States is obligated to uphold noncitizens' fundamental rights, including their rights to health. However, current US immigration laws—and their enforcement—not only fail to fulfill migrants' health rights but actively undermine their realization and worsen the pandemic's spread.

Specifically, the US immigration system's reliance on detention, which precludes effective social distancing, increases risks of exposure and infection for detainees, staff, and their broader communities. International agreements clearly state that the prolonged, mandatory, or automatic detention of people solely because of their migration status is a human rights violation on its own. But in the context of COVID-19, the consequences for migrants' right to health are particularly acute.

Effective alternatives exist: other countries demonstrate the feasibility of adopting and implementing immigration laws that establish far less restrictive, social services–based approaches to enforcement that respect human rights. To protect public health and realize its global commitments, the United States must shift away from detaining migrants as standard practice and adopt effective, humane alternatives—both amid COVID-19 and permanently. (*Am J Public Health*. 2021;111(8):1497–1503. https://doi.org/10.2105/AJPH.2021.306253)

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The United States is party to a range of international treaties and agreements that protect the fundamental rights of migrants. Under the Universal Declaration of Human Rights, which is not a treaty per se but is binding as part of customary international law, everyone, "without distinction of any kind," has the rights to medical care, education, liberty, and the right to seek asylum. Likewise, under the International Covenant on Civil and Political Rights, which the United States ratified in 1992, "everyone" has the rights of liberty, due process, and equality before the law. And finally, under the International Convention on the Elimination of All Forms of Racial Discrimination, which the United States ratified in 1994, the rights of health, education, and freedom of movement are guaranteed regardless of national origin. Pursuant to a 2002 UN general recommendation interpreting the International Convention on the Elimination of All Forms of Racial Discrimination, the United States is obligated to "respect the right of noncitizens to an adequate standard of physical and mental health by, *inter alia*, refraining from denying or limiting their access to preventive, curative and palliative health services."[1(p37)]

Other widely adopted treaties that are not US ratified—including the International Covenant on Economic, Social, and Cultural Rights (171 state parties) and the 1951 Convention Relating to the Status of Refugees (Refugee Convention; 146 states parties)—demonstrate substantial global agreement on the importance of guaranteeing the welfare of all people.[1] International instruments also limit the use of immigration detention. For example, the Refugee Convention, which the United States must observe as a party to the 1967 Protocol Relating to the Status of Refugees, clarifies that countries cannot "impose penalties" on asylum seekers for entering without authorization. Further, the UN High Commissioner for Refugees has made clear that "detention for the sole reason that the person is seeking asylum is not lawful" and that considering alternatives to detention is a requirement of parties to the Refugee Convention.[2] Under the International Covenant on Civil and Political Rights, short-term, judge-ordered restrictions on migrants' movement may be permitted if undertaken in humane conditions and expressly permitted by law. However, long-term, automatic, or mandatory restrictions violate migrants' right to liberty—and in all cases, their detention should be considered a last resort.[3]

Specific legal instruments also address the detention of minors and the practice's complete incompatibility with government obligations to ensure children's well-being. For example, the Convention on the Rights of the Child—which the United States signed in 1995 although it remains the only country that has yet to ratify it—establishes that "no child shall be deprived of his or her liberty unlawfully or arbitrarily" and that the detention of any minor "shall be used only as a measure of last resort and for the shortest appropriate period of time."[1(p301)] In 2012, the Convention on the Rights of the Child committee made clear that this language does not justify detaining children based on their migration status or that of their parents:-

> The detention of a child because of their or their parent's migration status constitutes a child rights violation and always contravenes the principle of the best interests of the child. In this light, States should expeditiously and completely cease the detention of children on the basis of their immigration status.[4]

The Convention on the Rights of the Child also guarantees children's right to health and requires countries to "ensure that a child shall not be separated from his or her parents against their will."

In light of these commitments, the scope and conditions of immigration detention in the United States have inspired condemnation from the international community. In 2017, after an investigative mission to the United States, the UN Human Rights Council Working Group on Arbitrary Detention proclaimed that its "mandatory detention of immigrants, especially asylum-seekers, is contrary to international human rights and refugee rights standards."[5] In 2018, the United Nations International Children's Emergency Fund chastised the United States for separating children from their parents at the United States–Mexico border and expressed grave concern about migrant children's "limited access to many of the essential services they need for their well-being, including nutrition, education, psychosocial support and healthcare."[6] In 2019, the UN high commissioner for human rights stated that she was "appalled" and "shocked" at the cruel, inhuman, and degrading treatment of children in US immigration detention.[7] Early in 2020, the Federal Court of Canada ruled that US immigration policies are "inconsistent with the spirit and objective of the STCA [Safe Third Country Agreement]," a bilateral treaty addressing the rights of refugees that has been in place since 2004, and called US practices an unjust violation of "life, liberty, and security."[8]

Moreover, domestic case law has established limits on the practice of child detention. The 1997 class action lawsuit *Flores v. Reno* led to a settlement agreement instituting limits on the amount of time and conditions in which minors could be detained and included a commitment to ensure the health and education of children in detention facilities.[9] Later court decisions applying the settlement strengthened the government's obligations to ensure family reunification and clarified that the agreement covered both unaccompanied minors and those detained with their parents. Despite the Department of Justice's attempt to withdraw from the Flores settlement in 2019, a federal court ruling affirmed that it remains in effect; moreover, the settlement applies to the full range of government agencies involved in immigration enforcement, including Customs and Border Protection (CBP), Immigration and Customs Enforcement (ICE), and the Department of Health and Human Services, to which ICE and CBP now transfer unaccompanied children pursuant to the Homeland Security Act of 2002 (Pub L No. 107-296).

Despite these commitments and global standards, however, official US policy holds that any child or adult who is not a US citizen or US national can be apprehended by CBP or ICE, leading to high levels of immigration detention not only in facilities used solely for immigration detention but also in ICE-contracted jails nationwide.[10] The past several years have witnessed an escalation in the imprisonment of children and families whose only offense is lack of authorization to remain in the United States. In fiscal year 2019, the Department of Homeland Security (DHS) had a record of 851 508 Southwest border apprehensions, of which 55.6% were families and 76 020 were unaccompanied minors.[11] For both children and adults, the threats to health and human rights cannot be overstated and demand a rethinking of our approach.

REALIZING THE RIGHT TO HEALTH

Immigration detainees in the United States primarily comprise asylum seekers and people awaiting deportation, typically for overstaying a visa or reentering the country after prior removal.[12] Even according to ICE's own records, most immigration detainees pose no threat to the community,[13] and as we discuss later in this essay, effective alternatives to detention exist. Nevertheless, detention has become the default method of processing asylum seekers and otherwise enforcing immigration laws, with substantial health consequences for millions of families and society more broadly.

Indeed, fully realizing the right to health is next to impossible in immigration detention. Even in the best of circumstances, the crowded conditions, lack of access to outdoor space, and psychological harms of detention pose threats to individual detainees' health and increase the risk of communicable disease. When detention centers are inadequately resourced or poorly administered, these risks quickly escalate, as has been the case in the United States. In 2019, the Office of the Inspector General investigated 4 ICE and CBP facilities and found that they posed "immediate risks or egregious violations" to detainee health.[14] One center required detainees to purchase their own toiletries despite ICE stating that these items are to be provided free of charge.[14] Inadequate provision of soap and shower access in overcrowded facilities add to communicable disease risks.[15,16] There are additional reports of detainees being given only an aluminum blanket to sleep in "freezing" cells.[17]

Detained children have likewise faced appalling violations of the right to health, leading a federal court to determine that CBP detention facilities' "deplorable and unsanitary conditions" violate the Flores settlement on the humane treatment of child detainees.[17] For example, from December 2018 to May 2019, 3 children in CBP custody died from influenza, tragically illustrating how the combination of higher disease exposure and inadequate medical treatment in detention settings exacerbates the threat of routine illness.[18] One study found that from January 2017 to March 2020, 22 ICE detention centers experienced 79 outbreaks of influenza, varicella, or mumps.[19] More broadly, the detention of minor migrants has been linked to devastating overall childhood developmental delays and a heightened risk of major psychological disorders—one study reported a 10-fold increase in psychiatric disorders, including post-traumatic stress disorder and depression—often resulting in self-harm and violent behavior.[20] And beyond the threats to the right to health, detention creates near insurmountable barriers to the effective fulfillment of children's right to education.

The COVID-19 pandemic has simply made these conditions worse, especially given the infeasibility of physical distancing.[15] One study based on interviews with 50 people detained during the pandemic in ICE facilities across 12 states found that 96% reported sleeping within 6 feet of another person, and 80% reported they could never maintain 6 feet of distance during meals.[15] As of December 28, 2020, ICE had reported positive tests from 8734 more detainees, with 474 of these currently "under isolation or monitoring."[21] These statistics do not show the full incidence of COVID-19 in immigration detention because of ICE's undertesting of detainees and ongoing deportations; moreover, the agency's lack of publicly available data on testing—alongside inconsistencies in the little data accessible online—further suggests that the reported numbers are an underestimate.[15,22]

Meanwhile, rather than prioritizing stronger measures to protect detainees' health, the Department of Health and Human Services and the Centers for Disease Control issued a public health order banning all asylum seekers entering from Canada or Mexico (regardless of nationality), not only violating human rights but also increasing the risks of the pandemic's spread globally, as asylum seekers are immediately sent back to their countries of origin or must undertake multiple border crossings to attend hearings on their case. In September 2020, the close of the fiscal year, ICE reported its highest annual death toll in 15 years, with 72.7% of nonsuicide deaths since April 2020 attributed to COVID-19.[22,23]

ALTERNATIVES TO DETENTION

The US immigration system's reliance on detention—and its predictably devastating consequences for public health, both amid the COVID-19 pandemic and generally—is not inevitable. And although always important, the pandemic has only underscored that finding safer, healthier, and more dignified alternatives to administrative detention (ATDs) is of the utmost urgency. ATDs, as defined by the International Detention Coalition, are "any law, policy or practice by which persons are not detained for reasons relating to their migration status."[24] For example, allowing asylum seekers and other migrants to live in the community while their case is pending, paired with access to social services and support from a designated case worker, upholds dignity and human rights while ensuring adequate and ongoing contact with participants. When well designed, ATDs are not alternate methods of detention but approaches that respect migrants' rights while monitoring their progress through legal immigration proceedings.[24]

The ATD approaches taken across countries have varied in terms of their respect for human rights and equity; these have included, among other elements, electronic monitoring, cash bonds, and regular reporting to an immigration office. Well-designed ATDs are particularly important for unaccompanied minors, who are especially vulnerable and cannot access some ATDs without a legal guardian.

In the migration context, evidence shows that ATDs can be just as effective as detention in ensuring that participants appear in court or comply with related legal requirements. For example, a 2011 examination of 13 ATDs around the world found that 10 had compliance rates of at least 94%, including 5 with compliance rates of 99% or above.[25] Among the 3 ATDs with lower rates—80%, 84%, and 90%, respectively—2 offered minimal social services, and the third saw an improvement in compliance after beginning to connect detainees with legal aid. According to UN experts, common elements of the programs that had the highest compliance or cooperation rates were the provision of accessible information about migrants' rights and responsibilities in the program, referrals to legal counsel, support to meet material needs, and dignified, humane treatment throughout the process.[25]

To better understand national approaches to ensuring international migrants' rights, with a focus on children, our team at the WORLD Policy Analysis Center (WORLD) at the University of California, Los Angeles is currently completing a comparative analysis of the migration laws and policies of countries around the world, including their legal protections from detention for asylum-seeking minors and other migrants and the provision and prioritization of ATDs. Having laws on the books that provide for ATDs is a critical first step for protecting detained migrants' fundamental rights. For countries that allow detention, we compared approaches to time restrictions, facilities, conditions, and rights while detained, including the right to family unity for accompanied minors and the assignment of guardians to unaccompanied minors.

For example, in Costa Rica, minor migrants cannot be detained, regardless of whether they are accompanied or unaccompanied. Unaccompanied asylum-seeking children are provided with supervision, and "all appropriate alternatives to detention should be considered" for accompanied asylum seekers.[26] Costa Rica is also part of the Protection Transfer Agreement, which provides safe haven to asylum seekers from Central America until the United States or other resettlement countries accept their refugee status.[27] In Ecuador, minors cannot be ordered to detention for administrative offenses; they may be placed in youth migrant shelters, in foster care, or with family members.[28] Freedom from detention is also extended to an accompanied child's parents "when the best interests of the child or adolescent demand the maintenance of family unity."[29]

Moreover, some countries specify in legislation that detention of any migrants—children or adults—for longer than a few days is prohibited. For example, in El Salvador, the law proclaims that asylum seekers cannot be held in custody for more than 72 hours, "human rights must be respected," and "in any case, no applicant may be confined to prison."[30] In the Democratic Republic of the Congo, migrants can be held in a "remand center" for no longer than 8 days.[31] In Sweden, laws prioritize ATDs for minors, who can in no case be detained for more than 6 days.[32] Although effective implementation is critical to these laws having impact and requires further assessment, enshrining a commitment to ATDs in legislation provides an important foundation for protecting migrants' rights.

Governments have also taken specific steps to tailor ATDs and other aspects of immigration policy to the challenges created by COVID-19. South Korea's government, for example, is offering free coronavirus testing and treatment to its 390 000 undocumented immigrants, without arrests or collecting personal information.[33] In some other countries, governments have temporarily extended visas and residency status to undocumented migrants.

Although the United States has no comparable national policy, moderately effective ATDs have been piloted in the United States in recent years. In January 2016, ICE began a 5-year social services–based ATD, the Family Case Management Program (FCMP). FCMP provided more than 900 asylum-seeking families with stabilization services to meet basic needs, including food security and medical care, legal orientation to introduce clients to basic US laws, and compliance visits with case managers to plan for future settlement or deportation.[34] Shortly after the inception of the Trump administration, ICE terminated FCMP 3 and a half years early, claiming costs were too high and deportation rates were too low.[35] However, FCMP cost far less, at $38.47 per person per day compared with $318.79, than the cost of detention.[36] Included in FCMP's lower costs were essential services that supported participants' compliance with immigration proceedings while upholding their basic human rights and their ability to practice public health recommendations. Further, according to ICE's evaluation of the program, families who completed FCMP had 99% compliance rates for monitoring and court attendance.[34]

FCMP was subject to legitimate criticism. Critics, including the DHS's advisory committee, raised valid concerns about FCMP being run by the GEO Group, ICE's top contracted private prison corporation, which operates multiple detention facilities.[37] One study also noted that FCMP did not provide families financial assistance and criticized the nongovernmental organization–government collaboration, arguing that it blurs the line between control and care.[38] Further, FCMP was a pilot program rather than a permanent, codified shift in the US approach to immigration detention, which is essential for ATD programs to be consistently implemented rather than subject to political discretion.

Nevertheless, the US experimentation with services-based ATDs—and the demonstrated success of other countries that have adopted ATDs on a large-scale, permanent basis—illustrates the feasibility of replacing the current detention-oriented system with one that prioritizes migrants' health and humanity. Reappropriating ICE's budget to comprehensive, social services–based ATDs would improve migrants' health and protect their dignity, while benefiting society more broadly by preserving family and community bonds and reducing the threats to public health created by detention.

RECOMMENDATIONS

The United States must permanently improve its migration policies to adhere to international human rights standards and limit its unnecessarily punitive, harsh treatment of migrants. The US government's detention of children and adults solely because of their migration status is not only inhumane, detrimental to public health, inconsistent with international law, and widely condemned by the global community but also ineffective as an immigration deterrence tactic.[39] Improving policies to shift the focus from detention to ATD programs will reduce the risk of COVID-19 and other infectious diseases spreading among detainees and the wider population, protect essential human rights, and end the costly and ineffective immigration detention system.

Specific considerations about how to design effective, human rights–centered ATDs warrant comprehensive analysis informed by both rigorous research and the experiences of affected communities. As a foundation, however, ATDs should prioritize the dignity, humanity, and fundamental needs of migrants, including by ensuring family unity, restricting movement only as absolutely necessary, and providing referrals to legal and social services. For the many migrants with families or established bonds and responsibilities in the United States, a comprehensive ATD would include being released to their homes, subject to noninvasive requirements for regular reporting to immigration caseworkers. Moreover, strong protections must be in place to safeguard migrants' basic due process rights, including the rights to a hearing and judicial review of decisions about their status. Notably, past research has shown that ATDs that center migrants' humanity not only are more likely to uphold human rights standards but also result in higher levels of compliance by participants.[25]

Further, although protecting migrants' health, access to education, and basic liberties are human rights imperatives, the benefits extend to our society more broadly. Conversely, violating these rights ultimately affects us all. COVID-19 has demonstrated this acutely: in addition to the more than 8700 detainees who have tested positive for the virus, nearly 1000 workers at immigration detention facilities had confirmed cases of COVID-19 as of July 2020,[40] increasing the risk of infection among their own families and entire communities. (These numbers are likely far higher now, but a lack of transparency limits the availability of reliable statistics.) If we fail to ensure the health, safety, and fundamental needs of migrants to the United States—a responsibility shown to be irreconcilable with immigration detention—we will likewise fail to create a healthy, thriving society that upholds human rights standards for all.

HEALTH AND HUMAN RIGHTS

COVID-19 has laid bare the vast structural discrimination that persists in the United States and its impacts on health disparities. These inequalities are on full display in the US immigration system, which has subjected thousands of migrant children and adults to deplorable conditions and unacceptable health risks in its detention centers. Federal actions undertaken in the first month of the Biden administration, including DHS's suspension of the Remain in Mexico policy that banned asylum seekers from entering the United States, signal a potential shift toward more humane immigration policies, but immigration officers still hold considerable discretion over who is detained and subject to the DHS's ongoing deportations. To respect health and human rights more broadly, our immigration system requires a paradigm shift that necessitates, among other changes, the abandonment of immigration detention. The US detention of migrant children and adults violated international human rights treaties before COVID-19 and will continue to do so after the pandemic ends unless our policymakers correct course by enacting and implementing supportive, safe, and effective alternatives.

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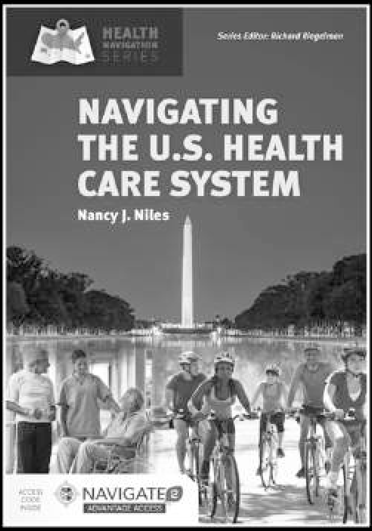

Disruptions to Abortion Care in Louisiana During Early Months of the COVID-19 Pandemic

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See also Coleman-Minahan, p. 1379, and Galea and Vaughan, p. 1398.

Objectives. To examine changes in abortions in Louisiana before and after the COVID-19 pandemic onset and assess whether variations in abortion service availability during this time might explain observed changes.

Methods. We collected monthly service data from abortion clinics in Louisiana and neighboring states among Louisiana residents (January 2018–May 2020) and assessed changes in abortions following pandemic onset. We conducted mystery client calls to 30 abortion clinics in Louisiana and neighboring states (April–July 2020) and examined the percentage of open and scheduling clinics and median waits.

Results. The number of abortions per month among Louisiana residents in Louisiana clinics decreased 31% (incidence rate ratio = 0.69; 95% confidence interval [CI] = 0.59, 0.79) from before to after pandemic onset, while the odds of having a second-trimester abortion increased (adjusted odds ratio [AOR] = 1.91; 95% CI = 1.10, 3.33). The decrease was not offset by an increase in out-of-state abortions. In Louisiana, only 1 or 2 (of 3) clinics were open (with a median wait > 2 weeks) through early May.

Conclusions. The COVID-19 pandemic onset was associated with a significant decrease in the number of abortions and increase in the proportion of abortions provided in the second trimester among Louisiana residents. These changes followed service disruptions. (*Am J Public Health*. 2021;111(8):1504–1512. https://doi.org/10.2105/AJPH.2021.306284)

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The COVID-19 pandemic has had clear direct effects on people's health.[1] Yet, pandemics can also have an impact on the health of populations indirectly.[2] For example, pandemics can disrupt health care delivery systems and use of health services, thereby indirectly affecting health.[3–6] Research to date on indirect effects of the COVID-19 pandemic has focused on changes in primary care utilization[7] and care disruptions for infectious diseases such as HIV and tuberculosis and for childhood vaccination.[8–11] Research also indicates that people were experiencing scheduling and financial barriers to reproductive health services because of the COVID-19 pandemic, including delays to care or canceled appointments in addition to concerns about ability to afford contraceptive methods.[12]

The COVID-19 pandemic may have influenced availability and use of abortion care, in particular. Commentaries have focused on state designations of abortion as a nonessential service in Texas and several other US states in March and April 2020.[13–15] Less research has focused empirically on changes in number, type, and timing of abortions during the pandemic. One study explored experiences of 103 independent abortion clinics in the early months of the pandemic.[16] This study showed that, while clinics in all regions were affected by the pandemic and by general public health responses to the pandemic, more facilities in the South and Midwest temporarily closed, canceled, or postponed abortion services.[16] Another study found a 27% increase in the rate of medication abortion requests to an online provider, with statistically significant increases in Louisiana, among other states.[17] This suggests a decrease in availability of clinic-based abortions or other barriers to obtaining facility-based abortion care. A study in Texas examined changes in number and timing of abortions during the period Texas designated abortion a nonessential service. This study showed that the number of abortions in Texas decreased and the number of Texas residents obtaining abortions in neighboring states increased.[18]

It is not yet known, though, whether other states experienced changes in number and timing of abortions following pandemic onset. This information is important, as previous research suggests that multiple factors—including pandemic-related abortion bans, preexisting restrictive abortion policies, the pandemic itself (i.e., clinicians and staff getting sick), and general public health responses to the pandemic—have contributed to disruptions in the abortion care delivery system.[16] Examining whether other states have experienced changes in abortions is especially relevant in light of a January 2021 US Supreme Court ruling that reinstated a prohibition on mailing medication abortion pills. In this case, the federal government cited data from 2 states that indicated that the number of total abortions had increased during the pandemic and thus argued that access to abortion had not been limited.[19]

Examining changes in abortions in Louisiana during the COVID-19 pandemic can help answer outstanding questions regarding whether and where the number and timing of abortions changed during the early months of the pandemic. Focusing on Louisiana is relevant, as Louisiana was an early COVID-19 hotspot.[20] Also, while Louisiana did not officially designate abortion a nonessential service,[21] Louisiana's official statement about which health facilities were deemed essential (in effect from March 21–May 1, 2020)[14] was ambiguously worded[22] and, thus, may have resulted in service disruptions as abortion clinics navigated their legal rights to remain open.

Documenting changes in the number, type, and timing of abortions is vital to better understand the pandemic's indirect health impacts. Such measures are important, as being unable to obtain a wanted abortion has significant adverse consequences on the health and well-being of women, children, and families,[23-26] and, although second-trimester abortion is very safe, delays in abortion care can increase risk of complications.[27,28] Risks associated with continuing an unwanted pregnancy may also be especially relevant during the pandemic.[29-34] As a way to reduce risks from in-person contact during the pandemic, many professional health associations have endorsed innovations in medication abortion delivery that eliminate clinic visits.[35,36] Thus, the relative proportion of each abortion method may shift during the pandemic.

We examined changes in abortions among Louisiana residents in the early months of the COVID-19 pandemic compared with previous years, as well as changes in abortion service availability. Specifically, we aimed to (1) examine changes in number, type, and timing of abortions among Louisiana residents from before to during the early months of the pandemic and (2) describe availability of abortion services in Louisiana and 3 neighboring states during the early months of the pandemic to explore whether variations in abortion service availability in these states might explain any observed changes in abortions.

METHODS

We obtained data on all abortions provided in Louisiana's 3 abortion clinics between January 1, 2018, and May 31, 2020, as part of data collection for a separate study. University of California, San Francisco, research assistants abstracted data from the Induced Termination of Pregnancy (ITOP) forms that the state of Louisiana requires for all abortions provided in Louisiana. We also obtained monthly data on abortions provided to Louisiana residents at all clinics in Arkansas and Mississippi and at 17 of 24 open facilities in Texas, which provided 93% of all abortions in Texas.[37] Arkansas, Mississippi, and Texas facilities provided the study team with information on Louisiana residents obtaining care at their location between September 2018 and May 2020, based on their administrative records.

We obtained data on whether abortion clinics were open and scheduling abortion appointments through mystery calls to all publicly advertised clinics[38] between April 2, 2020, and July 8, 2020, in Louisiana and 3 neighboring states (Arkansas, Mississippi, and Texas) where we anticipated Louisiana residents might obtain abortions. The University of California, San Francisco, study team made calls weekly in April and biweekly in May and early June, and placed final calls the first week of July. For each week of calls, research assistants called each clinic up to 3 times over 3 consecutive days or until successful contact was made (whichever occurred first) between 9 AM and 5 PM in that clinic's time zone. A similar protocol was used for Texas clinics, although precise timing of calls differed; another study team was already conducting a mystery call study in Texas, and we did not want to burden Texas clinics with duplicate efforts.

Measures

Abortion data from Louisiana and neighboring states included 3 outcomes: (1) total abortions was the number of abortions provided per month, (2) medication abortion was the number of medication abortions (vs other types of abortion) per month, and (3) trimester was the number of abortions provided in the second versus first trimester (≥ 12 weeks vs < 12 weeks) per month.

We created additional variables for analyses. COVID-19 pandemic was a dichotomous variable identifying whether the abortion was provided before versus after pandemic onset. We used March 2020 as pandemic onset for total abortions and medication abortion analyses, as March was when the first shelter-in-place orders were imposed.[39] We used April 2020 for trimester analyses to allow time for the delay to appear. Time was continuous of months beginning in January 2018. Postpandemic onset time was 0 for months January 2018 through February 2020 and continuous (1, 2, 3) beginning March 2020, delayed by 1 month for trimester analyses. Season was a categorical variable of which quarter (January–March, April–June, July–September, October–December) the abortion occurred to account for seasonal trends in abortion.[40]

Mystery client data included the following variables: Open and scheduling was a dichotomous variable of whether a clinic was open and scheduling appointments versus whether a clinic was either closed or open but not scheduling appointments. If a clinic did not answer after 3 call attempts, a clinic was considered closed or not scheduling. Wait time was a continuous variable of number of days to the clinic's next available preabortion consultation visit required by the state. Abortion type was a categorical variable of types of first-trimester abortions the clinic was providing (medication abortion only, aspiration abortion only, or both).

Analysis

We first examined abortion data descriptively to compare numbers of abortions and percentages of second-trimester and of medication abortions across years and across comparative months of March to May in 2018, 2019, and 2020. We then analyzed abortion data by using segmented regression, a method for interrupted time-series analyses,[41] using generalized linear models with Poisson link functions for count data (i.e., total abortions) and logit link for binary data of medication and second-trimester abortions. The goal of the modeling was to assess whether there was a change in abortions at pandemic onset and then whether the trend in abortions changed after pandemic onset. In each case, we first estimated a regression model with only the main predictor of COVID-19 pandemic and the relevant outcome (e.g., number of abortions per month) over the 29-month study period. We then included variables for time and for postpandemic onset time and, in a separate model, then added the variable for season. Final segmented regression models included COVID-19 pandemic, time, postpandemic time, and season. We also assessed whether findings varied if we removed the season variable and allowed for a 1-month autocorrelation. Findings were substantively similar when we used this alternative modeling approach.

Primary analyses focused on abortions among Louisiana residents in Louisiana clinics. Secondary analyses focused on abortions among Louisiana residents in Louisiana clinics and in clinics in neighboring states of Arkansas, Mississippi, and Texas. We used the postestimation margins commands in Stata version 15 (StataCorp LP, College Station, TX) to obtain predictions of changes in outcomes, and used the predict command to graph relevant output by month, adjusting for seasonality. Then, using the mystery call data, we computed the proportion of clinics that were open and scheduling and the proportion offering different types of first-trimester abortion (medication or aspiration), as well as median and range of wait times. S. C. M. R. and N. F. B. conducted analyses.

RESULTS

There were 6419 abortions among Louisiana residents at Louisiana clinics in 2018 and 6612 in 2019. Comparing the 3-month period March through May across years, there were 1832 abortions in 2018, 1816 in 2019, and 1426 in 2020. Segmented regression indicated a 31% decrease in total abortions at pandemic onset (COVID-19 pandemic incidence rate ratio [IRR] = 0.69; 95% confidence interval [CI] = 0.59, 0.79; $P < .001$). The model adjusted mean number of abortions was 558 abortions per month before pandemic onset and 382 abortions per month in the 3 months following. Total abortions increased from March through May 2020 (postpandemic onset time IRR = 1.08; 95% CI = 1.01, 1.15; $P = .03$; Figure 1 and Table 1).

In 2018 and 2019, 42% of abortions among Louisiana residents in Louisiana clinics were medication abortions. Comparing the March-through-May

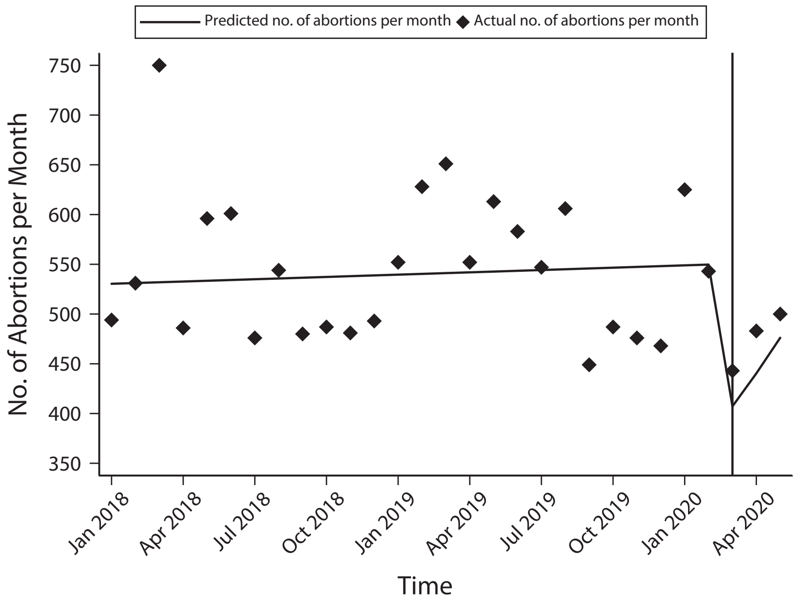

FIGURE 1— Actual and Predicted Number of Abortions Among Louisiana Residents in Louisiana Clinics per Month: January 2018–May 2020

Note. Vertical line indicates March 2020. The black trend line reflects the predicted values at the average season.

period across years, 43% of abortions were medication abortions in 2018 and 2019, and 31% in 2020. Using segmented regression, this difference was statistically significant (COVID-19 pandemic adjusted odds ratio [AOR] = 0.61; 95% CI = 0.44, 0.84; $P = .003$).

In 2018 and 2019, 11% to 12% of abortions among Louisiana residents in Louisiana clinics were in the second trimester. When we compared the April-through-May period across years, 10% of abortions were in the second trimester in 2018 and 2019 and 17% in 2020. In April through May 2018, there were 974 first-trimester and 107 second-trimester abortions; in April through May 2019, there were 1039 first-trimester and 119 second-trimester abortions; and in April through May 2020, there were 818 first-trimester and 163 second-trimester abortions. When we used segmented regression, there were higher odds of an abortion occurring in the second trimester after (vs before) April 2020 (COVID-19 pandemic AOR = 1.91; 95% CI = 1.10, 3.33; $P = .02$).

Analyses of the number, timing, and type of abortions among Louisiana residents at Arkansas, Louisiana, Mississippi, and Texas clinics September 2018 through May 2020 showed similar results (Table A, available as a supplement to the online version of this article at http://www.ajph.org). That the findings for Louisiana residents in Louisiana plus neighboring states were consistent with the main analyses reflects the lack of underlying change in the number of Louisiana residents obtaining abortions in Arkansas, Mississippi, and Texas (209 in March–May 2019 and 193 in March–May 2020).

Abortion Service Availability

In early April 2020, 33% of the 30 abortion clinics were open and scheduling abortion appointments, with a median wait of 7 days (range = 0–27). By the end of April, this increased to 67%, with a median wait of 10.5 days (range = 3–19). These measures remained relatively steady through July (Table 2). During the first 3 weeks of April, most open and scheduling clinics (range = 70%–80%) offered only medication abortion, while remaining clinics offered both medication and aspiration abortions. By the last week of April, the proportion of open and scheduling clinics offering only medication abortion had decreased to 50% and, by early May, had decreased to 27%; this remained relatively steady through July. Only 1 clinic in June and 1 in July offered aspiration abortion only (not shown).

Service availability varied across states. In Arkansas and Mississippi, all clinics were open and scheduling for nearly the entire study period. In Louisiana and Texas, fewer than half of clinics were open and scheduling at multiple time points. In Louisiana, typically 1 or 2 of the state's 3 clinics were open and scheduling in March, April, May, and July. In Texas, while fewer than half of clinics were open and scheduling in April, most were open by May. Similarly, median wait times varied by state. The median wait in Louisiana was greater than 2 weeks through the beginning of May; median waits in Arkansas and Mississippi were typically greater than 1 week; median waits in Texas were approximately 1 week. By contrast with clinics in other states, Louisiana clinics provided both medication and aspiration abortion when they were open and scheduling throughout the study time period.

Posthoc Analysis of Medication Abortion

That the proportion of medication abortions decreased after pandemic onset appeared counterintuitive given that mystery calls indicated that the majority of clinics were providing

TABLE 1— Segmented Regressions Predicting Changes in the Total Number, Timing, and Type of Abortions Related to the COVID-19 Pandemic Among Louisiana Residents Obtaining Care in Louisiana: January 2018–May 2020

	Total Abortions, IRR[a] (95% CI)	Medication Abortions, AOR (95% CI)	Second-Trimester Abortions,[b] AOR (95% CI)
COVID-19 pandemic[c]	0.69 (0.59, 0.79)	0.61 (0.44, 0.84)	1.91 (1.10, 3.33)
Time	1.00 (1.00, 1.00)	1.00 (1.00, 1.01)	1.00 (0.99, 1.01)
Postpandemic onset time	1.08 (1.01, 1.15)	0.96 (0.83, 1.11)	0.95 (0.68, 1.32)
Season			
Jan–Mar (Ref)	1	1	1
Apr–Jun	0.96 (0.92, 1.01)	1.49 (1.36, 1.63)	0.71 (0.62, 0.81)
Jul–Sep	0.87 (0.83, 0.91)	1.36 (1.24, 1.49)	0.87 (0.76, 1.00)
Oct–Dec	0.80 (0.77, 0.84)	1.30 (1.18, 1.43)	0.81 (0.71, 0.94)

Note. AOR = adjusted odds ratio; CI = confidence interval; IRR = incidence rate ratio.

[a] The analysis of total abortions was assessed using Poisson models, generating IRRs. The analyses of second-trimester and medication abortions were assessed with logistic regression models, generating AORs.

[b] Analyses for change in second-trimester abortions used before versus after April 2020 for the designation of COVID-19 pandemic and postpandemic time, whereas analyses for change in total abortions and medication abortions used before versus after March 2020.

[c] COVID-19 pandemic designates whether the abortion was provided before or after the onset of the COVID-19 pandemic; time refers to months since January 2018; postpandemic time refers to months after the onset of the pandemic.

medication abortion only in the first months following pandemic onset. A posthoc exploration of changes in total abortions and medication abortions at Louisiana clinics found the decrease in abortions was concentrated among 2 clinics, where there was a 42% decrease in abortions. By contrast, the third clinic (which was the only one open and scheduling at all mystery call time points) had a 17% increase in abortions. Unlike most other clinics in the sample, this clinic provided both aspiration and medication abortions throughout the mystery call period. In the 2 clinics where the reduction in total abortions was concentrated, more than half of abortions in 2018 and 2019 were medication abortions, whereas in the clinic that remained open and scheduling and saw the increase in abortions, only 12% of abortions in 2018 and 2019 were medication abortions. Rather than indicating a decrease in medication abortions within clinics, the data indicate a shift in where Louisiana residents obtained care in the early months of the pandemic (i.e., more obtained care at the single clinic that typically provided more aspiration than medication abortions).

DISCUSSION

This study showed that onset of the COVID-19 pandemic was associated with a 31% reduction in the number of abortions in Louisiana and an increase in the proportion of abortions provided in the second trimester. This pattern of findings is similar to changes observed in Texas.[18] These findings indicate that changes in the number and timing of abortions during the pandemic occurred not only because of an explicit executive order ban in Texas but also in the context of an ambiguously worded executive order in an early pandemic hotspot. By contrast with the Texas study,[18] however, we did not observe a corresponding increase in clinic-based abortions among Louisiana residents in neighboring states, nor did we observe a rapid increase in the number of abortions in May after Louisiana's executive order was no longer in effect. Future research should examine whether other states in different abortion-policy and COVID-19 contexts experienced similar changes in abortion in the early months of the pandemic.

Previous research has shown that most abortion clinics continued to provide abortion care in the early months of the pandemic, with more service disruptions occurring in the Midwest and South.[16] This study echoes those findings, as it highlights significant service disruptions in Louisiana and neighboring states. Mystery call data indicate that Louisiana and Texas abortion clinics experienced more notable disruptions than clinics in Arkansas and Mississippi. While the service delivery system in Texas rebounded by May when the state's executive order ban ended,[42] disruptions persisted in Louisiana until July. As the changes in number and timing of abortions in Louisiana followed these service disruptions in March through May 2020, changes in number and timing of abortions in Louisiana may also have persisted beyond May 2020; this should be examined in future research.

In April, most clinics we called reported offering only medication abortion, consistent with other research,[16] although this was not the case in Louisiana where open clinics consistently offered both medication and aspiration abortion. That most of the clinics in Arkansas,

TABLE 2— Open Clinics and Waiting Time for an Abortion Appointment by State and by Week: Arkansas, Louisiana, Mississippi, and Texas, April–July 2020

	No. of Clinics in State	% (No.), Median (Range), or %							
		Apr 2	Apr 9	Apr 16	Apr 23	May 7	May 21	Jun 4	Jul 2
% open and scheduling (no. of open clinics)									
AR	2	50 (1)	100 (2)	100 (2)	100 (2)	100 (2)	100 (2)	100 (2)	100 (2)
LA	3	33 (1)	33 (1)	67 (2)	33 (1)	67 (2)	33 (1)	100 (3)	33 (1)
MS	1	100 (1)	100 (1)	100 (1)	100 (1)	100 (1)	100 (1)	100 (1)	100 (1)
TX[a]	24	29 (7)	25 (6)	38 (9)	. . .	88 (21)	. . .	75 (18)	71 (17)
Total	30	33 (10)	33 (10)	47 (14)	67[a] (4)	87 (26)	67[a] (4)	80 (24)	70 (21)
Median wait time in days at open and scheduling clinics									
AR		7 (7–7)	12 (10–14)	10 (7–13)	10 (3–17)	14 (7–21)	13 (5–20)	3 (1–5)	8 (6–9)
LA		19 (19–19)	21 (21–21)	22 (19–24)	19 (19–19)	16 (12–20)	8 (8–8)	12 (9–12)	8 (8–8)
MS		4 (4–4)	12 (12–12)	7 (7–7)	4 (4–4)	9 (9–9)	13 (13–13)	13 (13–13)	17 (17–17)
TX[a]		7 (0–27)	8 (0–23)	3 (1–25)	. . .	8 (0–21)	. . .	6 (1–13)	6 (0–20)
Total		7 (0–27)	12 (0–23)	6 (1–25)	10.5[a] (3–19)	8 (0–21)	10.5[a] (5–20)	6 (1–13)	6 (0–20)
% of open and scheduling clinics providing only medication abortion									
AR		0	100	50	100	50	50	50	50
LA		0	0	0	0	0	0	0	0
MS		0	0	100	0	0	0	0	0
TX[a]		100	100	100	. . .	29	. . .	28	18
Total		70	80	79	50[a]	27	25[a]	25	19

[a] Calls in Texas were not made during the weeks of Apr 23 and May 21, so the denominator is 6 in those weeks.

Mississippi, and Texas offered only medication abortion in April underscores the ongoing importance of medication abortion in the abortion care delivery system, particularly when limiting in-person contact is key. During the pandemic, a federal judicial ruling temporarily allowed clinicians to provide medication abortion by telemedicine and mail medications directly to patients.[43] This was not possible, however, in states with laws that ban telemedicine for abortion care, such as the states in this study.[44] Our posthoc analyses indicate that decreases in medication abortion among Louisiana residents may be attributable to a shift in the clinics where people obtained care during the pandemic; more Louisiana residents obtained care at a clinic that had historically provided fewer medication abortions.

There are health implications of the decreased number of abortions associated with pandemic onset. People unable to obtain clinic-based abortions postpone seeking abortion; attempt to self-manage their abortions, which may put them at legal risk[17,45]; or continue their pregnancies, which increases risks of adverse health outcomes.[23–26] Other research indicates that the number Louisiana residents making online self-managed abortion requests to 1 online provider increased in the early weeks of the pandemic, although not by the same amount facility-based abortions decreased.[17] While research is needed to assess precise increases in births attributable to people being unable to obtain abortions in Louisiana, findings suggest we might see such an increase. Thus, the COVID-19 pandemic may have indirect effects on maternal and child health in Louisiana.

There are 2 larger implications. First, our findings indicate that, as with other forms of health care,[6] the pandemic was associated with reductions in availability and use of abortion services. One explanation is that the Louisiana health department released an order that was ambiguous regarding whether abortion was considered an essential service.[14,46] This order may have contributed to declines in availability as clinics explored whether they could remain open, suggesting that abortion services can be disrupted without outright bans. Another explanation is that Louisiana was an early hotspot in terms of number of COVID-19 cases.[16] This context could have influenced availability and use of abortion services directly through providers and patients becoming sick or through general public health responses that affected transportation and caregiving infrastructure, as has been documented elsewhere.[16] That this disruption persisted in Louisiana through July suggests that the ambiguously worded order may have had a lasting impact on availability of abortion services in Louisiana and also that the pandemic and general public health responses may have continued to influence the ability of Louisiana clinics to provide abortion care. The latter explanation would indicate an ongoing need for policies that make delivery of medication abortion without an in-person visit easier and for including abortion providers in emergency response planning. Future research should seek to understand whether and which pandemic-specific versus pre-existing policies have been the biggest barriers to abortion care during the pandemic.

Second, as mystery call data indicate, clinics can be "in between"[46] open and closed[47]; they may remain open yet have long waits or may not offer all types of abortion. It is important for research to use more complex measures of abortion service availability than traditional metrics such as the number of counties with an abortion clinic.[48]

Limitations

There are limitations. First, we only had data on the number of abortions in the 3 months after pandemic onset and thus cannot assess whether or when the number of abortions returned to prepandemic levels. However, focusing on March through May 2020 means most people having abortions likely became pregnant either before or soon after pandemic onset, when it was not yet clear how long the pandemic would last. Thus, abortion numbers from March through May 2020 are less likely to be influenced by pandemic-related influences on contraception access and childbearing intentions and may be more easily attributable to variations in abortion service availability during this time. In addition, the recent Texas study used this same time period.[18] Second, we do not have mystery call data before April 2020, and mystery call data from Texas were obtained on a different timeline. Third, Louisiana residents could have traveled to other states; if so, we overestimated the decrease in abortions among Louisiana residents. However, this would mean that Louisiana residents would have had to dramatically increase their distance traveled, as nearly three fourths of Louisiana residents of reproductive age live more than 150 miles from the nearest out-of-state abortion clinic.[49]

Conclusions

While most abortion clinics remained open and continued to provide care during the first months of the COVID-19 pandemic, most Louisiana clinics did not. In Louisiana, a 31% decrease in the number of abortions and an increase in the proportion of abortions provided in the second trimester followed this service disruption. Thus, the COVID-19 pandemic has had indirect effects on abortion care, which may result in adverse maternal and child health outcomes moving forward. AJPH

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S. C. M. Roberts and K. White developed the idea for this analysis. N. F. Berglas conducted analyses of abortion data. S. C. M. Roberts conducted analyses of mystery call data. R. Schroeder and M. Lingwall collected abortion data and mystery call data. D. Grossman collected out-of-state abortion data. S. C. M. Roberts wrote the first draft of the article. All authors provided substantive feedback on the content of the article.

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CONFLICTS OF INTEREST

There are no conflicts of interest to report.

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The institutional review boards of the University of California, San Francisco, and University of Texas, Austin, granted ethical approval for this research.

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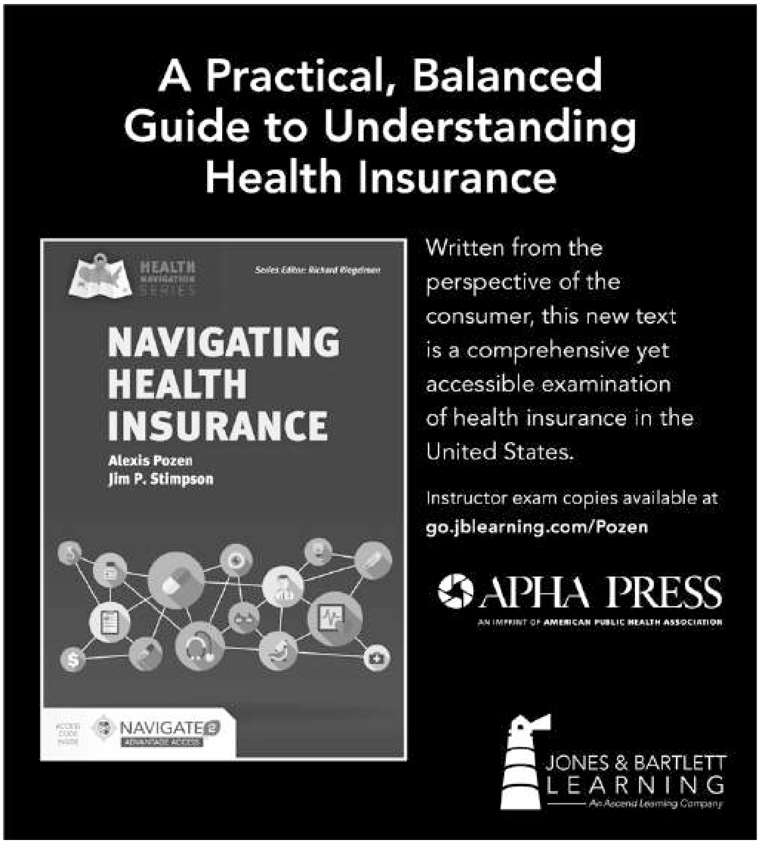

Pesticides Misused for Bed Bug Control: Comparing Professional and Nonprofessional Applications Reported to the National Pesticide Information Center, 2013–2017

April Strid, MS, Alicia Leytem, MS, Josean Perez, Kaci Buhl, MS, and Amy Cross, MS

Objectives. To compare outcomes when pesticides are used to control bed bugs by professionals and nonprofessionals.

Methods. All US National Pesticide Information Center inquiries from 2013 to 2017 were assessed to identify scenarios involving bed bugs and pesticide applications. Cases were evaluated with respect to types of applicators, misapplications, and human pesticide exposures.

Results. Misapplications were more than twice as likely to be reported in cases involving nonprofessional applications (14%) as in cases involving professional applications (5%). Human exposures to pesticides were reported more often when pesticides were misapplied (70%) than when there were no apparent misapplications (31%).

Conclusions. Both professionals and nonprofessionals may misuse pesticides to control bed bugs, which may increase the risks of exposure and adverse outcomes. Policy interventions may reduce pesticide incidents related to bed bug control by promoting professional involvement and adherence to product label instructions. (*Am J Public Health*. 2021;111(8):1513–1515. https://doi.org/10.2105/AJPH.2021.306307)

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The US Environmental Protection Agency considers bed bugs a pest of "significant public health importance," not because they are vectors for human pathogens but because infestations can exacerbate financial, mental, and physical problems.[1–3] Physical discomfort can include pain, itchiness, and allergic reactions. Reported effects on mental health include anxiety, sleep disruptions, and social isolation. The median cost of bed bug control in a single-family home was $1225 in 2015.[4] Patients have been denied health care treatment and access to public services as a result of the presence of bed bug infestations in their homes.[5] Tenants have been forced to pay for pest control in apartment buildings, which may have bed bug–related language in lease agreements. Several experts recommend hiring professionals (companies) to control bed bugs rather than attempting to do so oneself.

Pesticides should be applied strictly according to label directions. Although it is a violation of federal law to deviate from those directions, this occurs on a regular basis. Since 1995, people have relied on the National Pesticide Information Center (NPIC) for science-based information, helping them make decisions about pest control, health risks, regulations, and more. Pesticide specialists regularly note instances of pesticide applications for bed bug control that caused particular concern. Bed bugs live where people spend a great deal of time with limited protective clothing. Individuals who sleep in areas where pesticides are overapplied have repeated opportunities for absorption, aspiration, or ingestion.

Exposure to pesticides can result in a variety of outcomes, including symptoms that can be nonspecific and attributed to non-pesticide-related illnesses.[6] Possible symptoms vary greatly depending on location on the body, duration of exposure, and type of pesticide. As an example, pesticide poisoning can take the form of vomiting, sweating, pinpoint pupils, nausea, headache, weakness, dizziness, and other signs.[7]

In this study, we compared case reports collected by the NPIC to determine whether incidents (misapplications or human or animal exposures) were reported more often after applications by licensed professionals or by nonprofessionals.

METHODS

In an effort to compare outcomes when pesticides are used to control bed bugs by professionals and nonprofessionals, we analyzed records of NPIC calls and inquiries (hereafter "cases") related to bed bugs in a 5-year period (2013–2017). We reviewed each case ($n = 2946$) to determine whether there was a pesticide application and whether the application was completed by a professional or a nonprofessional. For each case, we tabulated adverse effects, misapplications, and spills. A professional applicator was defined as an applicator licensed by the appropriate local pesticide regulatory agency or tribe. An incident was defined as a misapplication, a spill, an unintended exposure, or an adverse effect involving a human or an animal.

RESULTS

We identified 792 pesticide applications (cases) for inclusion in this study: 510 cases involving a nonprofessional application and 282 cases involving a professional application. Nonprofessional pesticide applications for bed bugs were more likely to involve incidents (44%) than professional pesticide applications (34%; $\chi^2 = 5.9$; $df = 1$; $P = .01$). Also, they were more likely to involve misapplications (14% vs 5%; $\chi^2 = 14.6$; $df = 1$; $P = .001$). Human exposures occurred more often when a product was misapplied (70%) than when there were no apparent misapplications (31%; $\chi^2 = 50.4$; $df = 1$; $P < .001$). We noted requests for financial assistance to pay for bed bug control in 95 of 769 cases.

DISCUSSION

Professional pesticide applications for bed bug control involved fewer product misapplications and fewer instances of human exposures. However, about one third of professional applications were characterized as "incidents," meaning that there was an unintended exposure, a spill, or a misapplication (according to NPIC guidelines). As a result of selective underreporting of events to the NPIC, this likely overrepresents the proportion of cases involving incidents. However, the relatively high proportions of bed bug–related pesticide applications associated with adverse outcomes (34% of professional treatments and 44% of nonprofessional treatments) indicate a potential need for increased education, updated product labeling, or implementation of other strategies to reduce the unique risks associated with bed bugs. It should be noted that all inquiries to the NPIC are self-reported, and individuals may misremember or purposely provide misinformation for a variety of reasons.

Our data also demonstrated that hiring a professional pest control company may be cost-prohibitive. Requests for financial assistance to pay for bed bug control services likely underrepresent actual interest. This type of comment during NPIC inquiries may be secondary to other requests for pesticide information and is not always recorded in case logs.

PUBLIC HEALTH IMPLICATIONS

Federally required certification and licensing for pesticide applicators is intended to prevent product misuse and unintended human exposures. Our data suggest that regulatory licensing programs are successfully lowering risk, but there is room for improvement.

Policy interventions may reduce pesticide incidents related to bed bug control by promoting professional involvement and adherence to product label instructions. The relatively high number of instances of product misapplications in our data among both professionals and nonprofessionals suggests that public information campaigns could be initiated by pesticide manufacturers, statewide pesticide regulatory agencies, or state health agencies to educate users about the importance of following label instructions to reduce public health risks from pesticides.

Employing licensed professionals to control bed bug infestations may reduce the risk of human exposure and pesticide misapplication. Future research should focus on evaluating interventions designed to reduce the public health effects of bed bugs in community settings. AJPH

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Note. The information in this article does not in any way replace or supersede the restrictions, precautions, directions, or other information on pesticide labels or any other regulatory requirements, nor does it necessarily reflect the position of the Environmental Protection Agency.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to disclose.

HUMAN PARTICIPANT PROTECTION

No protocol approval was necessary for this study because no human participants were involved.

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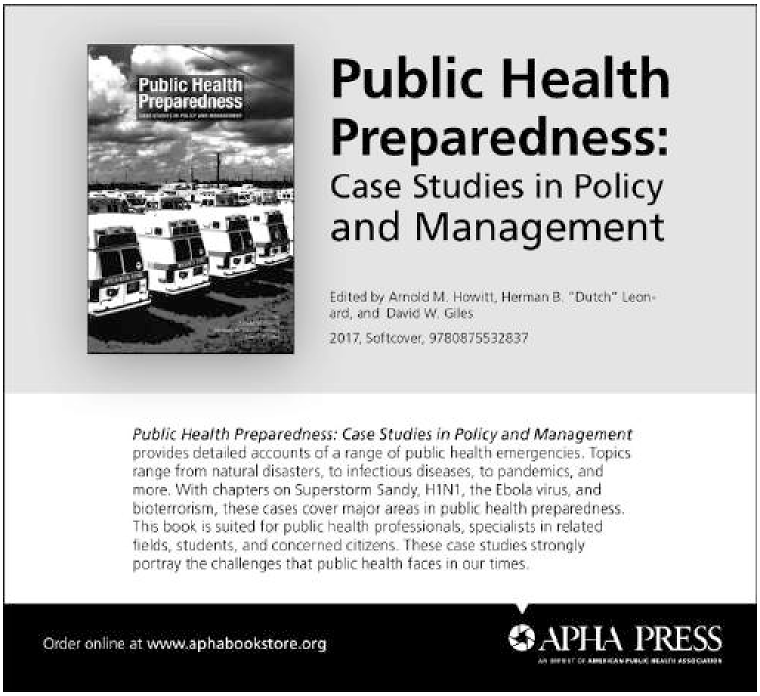

The Effect of Overdose Education and Naloxone Distribution: An Umbrella Review of Systematic Reviews

Amir Razaghizad, BSc, Sarah B. Windle, MPH, Kristian B. Filion, PhD, Genevieve Gore, MLIS, Irina Kudrina, MDCM, Elena Paraskevopoulos, MD, Jonathan Kimmelman, PhD, Marc O. Martel, PhD, and Mark J. Eisenberg, MD, MPH

See also Smart and Davis, p. 1382.

Background. Opioids contribute to more than 60 000 deaths annually in North America. While the expansion of overdose education and naloxone distribution (OEND) programs has been recommended in response to the opioid crisis, their effectiveness remains unclear.

Objectives. To conduct an umbrella review of systematic reviews to provide a broad-based conceptual scheme of the effect and feasibility of OEND and to identify areas for possible optimization.

Search Methods. We conducted the umbrella review of systematic reviews by searching PubMed, Embase, PsycINFO, Epistemonikos, the Cochrane Database of Systematic Reviews, and the reference lists of relevant articles. Briefly, an academic librarian used a 2-concept search, which included opioid subject headings and relevant keywords with a modified PubMed systematic review filter.

Selection Criteria. Eligible systematic reviews described comprehensive search strategies and inclusion and exclusion criteria, evaluated the quality or risk of bias of included studies, were published in English or French, and reported data relevant to either the safety or effectiveness of OEND programs, or optimal strategies for the management of opioid overdose with naloxone in out-of-hospital settings.

Data Collection and Analysis. Two reviewers independently extracted study characteristics and the quality of included reviews was assessed in duplicate with AMSTAR-2, a critical appraisal tool for systematic reviews. Review quality was rated critically low, low, moderate, or high based on 7 domains: protocol registration, literature search adequacy, exclusion criteria, risk of bias assessment, meta-analytical methods, result interpretation, and presence of publication bias. Summary tables were constructed, and confidence ratings were provided for each outcome by using a previously modified version of the Royal College of General Practitioners' clinical guidelines.

Main Results. Six systematic reviews containing 87 unique studies were included. We found that OEND programs produce long-term knowledge improvement regarding opioid overdose, improve participants' attitudes toward naloxone, provide sufficient training for participants to safely and effectively manage overdoses, and effectively reduce opioid-related mortality. High-concentration intranasal naloxone (> 2 mg/mL) was as effective as intramuscular naloxone at the same dose, whereas lower-concentration intranasal naloxone was less effective. Evidence was limited for other naloxone formulations, as well as the need for hospital transport after overdose reversal. The preponderance of evidence pertained persons who use heroin.

Author's Conclusions. Evidence suggests that OEND programs are effective for reducing opioid-related mortality; however, additional high-quality research is required to optimize program delivery.

Public Health Implications. Community-based OEND programs should be implemented widely in high-risk populations. (The full article is available online. *Am J Public Health*. 2021;111(8):1516–1517. https://doi.org/10.2105/AJPH.2021.306306)

PLAIN-LANGUAGE SUMMARY

Overdose education and naloxone distribution (OEND) programs are crucial for preventing opioid fatalities. These programs provide training to people likely to witness an overdose and deliver critical information about overdose prevention, recognition, and response. However, given the proliferation of ultrapotent synthetic opioids such as fentanyl in illicit drug supplies, uncertainties exist concerning optimal naloxone formulation and patient management. Furthermore, although several reviews on the impact of these programs have been published, evidence regarding the effectiveness of these programs and their impact on vital public health measures remains uncertain. Therefore, we synthesized 6 systematic reviews to provide a broad-based conceptual scheme of the effect and feasibility of OEND programs and to identify areas for possible optimization. We found unanimous evidence suggesting that OEND programs produce long-term knowledge improvements, improve participants' attitudes toward naloxone, provide sufficient training for participants to manage overdoses safely and effectively, and effectively reduce opioid-related mortality. We also found that high-concentration intranasal naloxone was as effective as intramuscular naloxone at the same dose, whereas lower-concentration intranasal naloxone was less effective. Most evidence concerned persons who use heroin. This study suggests that OEND programs effectively reduce opioid-related mortality and should be implemented widely in high-risk populations to prevent harm.

Disease-Specific Excess Mortality During the COVID-19 Pandemic: An Analysis of Weekly US Death Data for 2020

Dongshan Zhu, PhD, Akihiko Ozaki, PhD, and Salim S. Virani, PhD

See also Galea and Vaughan, p. 1398.

Objectives. To examine the disease-specific excess deaths during the COVID-19 pandemic in the United States.

Methods. We used weekly death data from the National Center for Health Statistics to analyze the trajectories of excess deaths from specific diseases in the United States during the COVID-19 pandemic, at the national level and in 4 states, from the first to 52nd week of 2020. We used the average weekly number of deaths in the previous 6 years (2014–2019) as baseline.

Results. Compared with the same week at baseline, the trajectory of number of excess deaths from cardiovascular disease (CVD) was highly parallel to the trajectory of the number of excess deaths related to COVID-19. The number of excess deaths from diabetes mellitus, influenza and respiratory diseases, and malignant neoplasms remained relatively stable over time.

Conclusions. The parallel trajectory of excess mortality from CVD and COVID-19 over time reflects the fact that essential health services for noncommunicable diseases were reduced or disrupted during the COVID-19 pandemic, and the severer the pandemic, the heavier the impact. (*Am J Public Health*. 2021;111(8): 1518–1522. https://doi.org/10.2105/AJPH.2021.306315)

In many countries, physical-distancing measures have been adopted to control the COVID-19 pandemic. These measures include stay-at-home orders, closing down mass public transportation systems, and placing restrictions on internal movement.[1] In addition, health care systems have had to adjust standard approaches to care in order to minimize risk to patients and health care personnel, and telehealth has been encouraged.[2] Finally, people with preexisting comorbidities have generally avoided hospitals through fear of contracting the virus. All of these have significantly affected the delivery of services for diagnosis, treatment, and management of noncommunicable diseases (NCDs) globally.[3,4] Hypertension services have been either partially or completely disrupted in 53% of countries, diabetes-related services in 49%, cancer-related services in 42%, and care related to cardiovascular diseases in 31%.[5]

We thus hypothesized that during the peak transmission phase of the COVID-19 pandemic (after March 11, 2020, the day the World Health Organization declared that COVID-19 was a pandemic), health services related to NCD management were disrupted or reduced to a certain extent. This in turn may have led to a higher number of deaths from NCDs. To study this, we assessed the weekly death data in the United States, at the national level and for 4 states, to analyze the trajectories of excess death from specific diseases during the COVID-19 pandemic.

METHODS

We obtained weekly US death data for the country and state level from the National Center for Health Statistics (NCHS).[6,7] We used weekly death data from the first to the 52nd week of 2020. According to the NCHS, data might be incomplete because of the lag in time between when the death occurred and when the death certificate was completed. The delay can range from 1 week to 8 weeks or more, and the more recent the week, the greater the number of delays.

We analyzed deaths from all causes, from natural causes, and disease-specific classifications of deaths (including COVID-19 in 2020). Disease-specific deaths include heart diseases (*International Classification of Diseases, Tenth Revision* [*ICD-10*; Geneva, Switzerland: World Health Organization; 1992] codes I00–I09, I11, I13, I20–I51), cerebrovascular diseases (I60–I69), diabetes mellitus (E10–E14), influenza and pneumonia (J10–J18), respiratory diseases (J40–J47, J00–J06, J30–J39, J67, J70–J98), malignant neoplasms (C00–C97), and unclassified deaths (symptoms, signs, and abnormal clinical and laboratory findings, not elsewhere classified, R00–R99). We combined heart diseases and cerebrovascular diseases as cardiovascular disease (CVD). We combined influenza, pneumonia, and respiratory diseases as influenza and respiratory diseases. In this analysis, we recorded deaths with COVID-19 as either an underlying or contributing cause as COVID-19–attributable death (U071).

We chose the average weekly deaths of the previous 6 years (2014–2019) as a baseline to calculate the excess of disease-specific deaths at the country level, and then at the state level (for California, Florida, Texas, and New York—states with the highest numbers of COVID-19 infections), compared with the same week in 2020. We plotted the trajectory of excess deaths of each disease-specific classification using SAS version 9.4 (SAS Institute, Cary, NC). We also plotted the number of weekly new cases of COVID-19 to understand the progress of the pandemic over time. In addition, we traced the governments' response timeline (regulations and recommendations) to the COVID-19 pandemic using the Oxford COVID-19 Government Response Tracker (released by the University of Oxford) to see the influence of the governments' response on the trajectories of excess mortality.[8,9]

RESULTS

Trajectories of disease-specific excess mortality data showed that at the country level (Figure 1), the excess deaths related to CVD and to influenza and respiratory diseases increased with the rise of excess deaths related to COVID-19 from week 12, and the first peak was at week 16. Compared with the baseline, the excess deaths from diabetes mellitus increased from week 12 to week 16, and it remained at about the same level after week 16. In addition, excess unclassified deaths in 2020 increased with time, and the more recent the week, the higher the number of deaths (Figure 1).

At the level of the 4 states, we found that the trajectory of excess deaths from CVD was highly synchronous with the trajectory of excess deaths related to COVID-19, especially in California (Figure 2a) and Florida (Figure 2b). In New York (Figure 3a) and Texas (Figure 3b), the excess deaths related to COVID-19 rose again from week 46, whereas the excess deaths from CVD remained stable or even decreased, which might be caused by the lag in time of death certificate issuance in recent weeks. Other disease-specific excess mortality (excess deaths from diabetes, influenza, and cancer) remained stable over time, although there was a slightly increased trend of unclassified excess deaths in California. The weekly new cases of COVID-19 in the United States and the 4 states are plotted in Figure 4. New York

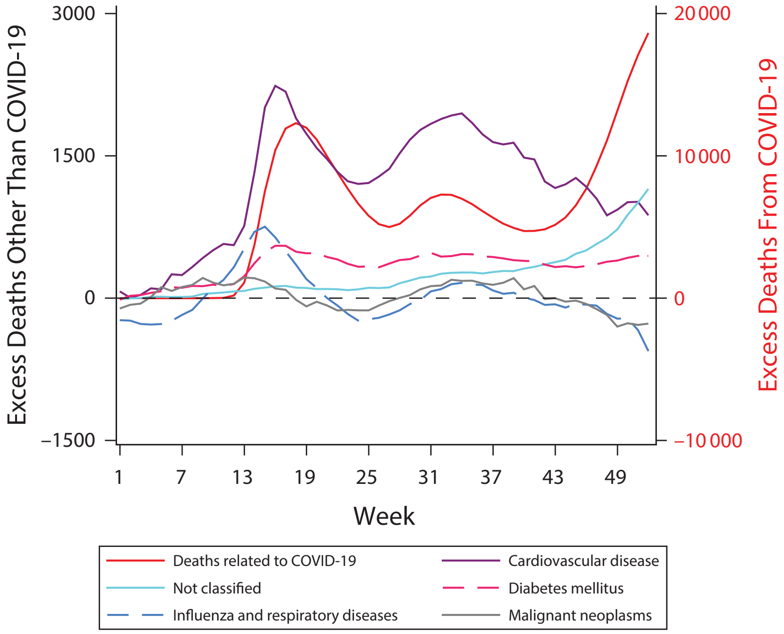

FIGURE 1— Trajectories of Disease-Specific Excess Deaths: United States, 2020

Note. The dashed line represents the baseline.

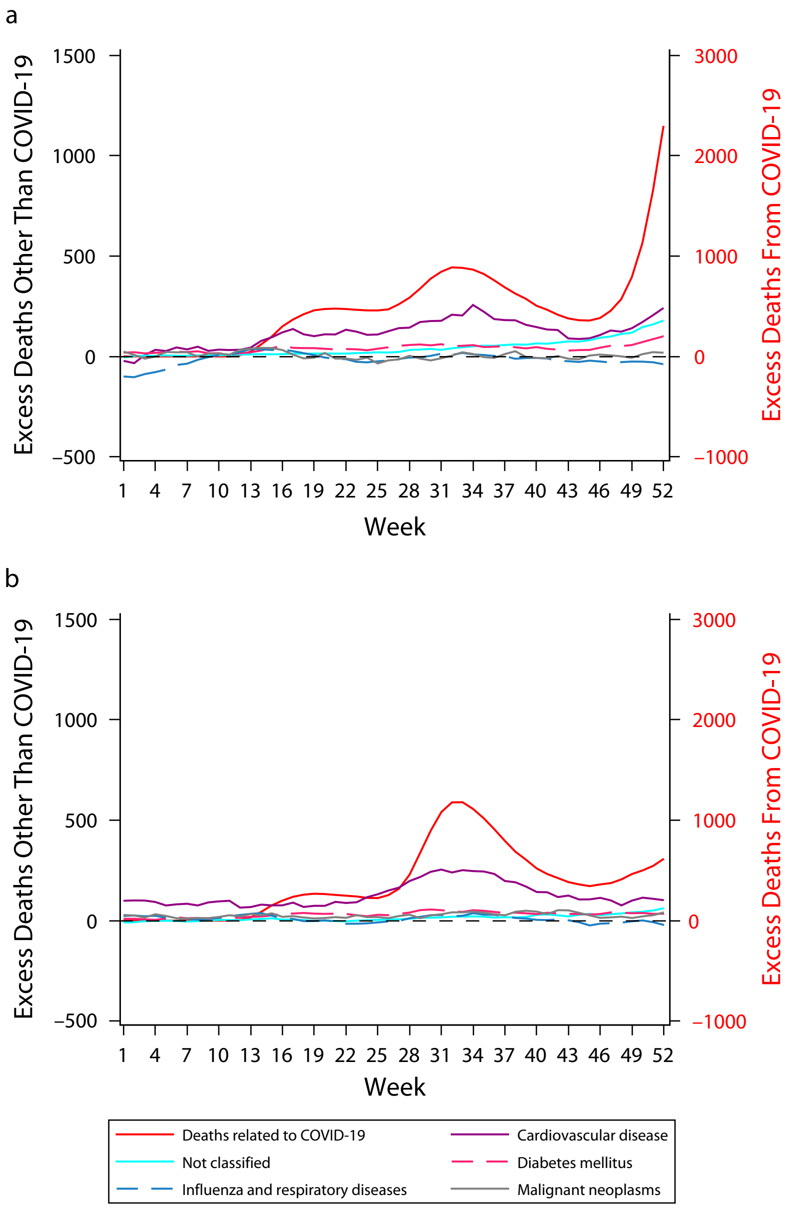

FIGURE 2— Trajectories of Disease-Specific Excess Deaths in (a) California and (b) Florida: 2020

Note. The dashed line represents the baseline.

was hit earlier by COVID-19 than the other 3 states (Figure 4).

After using the Oxford COVID-19 Government Response Tracker to trace governments' response to the COVID pandemic (Table A, available as a supplement to the online version of this article at http://www.ajph.org), we found that the 4 involved states all canceled public events in week 10 (March 11–12), implemented stay-at-home requirements in week 11 (March 15–21), and adopted restrictions on internal movement in week 12 (March 22–28).

DISCUSSION

Prior studies have shown that the severity of the COVID-19 pandemic is associated with the adoption of stringent measures as a response to the pandemic.[10] These measures can have an impact on access to and provision of services, and may increase vulnerability to poor outcomes among people with comorbid conditions. In the United States, the Department of Veterans Affairs reported that the number of inpatients for 6 potentially life-threatening diseases (including myocardial infarction and stroke) declined by 41.9% in the first week of the pandemic.[11] Also, one third or more of excess deaths were not related to COVID-19, but were from heart diseases, diabetes, and CVD.[4,12] Our study found that after week 11 (March 8–14, the beginning of the spread in the United States), excess deaths from CVD, diabetes, influenza, and respiratory diseases started to increase. The trajectories of excess deaths from CVD were highly in line with the trajectories of excess deaths related to COVID-19, either at the national level or in the 4 states.

The increased excess deaths from CVD and diabetes might be from several sources. First, in the early stage of the pandemic (before week 11), laboratory-confirmed cases only accounted for a small percentage of total cases.[13] Deaths from COVID-19 in the early-spread stage might have been classified as deaths from other diseases. Especially in elderly people, who are usually comorbid with multiple chronic diseases (e.g., CVD), deaths from COVID-19 in the early stage might have been classified as deaths from CVD. Our findings also support this misclassification in the early stage. In the national-level trajectories and in the trajectories of Florida and Texas, we found that the rise of excess deaths from CVD started earlier than the rise of excess deaths related to COVID-19. Second, there were deaths that might have been caused by COVID-19

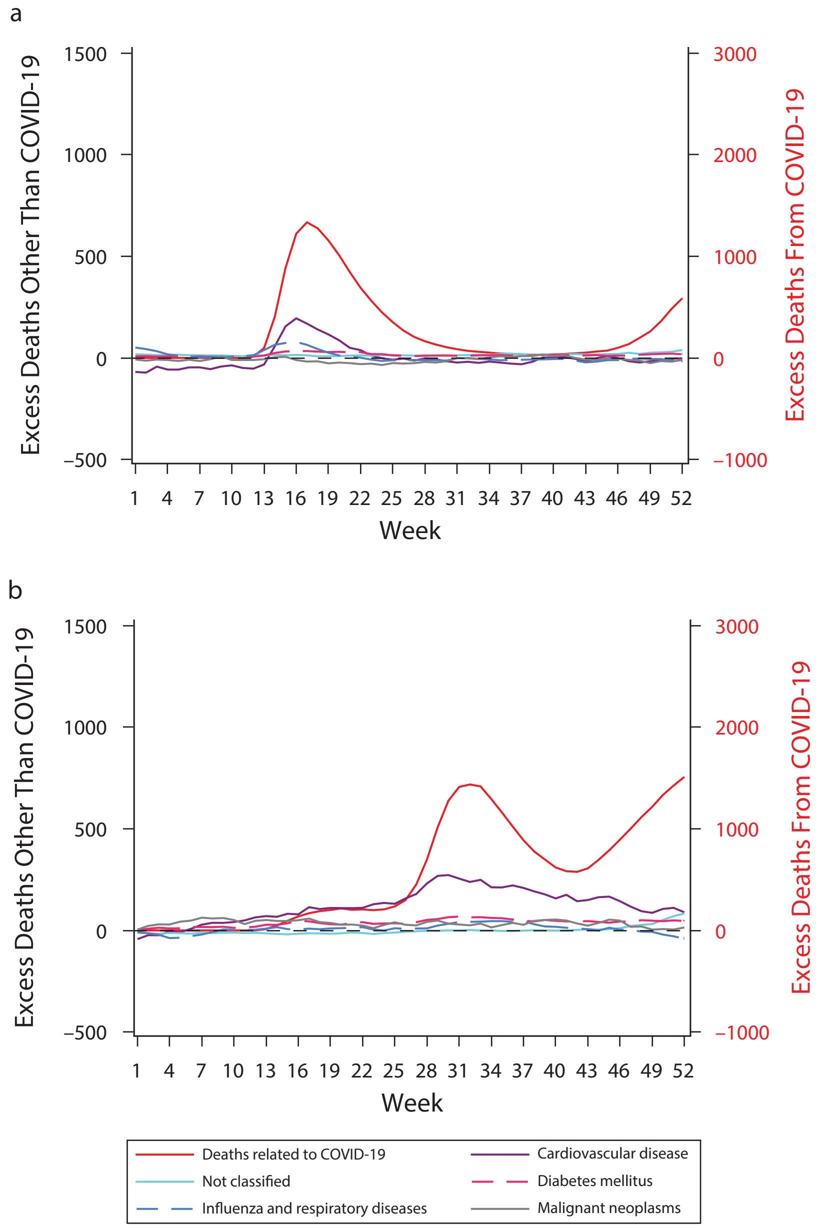

FIGURE 3— **Trajectories of Disease-Specific Excess Deaths in (a) New York and (b) Texas: 2020**

Note. The dashed line represents the baseline.

but were not ascertained. For example, people with COVID-19 who died at home or in nursing homes without being tested for COVID-19 might have been coded into other groups. Third, increased excess mortality from NCD might have been caused by disrupted or reduced services. As the pandemic continues, health care systems must balance the need to provide necessary services with minimizing the risk to patients and health care personnel. The reduction or disruption of services for screening and diagnosing NCDs, and patients' aversion to hospital visits, may have resulted in some patients dying from NCDs (e.g., acute myocardial infraction), whether or not they were diagnosed. This also explains why the trajectory of unclassified deaths increased at the national level: patients who died of NCDs without being diagnosed would be coded into unclassified. It is hard to determine how much each of these causes contributed to excess CVD deaths. This shows the challenges in quantifying excess deaths in the COVID-19 pandemic until more reliable data are available.

The full impact on excess mortality of the COVID-19 pandemic—and of the restrictions adopted to mitigate the risk of its spread—is yet to be fully understood. Because the 4 states all adopted the same measures at around the same time, the states' different trajectories may be mostly a result of the relative severity of the COVID-19 pandemic in each state. In the United States, the increasing excess deaths from CVD may indicate that the health service was disrupted during the pandemic. Globally, 58% of countries have adopted alternative strategies for continuing health services and 70% of countries have started collecting NCD data among COVID-19 patients.[14]

PUBLIC HEALTH IMPLICATIONS

Our results highlight the need to proactively plan on how to adjudicate causes of death in the event of a pandemic. From a public health standpoint, this may allow complete assessment of the impact of a pandemic and the associated increase in deaths from NCDs during a pandemic, thus linking together COVID-19 control strategies and NCD prevention to "build back better." AJPH

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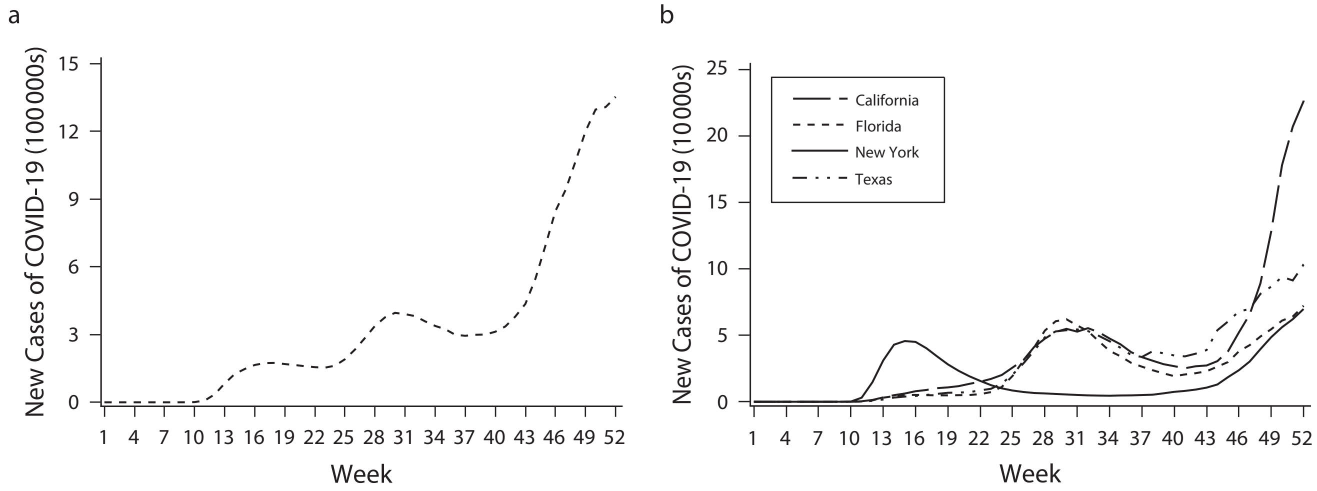

FIGURE 4— Weekly New Cases of COVID-19 in (a) the United States and (b) California, Florida, New York, and Texas: 2020

Public Health, Cheeloo College of Medicine, Shandong University, Jinan, and the NHC Key Lab of Health Economics and Policy Research (Shandong University), Jinan, China. Akihiko Ozaki is with the Department of Breast Surgery, Jyoban Hospital of Tokiwa Foundation, Fukushima, and the Medical Governance Research Institute, Tokyo, Japan. Salim S. Virani is with the Michael E. DeBakey VA Medical Center and Baylor College of Medicine, Houston, TX.

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CONTRIBUTORS

D. Zhu conceptualized the study, led the analysis, and drafted the article. A. Ozaki and S. S. Virani contributed to interpreting the results.

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CONFLICTS OF INTEREST

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HUMAN PARTICIPANT PROTECTION

Patients’ written informed consent was waived by the Ethics Committee of School of Public Health, Shandong University, based on the deidentified nature of the publicly available data in this study.

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Medicaid Expansion and Medical Debt: Evidence From Louisiana, 2014–2019

Kevin Callison, PhD, and Brigham Walker, PhD

See also Gee, p. 1385.

Objectives. To identify the association between Medicaid eligibility expansion and medical debt.

Methods. We used difference-in-differences design to compare changes in medical debt for those gaining coverage through Louisiana's Medicaid expansion with those in nonexpansion states. We matched individuals gaining Medicaid coverage because of Louisiana's Medicaid expansion (n = 196 556) to credit report data on medical debt and compared them with randomly selected credit reports of those living in Southern nonexpansion state zip codes with high rates of uninsurance (n = 973 674). The study spanned July 2014 through July 2019.

Results. One year after Louisiana Medicaid expansion, medical collections briefly rose before declining by 8.1 percentage points (95% confidence interval [CI] = –0.107, –0.055; $P \le .001$), or 13.5%, by the third postexpansion year. Balances also briefly rose before falling by 0.621 log points (95% CI = –0.817, –0.426; $P \le .001$), or 46.3%.

Conclusions. Louisiana's Medicaid expansion was associated with a reduction in the medical debt load for those gaining coverage. These results suggest that future Medicaid eligibility expansions may be associated with similar improvements in the financial well-being of enrollees. (*Am J Public Health*. 2021;111(8): 1523–1529. https://doi.org/10.2105/AJPH.2021.306316)

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On July 1, 2016, Louisiana became the 32nd state (including Washington, DC) to expand Medicaid eligibility to those earning at or below 138% of the federal poverty level in the year that eligibility is determined under the Affordable Care Act, as calculated by the Department of Health and Human Services. Before expansion, Medicaid coverage in Louisiana was limited to parents earning at or below 24% of the federal poverty level, pregnant women earning at or below 214% of the federal poverty level, and children in families earning at or below 255% of the federal poverty level. Nondisabled, childless adults were ineligible for Medicaid coverage.[1] By December 2018, more than 475 000 individuals had enrolled in Medicaid expansion in Louisiana, and the number of uninsured in the state had fallen by more than 50%.[2]

Gaining Medicaid coverage has been shown to improve access to care and increase the utilization of health services; however, the association between Medicaid coverage and financial health and security is less clear.[3–6] Early evidence suggesting medical debt contributed significantly to personal bankruptcy has been disputed, and estimates of the relationship between Medicaid coverage and medical debt have varied widely.[7,8] We provide the first evidence, to our knowledge, on the association, using de-identified credit report data linked to administrative enrollment records to compare individuals gaining coverage through Medicaid expansion in Louisiana to individuals in nonexpansion states. Three notable contributions of our study are as follows.

First, we examined changes in medical debt for those who actually gained Medicaid coverage as a result of expansion. Previous work has largely relied on survey data or simulated Medicaid eligibility measures to identify those likely to have gained coverage, potentially leading to measurement error in treatment exposure.[9] Second, we followed the medical debt load of those gaining Medicaid coverage under Louisiana's expansion for 2 years before and 3 years after expansion occurred. This is a significant improvement over earlier studies that relied on limited postperiod data.[8,10–13] As we show, the pattern of medical debt continues to evolve for several years after individuals in our sample gain coverage. Third, we compared changes in medical debt load for those gaining health insurance coverage under Louisiana's Medicaid expansion to similar individuals in nonexpansion states. Our inclusion of this control group improves the likelihood that our results are capturing changes in medical debt load associated with Medicaid expansion and not some unobserved confounding factor.

We found that Medicaid expansion in Louisiana was associated with a reduction in the medical debt burden of those gaining coverage and that the magnitude of the reduction grew over time. Before Medicaid expansion in Louisiana, nearly two thirds of those who would gain coverage had at least 1 outstanding medical debt reported to a collection agency, and nearly half carried a medical collection of $500 or more. By June 2019, 3 years after Medicaid expansion, the share of those gaining coverage with an outstanding medical collection had fallen by 13.5%, and the average balance of a medical collection had fallen by 46.5%. We also found large reductions in the average number of outstanding medical collections and collections with balances greater than $500 and balances greater than $1000. Our findings have direct implications for policymakers in the remaining nonexpansion states, the majority of which are also located in the Southern United States.

BACKGROUND

How medical debt contributes to household financial strain and the extent to which that strain is alleviated by gaining Medicaid coverage remain open questions. Between 20% and 60% of all personal bankruptcy filings have been attributed to a medical event,[7,14–17] and several studies have concluded that Medicaid expansion was associated with fewer bankruptcies.[10,11,18,19] Recent studies have also linked Medicaid eligibility to improved financial health, including fewer medical collections, payday loans, evictions, and unpaid bills.[3,8,10–13,20–23] However, a notable shortcoming of nearly all previous work is a reliance on probabilistic measures of Medicaid eligibility or self-reports of insurance coverage. Probabilistic eligibility, rather than actual Medicaid enrollment, has the potential to induce measurement error resulting in bias. Comparisons of survey responses on Medicaid coverage to administrative records have found error rates as high as 35%, underscoring the potential for significant measurement error in studies that rely on self-reports.[9]

Only 2 studies have used administrative Medicaid enrollment data matched to credit reports.[3,11] Results from the Oregon Health Insurance Experiment showed no effect of gaining Medicaid coverage on personal bankruptcies, tax liens, or judgments for unpaid bills, but indicated reductions in medical collections, money owed for medical expenses, and money borrowed to pay medical bills.[3] In a study that most closely resembles our work, researchers linked credit report data and Medicaid enrollment records in Michigan and found that gaining Medicaid coverage was associated with reductions in overall collections, medical collections, and past due debt.[11]

Although these studies provide the best evidence to date that Medicaid eligibility expansions are associated with reduced medical debt, they are not without their limitations. For one, a relatively small number of people gained coverage as a result of the Oregon lottery, and fewer than 70% of lottery participants could be matched to their credit reports.[3] Moreover, the study was able to track the financial health of lottery participants for only 14 months, on average, after coverage approval. In the study of Michigan's Medicaid expansion, the authors relied on the timing of individual enrollment to identify changes in medical debt rather than a comparison with a group unaffected by Medicaid expansion. This strategy is problematic if the decision to enroll in Medicaid is related to a medical event, as is often the case with presumptive eligibility enrollment.

METHODS

We used Medicaid enrollment records from the Louisiana Department of Health to identify individuals gaining Medicaid coverage in July 2016. The majority of those gaining coverage in the first year of expansion did so in the first month because of Louisiana's system-assisted enrollment, which used data from existing aid programs to determine Medicaid eligibility.[24]

We worked with Experian Information Solutions to match expansion enrollees to their credit reports after assigning each beneficiary a randomized identifier and removing personal information that would jeopardize anonymity. Experian located credit reports for approximately 98% of the expansion population, for an initial sample of 213 581 individuals. The credit report data contained several measures of medical debt, including the total number of unsatisfied medical collections and the total balance on all unsatisfied medical collections.

We also randomly selected the credit reports of approximately 1.4 million individuals living in zip codes with high rates of uninsurance in the following states that had yet to adopt Medicaid expansion as of July 1, 2019: Alabama, Florida, Georgia, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas. We considered a zip code to have a high rate of uninsurance if the share of individuals living in that zip code who reported that they lacked insurance coverage in the 2015 American Community Survey was above the 75th percentile of zip code–level uninsurance rates in the state. Approximately two thirds of the zip codes in our sample are also above the 75th percentile of zip code–level poverty rates. We used these data to construct a control group composed of individuals who would likely gain coverage if the states in which they lived adopted Medicaid expansion. By comparing changes in medical debt between those gaining Medicaid coverage in Louisiana and those in our control group, we were better able to eliminate the influence of potential confounding factors (e.g., overall improvements in the macroeconomy).

We gathered information on medical debt for our expansion and control samples in the month of June each year from 2014 through 2019 (25 months before Medicaid expansion in Louisiana and 36 months after). Finally, we dropped anyone who moved out of the state in which they lived in June 2016 to eliminate changes in exposure to different state policies and anyone with missing credit information in any study period. These restrictions resulted in a sample of 1 170 230 individuals, of whom 196 556 gained Medicaid coverage through Louisiana's expansion.

We compared changes in medical debt for the Louisiana expansion sample to our control sample using a difference-in-differences (DID) research design. DID is a quasiexperimental method that compares changes for a treatment group (i.e., the expansion population) to those for a control group (i.e., those in nonexpansion states). We modified the standard DID design to allow estimates of the association between Medicaid expansion in Louisiana and medical debt to vary over time by interacting an indicator variable for an individual's inclusion in the expansion population with indicators for each year of our credit report data.

Our regression models included controls for age and education along with individual fixed-effects terms, which controlled for time-invariant individual characteristics, including observable characteristics such as sex and race/ethnicity and unobservable characteristics such as an individual's rate of time preference or risk tolerance that could be associated with insurance coverage and medical debt. We attempted to address potential bias from changes unrelated to Medicaid expansion by including controls for state-level unemployment rates, poverty rates, per capita household income, and year fixed effects that controlled for correlates of medical debt that vary over time but are common to all individuals in our sample. We estimated our DID models using ordinary least squares estimation and clustered SEs at the state level to account for unobserved in-state correlations of the error terms. More details on our empirical specification can be found in the Appendix (available as a supplement to the online version of this article at http://www.ajph.org).

TABLE 1— **Summary Statistics For Treatment and Control Group: Southern United States, 2014–2019**

Baseline Sample Characteristics	Treatment Group	Control Group
Average age, y	37	8
% female	54	43
% with < high school education	17	25
% with a college degree	10	10
% with any medical collection	60	46
Average no. of medical collections	3	2
Average no. of medical collections > $500	1	1
Average medical collection balance, $	2308	1451
Average medical collection balance, log	4	3
% with any medical collection > $500	44	32
% with any medical collection > $1000	35	24

Note. Our analytic sample included 196 556 Medicaid expansion beneficiaries in Louisiana and 973 674 individuals from high-uninsured zip codes in nonexpansion states. We observed each of these individuals once per year from 2014 through 2019 for a total of 7 021 380 person-year observations. The baseline period was 2014–2016.

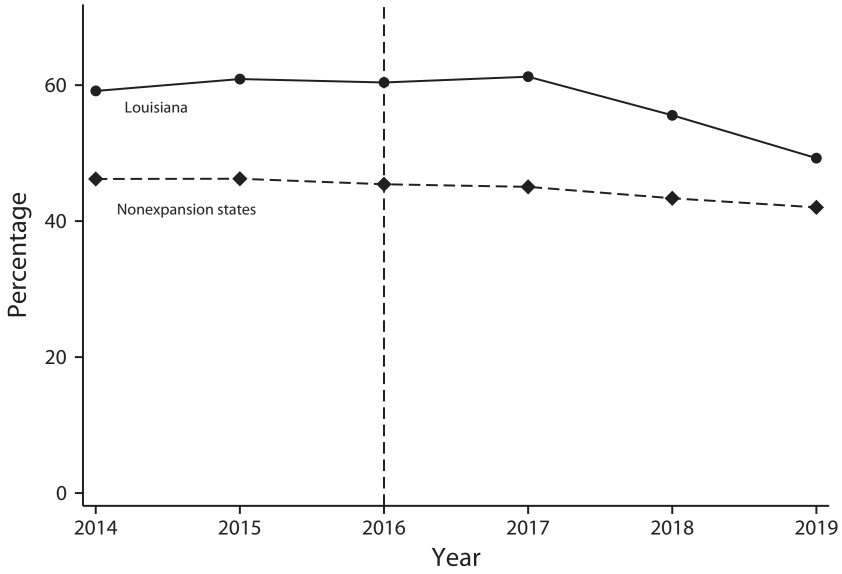

FIGURE 1— **Percentage of Medicaid Expansion Enrollees With Any Medical Collection in Louisiana vs Southern Nonexpansion States: Southern United States, 2014–2019**

Note. The control group is composed of a random sample of individuals living in zip codes with high uninsurance rates in Southern nonexpansion states. Both the Louisiana and control samples follow a balanced panel of the same individuals over time. The vertical line represents the last observation before Medicaid expansion in Louisiana.

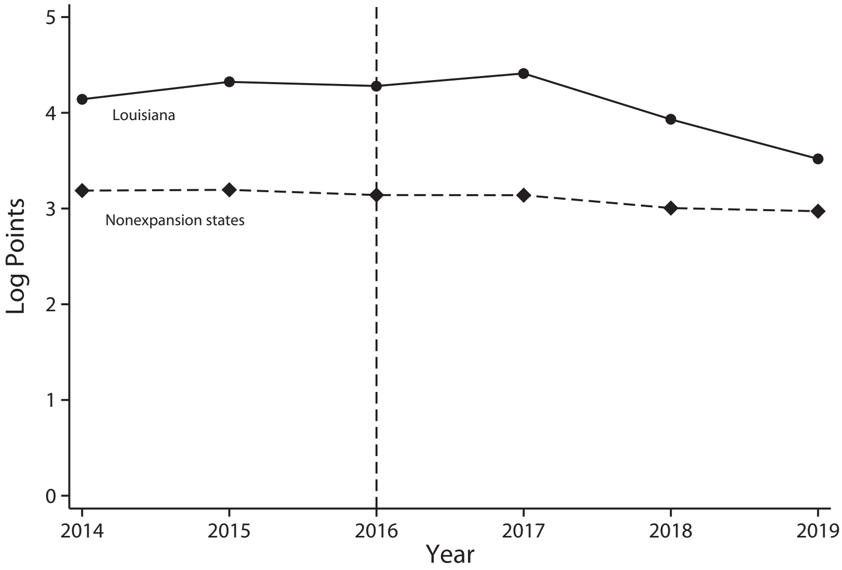

FIGURE 2— **Medical Collection Balance in Louisiana vs Southern Nonexpansion States (Log Points): Southern United States, 2014–2019**

Note. The control group is composed of a random sample of individuals living in zip codes with high uninsurance rates in Southern nonexpansion states. Both the Louisiana and control samples follow a balanced panel of the same individuals over time. The vertical line represents the last observation before Medicaid expansion in Louisiana.

RESULTS

Table 1 details baseline means for each of our outcome variables. Although we randomly selected individuals for our control group from zip codes with high rates of uninsurance in nonexpansion states, we could not explicitly condition on health insurance coverage status. As a result, the medical debt burden among our control group was lower than the burden among our treatment group before July 2016. On average, more than 60% of those in the expansion population had at least 1 outstanding medical collection on their credit report compared with 46% of those in the control group. The average total outstanding balance on all medical collections was $2300 for those in the expansion population compared with $1450 for those in the control group.

Figures 1 and 2 plot unadjusted trends for 2 of our measures of medical debt from 2014 through 2019. Figure 1 displays the share of individuals in the sample with at least 1 outstanding medical collection. In June 2017, 1 year after Medicaid expansion, the share of the expansion population with a medical collection remained steady at just above 60% but began a pronounced decline in 2018 that continued through 2019. The share of those in the control group with a medical collection remained largely stable over the sample period.

Figure 2 shows that medical balances for the expansion population were higher, on average, than those for the control group but fell dramatically following Medicaid expansion. We transformed debt values using a logarithmic scale to minimize the influence of outliers, and Figure 2 shows that average medical collection balances hovered between 4 and 5 log points from 2014

TABLE 2— The Effect of Medicaid Expansion on the Number of Medical Collections: Southern United States, 2014–2019

	Any Medical Collection, b (95% CI)	No. of Medical Collections, b (95% CI)	No. of Medical Collections > $500, b (95% CI)	Medical Collection Balance, b (95% CI)	Any Medical Collection > $500, b (95% CI)	Any Medical Collection > $1000, Estimate (95% CI)
25 mo before expansion	–0.01 (–0.02, 0.01)	–0.07 (–0.31, 0.17)	–0.05 (–0.01, 0.003)	–0.09 (–0.21, 0.04)	–0.01 (–0.02, 0.001)	–0.01 (–0.026, 0.01)
13 mo before expansion	0.01 (–0.004, 0.03)	0.19 (–0.004, 0.38)	0.07 (–0.002, 0.15)	0.11 (–0.03, 0.24)	0.02 (0.001, 0.03)	0.02 (–0.002, 0.03)
12 mo after expansion	0.01 (–0.01, 0.02)	0.19 (0.06, 0.32)	0.09 (0.03, 0.14)	0.09 (–0.02, 0.20)	0.01 (–0.003, 0.02)	0.01 (–0.002, 0.02)
24 mo after expansion	–0.02 (–0.05, 0.02)	–0.16 (–0.46, 0.13)	–0.07 (–0.17, 0.04)	–0.15 (–0.40, 0.09)	–0.02 (–0.04, 0.01)	–0.02 (–0.04, 0.01)
36 mo after expansion	–0.08 (–0.11, –0.05)	–0.90 (–1.13, –0.67)	–0.26 (–0.35, –0.18)	–0.62 (–0.82, –0.43)	–0.06 (–0.08, –0.04)	–0.05 (–0.07, –0.03)
Louisiana baseline mean	0.60	3.12	1.16	4.25	0.44	0.35

Note. CI = confidence interval. Study size was n = 7 021 380. The 1-month before expansion group was omitted from analysis. b values are from interaction terms between an indicator for Louisiana Medicaid expansion enrollment and survey periods. Individual controls included sex, age, education, and state unemployment rate. State controls included the unemployment rate and per capita household income. All models included individual and survey period fixed effects, and SEs are clustered at the state level.

through 2017 (approximately $2300) for individuals in the expansion population, but by 2019, had fallen by nearly 1 full log point (to just over $1700, on average).

The trends seen in Figures 1 and 2 are consistent with a negative association between Medicaid coverage and medical debt, although they lack controls for potential confounding factors. Consequently, we turned to our regression estimates (Table 2), which extended the number of outcomes related to medical debt that we examined. All estimates should be interpreted as changes for the treatment group compared with the control group relative to June 2016 (the omitted period in our regression model).

Table 2 contains estimates of changes in the share of the expansion population with at least 1 medical collection. Before expansion, changes in this outcome were small for the expansion population compared with the control sample. One year after Louisiana's Medicaid expansion, the share of the expansion population with at least 1 medical collection grew by 0.009 percentage points (95% confidence interval [CI] = –0.005, 0.023; $P = .180$), or 1.5%, before declining in 2018 and 2019. By 2019, the share of the expansion population with at least 1 medical collection had fallen by 0.080 percentage points (95% CI = –0.106, –0.054; $P < .001$), or 13.3%.

Table 2 provides estimates of changes in the average number of medical collections and the average number of medical collections with a balance greater than $500. In the first year following expansion, the average number of medical collections increased by 0.188 (95% CI = 0.058, 0.317; $P = .01$), or 6.0%, and the average number of medical collections with a balance greater than $500 increased by 0.087 (95% CI = 0.033, 0.142; $P = .006$), or 7.5%. By 2019, however, the expansion population had experienced a 0.896 percentage point (95% CI = –1.125, –0.667; $P < .001$), or 28.7%, reduction in the average number of medical collections and a 0.264 percentage point (95% CI = –0.350, –0.179; $P < .001$), or 22.7%, reduction in the number of medical collections greater than $500.

Table 2 displays changes in the average balance of medical collections for those in the expansion population compared with those in the nonexpansion control states. Because we log-transformed the medical collection balance outcome, the estimates are changes in balances measured in log points. Like the patterns in Table 2, medical collection balances rose slightly for those gaining Medicaid coverage in Louisiana in the year following expansion and then began to fall in 2018. By 2019, balances on medical collections for the Louisiana Medicaid expansion population had fallen by 0.621 log points (95% CI = –0.817, –0.426; $P < .001$), or 46.3% ($[e^{-0.621} - 1] \times 100$), compared with those in nonexpansion states. Table 2 presents changes in the probability of a medical collection of $500 or more and a medical collection of $1000 or more. In both cases, Medicaid expansion in Louisiana was associated with reduced medical debt by 2019.

DISCUSSION

Our findings indicate that Louisiana's Medicaid expansion was associated with a substantial reduction in the medical debt load for those gaining coverage. Compared with those in nonexpansion states, the probability of a medical collection fell by 13.3% and medical debt balances fell by approximately $1000, on average, for those in the expansion population. This is a slightly larger absolute reduction in medical debt than has been reported by other studies.[3,8,11] For example, previous work found that medical debt fell by an average of $511 in the first 21 months for those gaining coverage through Medicaid expansion in Michigan.[11] Another study reported that a Medicaid eligibility expansion in Oregon resulted in a $390 reduction in medical debt over the first 14 months that individuals gained coverage. The larger reductions in medical debt associated with Medicaid expansion in Louisiana can likely be explained by 2 factors. First, medical debt was higher, on average, for individuals gaining Medicaid coverage in Louisiana ($2308) than for those in Michigan ($1002) and Oregon ($1999). Second, we observed changes in medical debt reported to collections over a longer period of time following coverage gains for our sample (36 months) than for the samples used in Michigan (21 months) and Oregon (14 months). As our results indicate, medical debt continues to decline over time so that observing affected individuals at longer follow-up intervals will lead to large estimates of debt reduction.

Notably, the pattern of medical debt following expansion for those gaining coverage evolved over the 3-year follow-up period. One year following expansion, every indicator of medical debt load that we analyzed had initial relative increases—a finding at odds with other studies reporting reductions in medical debt associated with Medicaid coverage in the first year (or even 6 months) after eligibility expansions. We did not observe average medical debt loads begin to decline until the second year following expansion, after which medical debt continued to decline further in the third year. We lack a definitive explanation for this pattern and leave this as an area for future research. However, we have confirmed that the higher average debt loads in the first year following expansion in Louisiana are not driven by fewer individuals with low levels of medical debt.

Limitations

This research has several limitations. We were able to measure the association between Medicaid expansion and medical debt for individuals gaining coverage only in Louisiana, raising questions about the external validity of our findings. For example, Louisiana residents had a disproportionately high level of medical debt compared with residents in other Affordable Care Act Medicaid expansion states. However, like Louisiana, the majority of states that have yet to expand Medicaid eligibility are located in the Southern United States, with population demographics that more closely resemble those in Louisiana than in earlier expansion states. As a result, our estimates can guide expectations for policymakers considering expansion.

We observed Medicaid enrollment for those in Louisiana at a single point in time coinciding with the state's July 1, 2016, expansion. Therefore, we do not know whether individuals gaining coverage maintained that coverage throughout our sample period. However, were those in the Medicaid expansion population to subsequently move to private coverage or uninsurance, cost sharing for medical care would likely increase, suggesting that our estimates would represent the lower bounds of the relationship between Medicaid coverage and medical debt.

Data limitations did not allow us to construct a control group composed of individuals who would have qualified for Medicaid coverage if the states in which they lived expanded Medicaid under the Affordable Care Act. Instead, we approximated potential eligibility by selecting individuals living in zip codes with high rates of uninsurance. Although this limitation means that we do not know the insurance status of those in our control group, this shortcoming would not bias our estimates unless any changes in insurance status for those in nonexpansion states were systematically related to Louisiana's Medicaid expansion. We have no reason to believe this would be the case, and Figures 1 and 2 indicate no break in trend for the control group associated with Medicaid expansion in Louisiana.

Finally, every estimate of the association between Medicaid expansion and medical debt in Louisiana in the first year following expansion was positive and statistically significant. Unfortunately, we were not able to empirically identify the mechanism for this observed pattern, although it is likely that collections are a lagged indicator of medical debt.

CONCLUSIONS

Medicaid expansion in Louisiana was associated with substantial medical debt relief for those gaining coverage. Our findings provide insight into the implications for individual financial well-being of future Medicaid eligibility expansions. AJPH

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CONTRIBUTORS

K. Callison performed the statistical analysis. Both authors designed and wrote the article.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

HUMAN PARTICIPANT PROTECTION

This research was determined to pose minimal risk to the research participants and was approved through expedited review by the Tulane University institutional review board (IRB REF# 2019-1057). This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline for observational studies.

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Estimating Gains in HIV Testing by Expanding HIV Screening at Routine Checkups

Deesha Patel, MPH, Weston O. Williams, PhD, Janet Heitgerd, PhD, Nicole Taylor-Aidoo, MS, and Elizabeth A. DiNenno, PhD

Objectives. To estimate gains in the prevalence of individuals who had ever been tested for HIV overall and by subpopulations from increases in the percentage of persons who had a routine checkup and were tested.

Methods. We used data from the 2019 Behavioral Risk Factor Surveillance System to determine the prevalence of individuals who were ever tested for HIV and the prevalence of missed opportunities for HIV testing among those never tested in the United States. We assessed the effect of absolute percentage increases in having ever been tested among those who had a past-year routine checkup on increasing the overall prevalence of having ever been tested.

Results. In 2019, 49.5% of US adults had ever been tested for HIV; 34.5% had a missed opportunity. A 50% increase in testing at routine checkups would increase the prevalence of having ever been tested to 84.0%. Increases in the prevalence of having ever been tested (≥ 85%) was highest among persons aged 35 to 54 years, Black persons, persons who were female at birth, persons with health insurance, and persons reporting HIV risk behaviors.

Conclusions. Fully incorporating HIV screening into primary care would greatly increase the proportion of US adults who have been tested for HIV.

Public Health Implications. Continued efforts to promote HIV testing, including implementing routine screening in clinical settings, will help ensure that all US adults know their HIV status. (*Am J Public Health*. 2021;111(8):1530–1533. https://doi.org/10.2105/AJPH.2021.306321)

In 2006, the Centers for Disease Control and Prevention (CDC) recommended screening for HIV infection (regardless of clinical signs or symptoms) in health care settings at least once in a lifetime for all persons aged 13 to 64 years.[1] Seven years later, the US Preventive Services Task Force recommended that clinicians screen for HIV infection in persons aged 15 to 65 years, opening the way for increased HIV-testing coverage and payments by health insurers.[2]

Despite these recommendations, fewer than half (45.9%) of US adults aged 18 to 64 years in the 50 states and the District of Columbia reported having ever been tested for HIV in 2017, and the prevalence of having ever been tested for HIV varied by subpopulations.[3] For example, fewer than one third of persons aged 18 to 24 years have ever been tested for HIV compared with more than half of persons aged 25 to 44 years. Nearly 70% of Blacks have ever been tested for HIV, whereas the prevalence of having ever been tested for HIV ranged from 38.4% to 48.1% among other racial/ethnic subgroups.

Expanding routine HIV screening in health care settings is a key approach to diagnosing people with HIV, as outlined in the nation's initiative *Ending the HIV Epidemic in the U.S.*[4] Our purpose was to estimate gains in the prevalence of having ever been tested for HIV overall and by subpopulations at various levels of increase in the percentage of persons who had a past-year routine checkup and who were tested.

METHODS

We used data from the 2019 Behavioral Risk Factor Surveillance System (BRFSS)[5] for our analysis. BRFSS is an annual cross-sectional survey among noninstitutionalized US adults aged 18 years and older that collects data on health-related risk behaviors, chronic health conditions, and use of preventive services. Data are weighted to generalize sample results and provide nationally representative estimates.

Our analysis was limited to respondents living in the 50 US states, the District of Columbia, and Puerto Rico. We included respondents aged 18 to 64 years to align with the recommendations.[1,2] We examined respondents' reports of whether they had ever had an HIV test and whether they had a routine checkup within the past year. When respondents reported having never been tested for HIV and having had a routine checkup in the past year, we considered that a missed opportunity for HIV testing. We also examined estimates of having ever been tested and a missed opportunity for testing by sociodemographic characteristics (i.e., age, race/ethnicity, sex at birth, health insurance coverage) and by report of any HIV risk behaviors.

We calculated the prevalence of having ever been tested for HIV and a missed opportunity for an HIV test using survey weights, including 95% confidence intervals, overall and for each type of subpopulation. To examine the impact of increased testing during past-year routine checkups, we assessed the effect of absolute percentage increases in having ever been tested among individuals who had a past-year routine checkup on increasing the overall prevalence of having ever been tested. For example, if we observed that 50% of those who had a past-year routine visit had ever been tested, we increased the percentage by 10 percentage points (i.e., 60% of those who had a past-year routine visit being tested) and estimated the percentage increase in having ever been tested in the total population. We describe the effect of increasing routine screening (i.e., reducing missed opportunities) on having ever been tested overall and by subpopulations.

We conducted all analyses in SAS version 9.4 (SAS Institute, Cary, NC).

RESULTS

In 2019 among US adults aged 18 to 64 years, 49.5% had been tested for HIV and about one third (34.5%) had missed an opportunity for an HIV test (Table 1). If HIV testing increased by 50% among those who had a past-year routine checkup, the prevalence of having ever been tested for HIV in the overall population would increase to 84.0%.

Approximately 60% of those aged 25 to 34 years or 35 to 44 years had been tested for HIV. Increasing HIV testing by 40% among those who had a past-year routine checkup maximizes the percentage of those who were ever tested in these age groups to 81.5% and 85.2%, respectively. A 50% increase in testing among those who had a past-year routine checkup would result in a prevalence of having ever been tested for HIV of 87.1% among those aged 45 to 54 years compared to 66.9% among those aged 18 to 24 years.

More than 70% of Blacks had ever been tested for HIV. This would increase to 93.2% if HIV testing increased by 30% among Blacks who had a past-year routine checkup. If HIV testing increased by 50% among Hispanics/Latinos, Whites, and persons of other races/ethnicities who had a past-year routine checkup, the prevalence of having ever been tested for HIV in these subpopulations would increase to 82.2%, 80.3%, and 77.2%, respectively.

Female respondents had a higher percentage of having ever been tested (54.5%) than did male respondents (45.7%). Increasing HIV testing by 50% among female and male respondents who had a past-year routine checkup would result in 89.9% and 80.1%, respectively, who were ever tested.

About half of those with health insurance (49.8%) and those without health insurance (49.1%) had ever been tested. A 50% increase in testing at past-year routine checkup would result in a greater increase in having ever been tested among those with health insurance (86.5%) than those without health insurance (70.8%).

The percentage of those who have ever been tested among those who reported any HIV risk behaviors was 69.6%; a 30% increase in testing among those with a missed opportunity maximized the percentage of having ever been tested to 86.8% for this group.

DISCUSSION

In 2019, about half of US adults aged 18 to 64 years had ever been tested for HIV in accordance with the CDC and US Preventive Services Task Force recommendations.[1,2] Increasing HIV testing by 50% among those who had a past-year routine checkup would increase the prevalence of having ever been tested to more than 80%. Although all subpopulations benefit from increased testing among those who had a past-year routine checkup, the groups that would reach the highest prevalence of having ever been tested would be those aged 35 to 44 years and 45 to 54 years, Blacks, female respondents those with health insurance, and those reporting any HIV risk behaviors. Although the goal of screening more than 80% of US adults for HIV is aspirational, research demonstrates that increased screening in health care

TABLE 1— Missed Opportunity for HIV Testing at Past-Year Routine Checkup, Ever Tested for HIV, and Gains in Ever Tested for HIV With Expanded Screening at Past-Year Routine Checkup: United States, 2019

	Overall % (95% CI)	Missed Opportunity,[a] % (95% CI)	Past-Year Routine Checkup,[b] % (95% CI)	Ever Tested for HIV,[c] % (95% CI)	10% Increase in Routine Screening,[d] %	20% Increase in Routine Screening,[d] %	30% Increase in Routine Screening,[d] %	40% Increase in Routine Screening,[d] %	50% Increase in Routine Screening,[d] %
Overall	100	34.5 (34.2, 34.9)	71.4 (71.0, 71.8)	49.5 (49.1, 49.9)	56.7	63.8	70.9	78.1	84.0
Age, y									
18–24	15.6 (15.3, 15.8)	41.6 (40.5, 42.7)	65.5 (64.4, 66.6)	34.1 (33.0, 35.2)	40.7	47.2	53.8	60.3	66.9
25–34	22.2 (21.9, 22.5)	23.9 (23.1, 24.6)	63.2 (62.4, 64.1)	57.6 (56.8, 58.5)	64.0	70.3	76.6	81.5	81.5
35–44	20.8 (20.4, 21.1)	24.2 (23.4, 24.9)	68.0 (67.2, 68.8)	61.0 (60.2, 61.8)	67.8	74.6	81.4	85.2	85.2
45–54	20.5 (20.2, 20.8)	34.6 (33.8, 35.4)	76.5 (75.8, 77.2)	52.5 (51.7, 53.3)	60.2	67.8	75.5	83.1	87.1
55–64	21.0 (20.8, 21.3)	50.1 (49.4, 50.8)	82.5 (81.9, 83.1)	38.7 (37.9, 39.4)	46.9	55.2	63.4	71.6	79.9
Race/Ethnicity									
Non-Hispanic White	57.9 (57.5, 58.2)	38.6 (38.2, 39.0)	71.4 (71.0, 71.8)	44.6 (44.2, 45.0)	51.7	58.9	66.0	73.2	80.3
Non-Hispanic Black	12.6 (12.3, 12.8)	21.3 (20.3, 22.2)	79.8 (78.8, 80.9)	71.9 (70.8, 73.0)	79.9	87.9	93.2	93.2	93.2
Hispanic/Latino	20.1 (19.8, 20.4)	28.1 (27.1, 29.1)	66.5 (65.5, 67.6)	54.1 (53.0, 55.2)	60.7	67.4	74.1	80.7	82.2
Other[e]	9.5 (9.2, 9.7)	39.5 (37.9, 41.1)	70.6 (69.2, 72.1)	41.9 (40.4, 43.5)	49.0	56.1	63.1	70.2	77.2
Sex at birth									
Male	49.3 (48.5, 50.2)	35.2 (34.0, 36.4)	68.9 (67.7, 70.1)	45.7 (44.4, 46.9)	52.6	59.4	66.3	73.2	80.1
Female	50.7 (49.8, 51.5)	35.4 (34.2, 36.6)	79.9 (78.9, 80.9)	54.5 (53.3, 55.8)	62.5	70.5	78.5	86.5	89.9
Health insurance									
Yes	84.1 (83.8, 84.4)	36.7 (36.4, 37.1)	76.1 (75.7, 76.5)	49.8 (49.4, 50.2)	57.4	65.0	72.6	80.2	86.5
No	15.9 (15.6, 16.2)	21.7 (20.7, 22.6)	45.7 (44.6, 46.8)	49.1 (48.0, 50.2)	53.7	58.2	62.8	67.4	70.8
HIV risk behavior[f]									
Yes	8.4 (8.1, 8.6)	17.1 (16.1, 18.2)	64.4 (62.9, 65.8)	69.6 (68.3, 70.9)	76.1	82.5	86.8	86.8	86.8
No	91.6 (91.4, 91.9)	36.2 (35.8, 36.6)	72.1 (71.7, 72.5)	47.6 (47.2, 48.0)	54.8	62.0	69.2	76.5	83.7

Note. CI = confidence interval.

[a] Percentage of persons aged 18–64 years never tested for HIV (i.e., answered "no" to the question "Have you ever been tested for HIV? Do not count tests you may have had as part of a blood donation. Include fluid from your mouth") and had a past-year routine checkup (i.e., answered "within the past year [anytime less than 12 months ago]" to the question "About how long has it been since you last visited a doctor for a routine checkup?").

[b] Percentage of persons aged 18–64 years who had a past-year routine checkup (i.e., answered "within the past year [anytime less than 12 months ago]" to the question "About how long has it been since you last visited a doctor for a routine checkup? [A routine checkup is a general physical exam, not an exam for a specific injury, illness, or condition]").

[c] Percentage of US adults aged 18–64 years having ever been tested for HIV (i.e., answered "yes" to the question "Have you ever been tested for HIV? Do not count tests you may have had as part of a blood donation. Include fluid from your mouth").

[d] Percentage of US adults aged 18–64 years ever tested for HIV if there is an absolute percentage increase in having ever been tested for HIV at past-year routine checkups.

[e] Asian, American Indian/Alaska Native, Native Hawaiian/Pacific Islander, multiracial, other.

[f] Having HIV risk behavior was defined as answering yes to any of the following: injecting any drug other than those prescribed in the past year; being treated for a sexually transmitted disease, or STD, in the past year; or giving or receiving money or drugs in exchange for sex in the past year.

settings would be cost effective, even for lower-risk groups,[6] and is key to ending the HIV epidemic.[4]

Barriers to HIV testing in primary care settings include health care providers' unfamiliarity with national recommendations,[7,8] continued preference for risk-based screening,[8] assumptions about risk,[9] and HIV stigma.[9] However, studies have shown that improved HIV-testing uptake is possible using interventions such as patient text message reminders[10] and provider electronic medical record prompts.[11] For example, a 2-fold increase in HIV screening was achieved using a passive electronic medical record reminder at a hospital-based, academic primary care practice.[12]

Limitations to this analysis include potential recall bias because of self-reporting and the inability to discern separate groups of persons at high risk for HIV (e.g., men who have sex with men, transgender persons, persons who inject drugs). The exploration of absolute percentage increases in receiving at least 1 lifetime HIV test during routine checkups provides information about potential gains; however, individuals might opt out of routine testing even if it is always offered.

PUBLIC HEALTH IMPLICATIONS

Fully incorporating HIV screening into primary care would greatly increase the proportion of US adults tested. Without interventions to combat the barriers we have described, we are unlikely to see a 50% increase in HIV testing at routine checkup. Continued efforts to promote HIV testing (e.g., CDC's Let's Stop HIV Together campaign[13]), implement routine screening in clinical settings, conduct targeted HIV testing in nonclinical settings, and scale up HIV self-testing (especially with disruption of health care services because of COVID-19) will be needed to ensure that all US adults know their HIV status—a key component of *Ending the HIV Epidemic in the U.S.*[4] AJPH

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CONTRIBUTORS

D. Patel led the analysis planning and the writing and editing of the brief. W. O. Williams conducted the statistical analysis. J. Heitgerd and E. A. DiNenno supervised the design and reporting of the study. N. Taylor-Aidoo contributed to the analysis planning. All authors contributed to concept and design, data interpretation, and drafts or revisions of the brief.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

HUMAN PARTICIPATION PROTECTION

Human participant protection was not required because the study was a secondary analysis of de-identified, publicly available data.

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Prisons and COVID-19 Spread in the United States

Kaitlyn M. Sims, MSc, Jeremy Foltz, PhD, and Marin Elisabeth Skidmore, PhD

See also Murphy, p. 1392, and Galea and Vaughan, p. 1398.

Objectives. To empirically evaluate the relationship between presence of a state or federal prison and COVID-19 case and death counts.

Methods. We merged data on locations of federal and state prisons and of local and county jails with daily case and death counts in the United States. We used a selection-on-observables design to estimate the correlation between prisons and COVID-19 spread, controlling for known correlates of COVID-19.

Results. We found empirical evidence that the presence and capacities of prisons are strong correlates of county-level COVID-19 case counts. The presence of a state or federal prison in a county corresponded with a 9% increase in the COVID-19 case count during the first wave of the pandemic, ending July 1, 2020.

Conclusions. Our results suggest that the public health implications of these facilities extend beyond the health of employees and incarcerated individuals, and policymakers should explicitly consider the public health concerns posed by these facilities when developing pandemic-response policy. (*Am J Public Health*. 2021;111(8):1534–1541. https://doi.org/10.2105/AJPH.2021.306352)

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Prisons, meat-packing plants, nursing homes, and rural health systems have all been identified as structural vulnerabilities to US public health,[1] but our understanding of the role of prisons in COVID-19 spread is limited. As of November 30, 2020, at least 252 000 incarcerated individuals (incarcerated persons and detainees) and employees in US prisons and jails tested positive for the coronavirus, and 1450 died.[2] Incarcerated individuals are a highly vulnerable population whose barriers to timely health care include requiring incarcerated individuals to pay copays for health care, a practice that is legal in 35 states.[3–5] People of color are both disproportionately represented in prisons and disproportionately affected by COVID-19.[6–8] Finally, prisons are vital to the economy of many small and midsized towns in America.[9] Despite these issues and calls for increased public health interventions in prisons,[10] the statistical relationship between prisons and COVID-19 cases and deaths has not been adequately quantified.

Recent work has highlighted the structural vulnerabilities of prisons and the public health risk to the surrounding communities.[1,11] Incarcerated individuals and employees at prisons are at risk from "crowded dormitories, shared lavatories, limited medical and isolation resources, daily entry and exit of staff members and visitors, continual introduction of newly incarcerated or detained persons, and transport of incarcerated or detained persons in multi-person vehicles."[12(p587)] There have been numerous case outbreaks in prisons,[5,13] particularly during the first wave of the pandemic.[14]

Prisons are worthy of special public health scrutiny because closing prisons is politically and practically challenging compared with other institutional settings (such as meat-packing plants and schools) that have also been shown to foster COVID-19 outbreaks. Even when prisons are "shut down," incarcerated individuals and correctional employees remain on-site, and employees typically return to their homes after their shifts. In contrast, meat-packing plant closures have been somewhat successful in slowing outbreak growth, in part because meat-packing plant employees are not on-site.[15] The inability to close a prison suggests that containing and slowing an outbreak from a prison may pose a greater challenge. In this light, our finding that outbreak magnitude is increasing in proportion to prison population and capacity has important implications for local public health officials as well as prison facility planning and management.

The evidence we show that prisons are correlated with COVID-19 spread could be of particular use to researchers and policymakers working in rural and suburban contexts. Over 2.1 million people are incarcerated in the United States at any given time; following a surge of prison construction in the 1990s, a disproportionate number of prisons are located in nonmetropolitan areas.[9,16,17] There is a broad literature of community economic development on the impacts of prisons on the communities in which they are located.[18,19] The existing literature on the public health implications of prisons on the surrounding communities, however, focuses more on public health within the prison populations as opposed to potential spillovers from prisons to the health of the surrounding population. In light of the current pandemic and the salience of these facilities, our work provides vital insight on the intersection between prisons and short- and long-term public health outcomes.

METHODS

We analyzed the presence of state and federal prisons as a correlate of COVID-19 spread by matching data on prison locations and capacities, reported cases and deaths, and county-level demographic and weather controls. Our data extended from January 20, 2020 (the date of the first reported US case) through July 1, 2020; this roughly corresponds to the "first wave" of the outbreak. Our identification came from a selection-on-observables design, using counties without prisons as our control group. This assumes that pre–COVID-19 prison location decisions are orthogonal to outbreak severity after controlling for county-level covariates. We controlled for county-level characteristics that have already been identified in the literature as correlates of COVID-19 spread.[15,20] This helped to strengthen the quality of our control group and ruled out alternative explanations of a statistical relationship between case load and location of prisons other than the presence and size of the facilities themselves.

We modeled our econometric methods and choices of control variables on existing literature[15,20]; the former provided the core methodology for estimating community-level correlations of COVID-19 cases, and the latter demonstrated the importance of meat-processing plants in community transmission. We estimated the following using ordinary least squares regression:

$$Outcome_c = \beta * Prison_c + \sum_{j=1}^{k} a_j x_{c,j} + \gamma_s + \acute{U}_c \tag{1}$$

where Outcome$_c$ is the inverse hyperbolic sine transformation of either cases or deaths in county *c* or is the outbreak delay, defined as the difference between the first reported US case and when cases within the county exceeded 1 per 100 000. (We used the inverse hyperbolic sine transformation to account for zeros. Using data through July 1, 2020, there were 24 counties with 0 cases and 1106 with 0 deaths.) The variable $Prison_c$ is either a binary measure of state or federal prison presence, or a continuous measure of prison capacity (measured in 1000-person increments). Our parameter of interest, β, measures the effects of prisons on the outcome of interest. Each χ_j is a county-level regressor drawn from the existing COVID-19 literature, including presence of a meat-packing facility, log population, population density, indicators for degree of county urbanness or rurality, population share commuting by public transit and outside the county, population share older than 75 years, population share residing in a nursing home, average daily temperature in February to April 2020, log household median income, the social capital index, and Republican vote share during the 2018 congressional election. We also controlled for the days since first case—that is, the days (measured from July 1) since cases in that county exceeded 1 per 100 000 population. All else being equal, counties with earlier outbreaks will likely have more total cases. We included state fixed effects (γ_S) and used robust standard errors in all specifications. Following best practices in the literature, we should not have—and did not—cluster at the state level.[21] As we only had 1 observation for each county, we were thus unable to cluster standard errors at the level of treatment (the county), as would otherwise be recommended

We first estimated this relationship between prisons and cases using a pooled approach, analyzing the total number of cases and deaths in each county. In this approach, we truncated data at July 1, 2020, to best predict the effect of prison presence on the first wave of COVID-19. There is reason to believe that after the first wave, the policy landscape became increasingly complicated, making it difficult to disentangle the effect of these facilities from endogenous school shutdowns, university openings, etc. Limiting analysis to the first wave also avoids issues of differential susceptibility as more of the community has full or partial immunity from previous waves. Additionally, the first wave of the pandemic is important to study in and of itself given that a first wave is guaranteed in future pandemics, although subsequent waves are not.

Even after limiting analysis to the first wave of the pandemic, we may have contaminated controls if counties responded to early outbreaks by building testing centers, sourcing ventilators, or adjusting work and school policies, which might bias the results of our pooled sample. To account for this, we estimated Equation 1 using a duration-equalized sample, where we subsampled the data starting 30 days after the initial onset in each county and resampled every 30 days. We defined initial onset as the day that cases first exceeded 1 per 100 000 population. This created a "snapshot" of prison and control counties at the same relative point in the outbreak.

Our identification strategy relied on exogeneity between prison presence and COVID-19 spread and death rate after controlling for other county characteristics. Although the placement of prisons clearly predates COVID-19 and therefore cannot be subject to reverse causality, there are legitimate concerns related to both unobserved heterogeneity and measurement error. However, Taylor and coauthors found that ordinary least squares results are robust to alternative modeling strategies aimed at addressing endogeneity of facility location, including instrumental variables and matching on observables.[15] We took this as supportive evidence that prison location is largely exogenous to COVID-19 spread. Our identification rested on the stable unit treatment value assumption, requiring that there were no spatial spillovers between counties with prisons and those without. To control for spatial spillovers, we included measures of the share of the population commuting out of the state and county for work. To the extent that we may not have fully captured spatial spillovers, we expected them to inflate cases and deaths in nontreated counties, biasing our results toward zero. As in all studies with observational data, the identification was imperfect, but, in the most plausible cases, it biased our results toward zero. Our findings are best interpreted as a lower bound for the correlation between prison presence and scale on COVID-19 transmission.

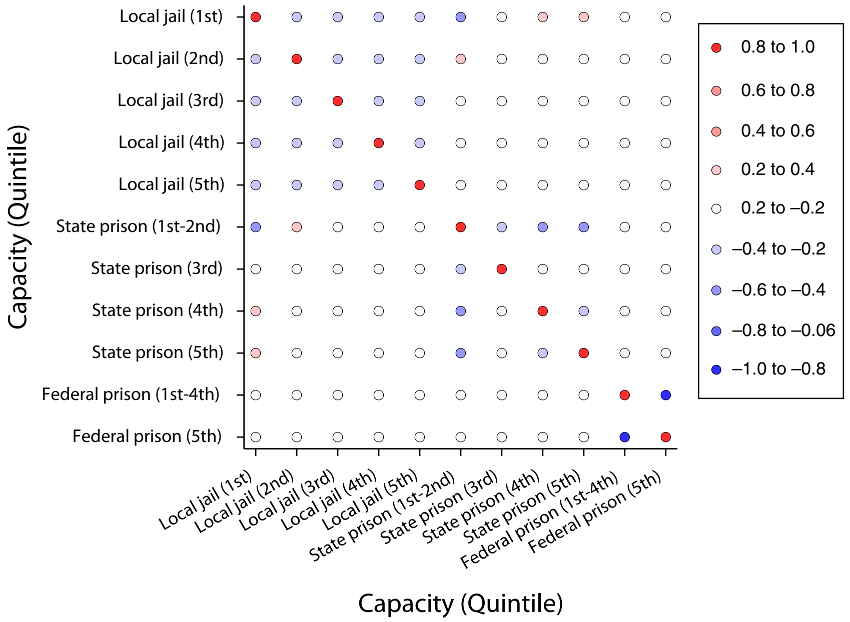

FIGURE 1— Correlation Scatterplot of Number of Jails and State and Federal Prisons in a County, by Quintiles and Capacity: United States, 2020

Note. The color gradient represents the correlation coefficient. Presence of a state or federal prison is broken up by the total capacity of state or federal prisons within the county. For state prisons, we combine the first and second quintiles, which contain all counties with no prison capacity (54% of counties). For federal prisons, the first through fourth quintiles contain the counties with no prison capacity (93% of counties).

COVID-19 case data came from 2 public data sources. First, we used county-level data on case counts and deaths collected by Johns Hopkins University.[22] Second, we used a daily tracker of case counts available through the *New York Times*.[2] We used this second source of case counts in the duration-equalized analysis, following existing work.[20] Prison capacities and locations came from the US Department of Homeland Security.[23] There are 5808 incarceration facilities in the data, 2100 of which are state or federal facilities. We considered a facility as being present in the county if it had a capacity greater than 0. The data do not include private prisons, which account for roughly 8% of the US prison population.[24] Of 3142 counties and county equivalents, 922 had a prison (Figure A, available as a supplement to the online version of this article at http://www.ajph.org). Figure 1 presents a correlation matrix of the number of jails and state and federal prisons in a county, which we divided into quintiles by capacity. The presence of a prison of any size was negatively correlated with the presence of a second prison in the same county, which reflects the fact that counties must bid for prison contracts, and being awarded 1 contract decreases the chance of being awarded another. We took this as evidence that prisons were not strongly colocated.

County-level demographic data (population, household median income, share of the population aged 75 years and older, and share of the population

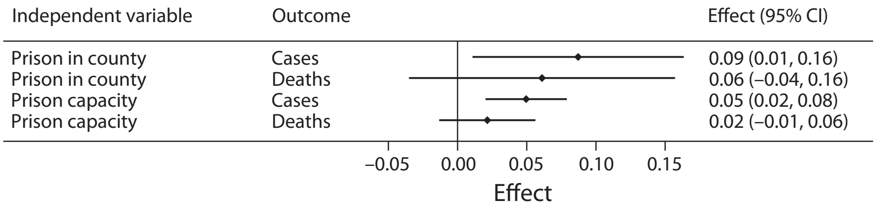

FIGURE 2— **Relationship Between State or Federal Prison Presence and Inverse Hyperbolic Sine (IHS)-Transformed Cases or Deaths by Prison Presence and Capacity: United States, 2020**

Note. CI = confidence interval. We use ordinary least squares regression to estimate the relationship between state or federal prison presence (a binary indicator equal to 1 if the county does have a state or federal prison) and the number of IHS-transformed COVID-19 cases or deaths.[22] Column 1 describes the treatment variable of interest (prison presence or county-level prison capacity in 1000-person increments). Column 2 describes the outcome variable of interest. The points and spikes represent the estimated effect size and 95% confidence interval, whereas the last column states these effect sizes and confidence intervals in numbers. We include state-level fixed effects to account for state policy and economic factors that may be associated with COVID-19 spread. We control for presence of a meat processor within the county, days since cases exceeded 1 per 100 000 population, logged population, population density, urban–rural classification dummies, population share commuting by public transit, population share older than 75 years, population share living in a nursing home, average temperature February to April, logged median household income, the social capital index value, and 2018 midterm Republican vote share.

commuting by public transit, out of the county, and out of the state) came from the 2018 and 2019 American Community Survey 5-year estimates.[25] County land area came from the US Census Bureau. Urban–rural classifications came from the National Center for Health Statistics Urban–Rural Classification Scheme for Counties.[26] Population share residing in a nursing home came from the Nursing Home Compare Datasets: Provider Info.[27] We used the Social Capital Index, which is a county-level index with mean 0 and standard deviation 1.[28] Average daily temperature from February to April came from the National Oceanic and Atmospheric Administration.[29] Slaughterhouse and meat processor presence came from the Meat, Poultry and Egg Product Inspection Directory, available through the US Department of Agriculture.[30] Republican vote share in the 2018 midterm congressional election came from Stephen Pettigrew.[31] Geographic matching used SimpleMaps.[32] We report covariate means and standard deviations by whether the county contained a prison (Tables A and B, available as supplements to the online version of this article at https://www.ajph.org). Our final sample consisted of 2979 counties with matched prison presence data and control variables and 1880 counties with matched prison capacity data and control variables. We tested for robustness to this smaller sample in online Table G (available as a supplement to the online version of this article at https://www.ajph.org).

RESULTS

After controlling for covariates, we found that COVID-19 cases were 9% higher in counties with a prison (Figure 2) and that they were increasing in proportion to incarcerated population and total capacity (measured in 1000-person increments). An additional 1000-person capacity is correlated with a 4.96% increase in cases.

We found no evidence that prisons were correlated with COVID-19 deaths. Medical researchers and epidemiologists have shown that the causal chain from cases to deaths is complex and can be affected by individual access to health care, preexisting conditions, and hospital capacity, including ventilator access.[33,34] Health care access may be higher in the vicinity of prisons, as prison employees are typically state or federal employees with health care benefits for themselves and their families. (We are unaware of prison employees being required to report for duty despite being sick, unlike in the meatpacking industry.) Our results highlight the need for a nuanced investigation of the link between prisons and fatal or nonfatal COVID-19 cases.

Figure 3 shows that the relationship between prison presence and COVID-19 cases was robust to different outbreak duration choices. Prison presence corresponded to an 11% increase in cases after 30 days and a 16% increase after 60 days, both of which were larger effects than in the pooled sample. The result plateaued after 120 days, supporting our choice of the July 1 cutoff.

We investigated the relationship of federal prisons, state prisons, and jails with COVID-19 outcomes in Figure 4 and Table G (available as a supplement to the online version of this article at https://www.ajph.org). When we included jails, we found no evidence that counties with a prison or jail had larger outbreaks than counties with neither. Considering each type of facility separately, we found that cases were 11% higher in counties with a state prison, whereas cases were no higher in counties with a federal prison or a jail. The weak relationship between jails and cases was likely due to attenuation bias, since 61.2% of all counties had at least 1 jail or prison, whereas only 31% of counties had a state or federal prison. The null result for federal prisons suggests that the federal prison lockdown, which went into effect on April 1, 2020, may have been successful in slowing COVID-19 spread in and around prisons.[36,37]

DISCUSSION

We found that the presence of a prison corresponded with a 9% increase in cases within the county. Cases increased with the capacity of the prison, and federal and state prisons were stronger correlates of case counts than local and county jails (hereafter, "jails"). We conclude that both the presence and scale of incarceration facilities matter for disease spread.

We calculated a back-of-the-envelope estimate of US COVID-19 cases associated with presence of prisons. In our data, there were 2 653 050 confirmed COVID-19 cases as of July 1, 2020. As we expected the effects of prisons to be particularly important for rural and suburban communities, we calculated these associated cases for each of the rural–urban classification groups. Using the coefficients from Figure 2, we found that 132 582 cases (4.9% of all cases as of July 1) were associated with prisons, with the greatest number of associated cases found in larger, more metropolitan areas. These numbers are smaller than those found in studies looking at the Sturgis Motorcycle Rally superspreader event (in August 2020[38]) and at meat processors[15] but are still sizable and important. This is particularly true when we consider the opt-in nature of these large superspreader events, in contrast to the absence of choice that incarcerated individuals have in where they are incarcerated and how correctional facilities respond to transmission risk.

Next, we accounted for heterogeneity in the effect by urban–rural classification. Table K (available as a supplement to the online version of this article at https://www.ajph.org) uses the coefficients from 3 separate regressions of prisons on case counts, split by urban–rural classification (regression results are reported in Table J, available as a supplement to the online version of this article at https://www.ajph.org). Increases in prison capacity are correlated with increases in cases in all classifications. However, smaller counties have smaller capacity prisons, on average, and the dummy for prison presence is only significant in large, urban counties. Less than 1% of micropolitan or noncore cases are associated with prison presence, whereas the population share in large central or fringe counties is over 16%, or 300 903 cases.

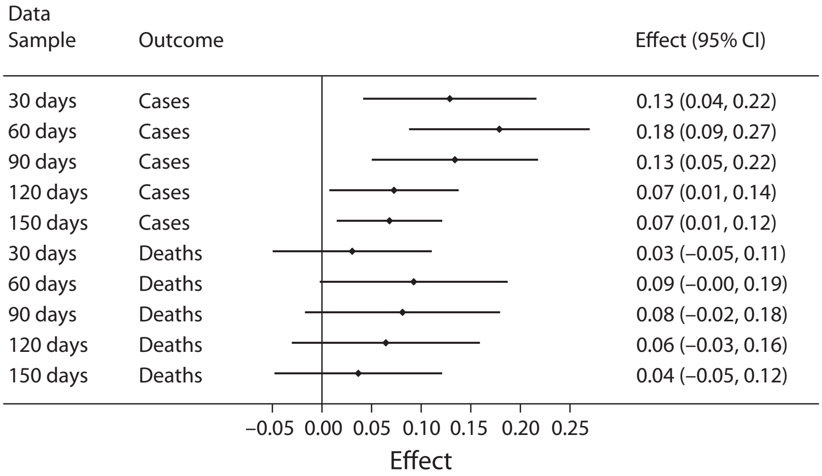

FIGURE 3— Relationship Between State or Federal Prison Presence and Inverse Hyperbolic Sine (IHS)-Transformed Cases or Deaths by Days Since Outbreak: United States, 2020

Note. CI = confidence interval. We use ordinary least squares regression to estimate the relationship between state or federal prison presence (using binary indicator equal to 1 if the county does have a state or federal prison) and IHS-transformed cases or deaths using a duration-equalized sample of counties a certain number of days since outbreak onset.[35] Column 1 indicates the number of days since outbreak onset in that county. Column 2 indicates the outcome variable of interest. The points and spikes represent the estimated effect size and 95% confidence interval, whereas the last column states these effect sizes and confidence intervals in numbers. We include state-level fixed effects to account for state policy and economic factors that may be associated with COVID-19 spread. We control for presence of a meat processor within the county, logged population, population density, urban–rural classification dummies, population share commuting by public transit, population share older than 75 years, population share living in a nursing home, average temperature February to April, logged median household income, the social capital index value, and 2018 midterm Republican vote share.

Finally, we used the coefficient estimates from our main specification to conduct a back-of-the-envelope calculation of the number of spillover cases beyond those in prison outbreaks themselves. We collected state-level cumulative totals of the number of cases and deaths among incarcerated individuals and corrections officers and staff around July 1, 2020 (data collected by the Marshall Project[16]). (Some states did not report on exactly July 1, 2020, so data comes from June 28 to July 3.) We then compared the number of cases and deaths in prisons to the estimated cases associated with prisons to estimate the spillover of cases beyond 6 prison environments. We estimated a total spillover of 95 055 cases and 3336 deaths across all 50 states (excluding the District of Columbia, for which prison-

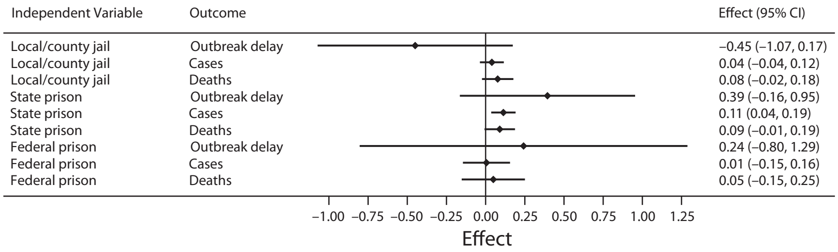

FIGURE 4— Relationship Between Prisons or Jail Presence by Governance Type and Either COVID-19 Outbreak Delay, Inverse Hyperbolic Sine (IHS)-Transformed Cases, or IHS-Transformed Deaths: United States, 2020

Note. CI = confidence interval. We use ordinary least squares regression to estimate the relationship between prisons or jail presence by governance type (a binary indicator equal to 1 if the county has a jail, state prison, or federal prison) and either COVID-19 outbreak delay (days since cases exceeded 1 per 100 000 population in the county), IHS-transformed cases, or IHS-transformed deaths.[22] Column 1 describes the treatment variable of interest (a binary indicator for whether the county has a jail, a state prison, or a federal prison). Column 2 describes the outcome variable of interest. The points and spikes represent the estimated effect size and 95% confidence interval, whereas the last column states these effect sizes and confidence intervals in numbers. We include state-level fixed effects to account for state policy and economic factors that may be associated with COVID-19 spread. We control for presence of a meat processor within the county, days since cases exceeded 1 per 100 000 population, logged population, population density, urban–rural classification dummies, population share commuting by public transit, population share older than 75 years, population share living in a nursing home, average temperature February to April, logged median household income, the social capital index value, and 2018 midterm Republican vote share.

specific case and death data were not available). We take this as suggestive evidence that the effects of prisons on COVID-19 transmission extends beyond cases and deaths among incarcerated individuals and corrections officers and staff.

Limitations

Despite the significant results presented here, there are limitations when using data on COVID-19 case counts and deaths. Testing is inconsistent throughout the United States, and shortages of tests have made it difficult for individuals exhibiting symptoms to get tested.[39] This is exacerbated by the fact that asymptomatic carriers are often unlikely to be tested at all, making reported case counts a noisy proxy for the true level of cases.

Pertinent to our work, testing protocol in prisons varied significantly across states and facilities. In late April, some facilities began testing all incarcerated individuals, whereas others had stopped testing altogether.[40] We cannot rule out that the spike in cases we detected was influenced by large-scale testing in the prisons. However, we detected a significant increase in cases 30 days after outbreak onset, which is before the earliest reported mass testing in prison for the median county. Moreover, we found a difference up to 150 days after the outbreak onset, suggesting continued cases beyond an initial testing spike. Finally, our estimate of prison-related cases exceeds the actual number of cases in prisons, suggesting spread from prisons to the surrounding community.

Finally, we interpret our results as correlational evidence of the relationship between these facility types and COVID-19 spread, rather than causal evidence. Although the location decision for prisons should be exogenous to county-level spread, future work is needed to strengthen this causal link. As data become available, especially at an individual level, researchers may distinguish between the risk of prison presence and the risk of proximity to a prison.

CONCLUSION

We present the first empirical evidence that prisons are strongly correlated with COVID-19 case counts. The relationship is robust to multiple specifications and is increasing in prison capacity. Our results highlight public health concerns in suburban and rural America with respect to the presence and scale of prison facilities. Although economies of scale exist in general for prisons in terms of profitability and cost-effectiveness and for local policymakers in terms of job creation, we found evidence that public health risk is higher around larger facilities. These counties may also need proportional public health infrastructure to cope with potential adverse outcomes.

Our results suggest that coordinated responses, particularly closures, may be effective in slowing the spread of outbreaks in and around prisons. Prisons, in conjunction with small or underfunded local hospitals, may make rural outbreaks worse or unmanageable. Community leaders will want to consider the role of prisons when developing response plans for outbreaks of communicable disease. Such response plans should include the spatial distribution of personal protective equipment, equipment such as ventilators, and general prevention funds, making specific considerations for the safety of incarcerated individuals, prison employees, and their families. Coordination between prison and public health officials on mitigation strategies is vital to keeping these essential institutions functional.

Finally, this work speaks to structural vulnerabilities of the US health care system that are deserving of the focus of policymakers. The impact of COVID-19 in these facilities—and the impact of these facilities on their wider communities—underscores how unprepared US health care and carceral systems are for global health crises. AJPH

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K. M. Sims completed data collection, cleaning, and coding. J. Foltz and M. E. Skidmore conceptualized the project and identified data. All 3 authors collaborated on developing the empirical strategy and writing the manuscript and all subsequent revisions.

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CONFLICTS OF INTEREST

The authors do not report any conflicts of interest.

HUMAN PARTICIPANT PROTECTION

No human participants were involved in this study. All data were publicly accessible county-level aggregates.

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Slow Spread of SARS-CoV-2 in Southern Brazil Over a 6-Month Period: Report on 8 Sequential Statewide Serological Surveys Including 35 611 Participants

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See also Tereshchenko, p. 1387.

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Objectives. To evaluate the spread of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) over 6 months in the Brazilian State of Rio Grande do Sul (population 11.3 million), based on 8 serological surveys.

Methods. In each survey, 4151 participants in round 1 and 4460 participants in round 2 were randomly sampled from all state regions. We assessed presence of antibodies against SARS-CoV-2 using a validated lateral flow point-of-care test; we adjusted figures for the time-dependent decay of antibodies.

Results. The SARS-CoV-2 antibody prevalence increased from 0.03% (95% confidence interval [CI] = 0.00%, 0.34%; 1 in every 3333 individuals) in mid-April to 1.89% (95% CI = 1.36%, 2.54%; 1 in every 53 individuals) in early September. Prevalence was similar across gender and skin color categories. Older adults were less likely to be infected than younger participants. The proportion of the population who reported leaving home daily increased from 21.4% (95% CI = 20.2%, 22.7%) to 33.2% (95% CI = 31.8%, 34.5%).

Conclusions. SARS-CoV-2 infection increased slowly during the first 6 months in the state, differently from what was observed in other Brazilian regions. Future survey rounds will continue to document the spread of the pandemic. (*Am J Public Health*. 2021;111(8):1542–1550. https://doi.org/10.2105/AJPH.2021.306351)

More than 118 million COVID-19 cases have been reported worldwide, and more than 2.6 million persons have died, as of March 11, 2021.[1] Since May 2020, Brazil has been a hotspot for the pandemic; it is the third country in the world in absolute number of confirmed cases (11.2 million as of March 11, 2021) and the second in the number of deaths (270 900 as of March 11, 2021).[1] However, there has been marked regional variability in progression of the pandemic in Brazil. A countrywide survey in mid-May 2020 showed that whereas the proportion of the population with antibodies was 6.3% in the North (Amazon) region, it was below 1% in the 4 remaining regions of the country. In early June 2020, figures remained below 1% in 3 regions, but increased to 9% in the North (Amazon) and 3.2% in the Northeast region.[2]

Brazil's South region comprises 3 states with a combined population of 27.4 million people, of whom 11.3 million live in the southernmost state of Rio Grande do Sul (hereafter "the State"; Figure A, available as a supplement to the online version of this article at http://www.ajph.org), where the first COVID-19 death was reported on March 24, 2020. Eighteen days later, we started the first round of a series of statewide seroprevalence surveys. In August 2020, we published results from the first 3 survey rounds. Although prevalence increased by 4-fold between the first and third rounds, it remained far below 0.5%, suggesting that the epidemic was at an early stage in the State.[3] Eight rounds have been completed between April and September 2020, allowing us to document the spread of the virus in the State over 6 months.

Social distancing measures were widely adopted early in the pandemic. On May 9, 2020, the State's government launched the Controlled Distancing Model, a color-coded strategy aimed at defining how much each region of the State would be allowed to relax social distancing measures. The scheme was based on reported cases and deaths, prevalence (based upon our surveys), and hospital bed occupancy rates. Further information on the model and on the indicators used is available in Box A (available as a supplement to the online version of this article at http://www.ajph.org). Our objective was to report on the 6-month spread of COVID-19 infections in the State based on 8 sequential statewide population-based serological surveys.

METHODS

We present results from the 8 rounds that were completed in 2020. Of the 8 rounds,[4] surveys 1 through 4 took place 2 weeks apart. Given the slow increase in prevalence, the interval was increased to 4 weeks until prevalence reached 1%, after which the interval was reduced to 3 weeks. The exact dates of each round were April 11–13, 2020 (round 1), April 25–27 (round 2), May 9–11 (round 3), May 23–25 (round 4), June 26–28 (round 5), July 24–26 (round 6), August 14–16 (round 7), and September 4–6 (round 8). Further details on the study protocol are available elsewhere.[4]

The Brazilian Institute of Geography and Statistics divides Rio Grande do Sul State into 8 intermediate regions and 497 municipalities (Figure A). A multistage sampling approach was adopted (Box B, available as a supplement to the online version of the article at http://www.ajph.org).

We used the rapid point-of-care lateral-flow Wondfo SARS-CoV-2 Antibody Test (Wondfo Biotech Co, Guangzhou, China). The manufacturer's own validation study reported a sensitivity of 86.4% and specificity of 99.6%, using samples collected from 361 confirmed cases and 235 negative controls in China. We conducted 2 separate validation studies on this test.[5,6] In the first study, carried out in April,[5] we estimated a sensitivity of 77.1% by administering the Wondfo test to 83 patients with positive reverse-transcriptase polymerase chain reaction (RT-PCR) tests within the past 60 days. However, emerging evidence on the decline of antibodies over time motivated us to conduct a second validation study, in which we administered the rapid test from mid-October to mid-November to 133 patients who had positive RT-PCR results from April to October. In the second study, test sensitivity ranged from about 80% (among participants with positive RT-PCR within 2 months) to as low as 42% after 5 months of the RT-PCR, with a mean value of 63.2%.[5] In our publication using data from the first 3 rounds,[3] we used a meta-analytical technique to summarize the results of 4 validation studies available until that time—with a combined sensitivity of 84.8% and specificity of 99.0%—to correct prevalence obtained in our study.[3] In a later publication analyzing data from national serological surveys,[4] we further refined the correction parameters using the same sensitivity of 84.8% and setting specificity at 99.95% based on the results of the first survey in Rio Grande do Sul, where only 2 positive results were obtained in 4500 participants. Details on this approach are provided elsewhere.[4] In the present analyses, we present the unadjusted prevalence, the adjusted prevalence using the same strategy applied in the national study, and the prevalence adjusted for the decay in antibodies over time.

To account for the time-dependent decline in sensitivity of the Wondfo, we estimated how the pandemic behaved over time in each of the 9 cities. We used official statistics of COVID-19 death rates (which are more reliable than reported cases, which depend on intensity of testing), and we assumed that infected individuals who died had become positive in the test 2 weeks before dying.[7] Therefore, for each survey round in each city, we corrected the unadjusted prevalence using a sensitivity value that represented a weighted average of the values obtained in our second validation study,[6] with the COVID-19 all-ages mortality rate curve in each city providing the statistical weights. For example, if most deaths in a city were recent, sensitivity had a higher value than in another city where most deaths had occurred in the past, and, thus, sensitivity values had already declined by the time of the survey round. Uncertainty in the model that describes the relationship between sensitivity and time was incorporated by resampling the model coefficients in the parametric bootstrap procedure implemented in the previously developed correction method.[4] Figure B (available as a supplement to the online version of this article at http://www.ajph.org) presents the fitted curves.

A questionnaire was applied to participants in all rounds, including information on gender, age, schooling, self-reported skin color, and compliance with social isolation measures. Schooling was recorded as the highest level completed with a pass grade. Given Brazil's widespread multiethnic population, the classification of ethnicity recognizes 5 groups, based on the question: "How do you classify yourself in terms of color or race?" The 5 response options are "White," "Brown" ("*Pardo*" in Portuguese), "Black," "Yellow (Asian)," and "Indigenous." We instructed interviewers to check the "Yellow" option when the respondent mentioned being of Asian descent, and "Indigenous" when any of the multiple First Nations were mentioned. The "Brown" category reflects mixed ancestry including European, African, or Indigenous backgrounds. In terms of social distancing measures, individuals were asked about their routine activities through the following question: "Which of the following options best describes your current routine?":

a. stays at home all the time;
b. leaves the household only for essential activities, such as buying food;
c. leaves the household sometimes, to buy things or to stretch the legs;
d. leaves the household daily; or
e. leaves the household daily, to work or other regular activity.

In the analyses, we combined categories "b" and "c," and categories "d" and "e."

We fitted LOWESS regression[8] to the time-trend data on the number of deaths and cases per 100 000 inhabitants in Brazil made available by the State (https://covid.saude.gov.br). Our intent was 2-fold: adjust a smoothed curve to the data and generate interpolated values based on this curve.

All analyses took the clustering of the sample into account. For the analysis of the association of SARS-CoV-2 infection with sociodemographic and socioeconomic variables, we calculated the prevalence of infection (8 rounds combined) in each subgroup of the independent variables. The combined prevalence is simply the number of positive tests across all surveys divided by the number of tests performed across all surveys. We calculated *P* values with the χ^2 test. We also compared the distribution of social distancing behavior between the 8 surveys using a χ^2 test with Rao and Scott second-order correction,[9] which accounts for the sampling design and yields a statistic that follows an F-distribution with 1 and 2 degrees of freedom (df). We performed all analyses with R version 3.6.1.[10] We used the "survey" package[11,12] to incorporate the sampling design and to compare the distribution of social distancing behavior across surveys.

Only interviewers with negative tests for SARS-CoV-2 and absence of any symptoms collected data. They used individual protection equipment that was discarded after visiting each household.

RESULTS

We were able to interview and test 4151 people in the first round, 4460 in the second, and 4500 participants in each of the remaining rounds of data collection. Nonresponse rates increased in the later rounds. In the first round, refusals accounted for 8.9%. The corresponding proportions were 8.8%, 7.1%, 7.9%, 10.0%, 12.0%, 13.3% and 14.0% in rounds 2 through 8, respectively.

Table 1 describes the sample in each round according to gender, age, skin color, and education levels. The proportion of males was stable at around 40% in all rounds. Around 10% of the participants were aged 0 to 19 years in each round, and the proportion of participants aged 80 years or older was stable at around 4%. Around three quarters of the sample reported White skin color. Taking the 8 rounds together, only 262 Asian and 173 Indigenous participants were included, and, therefore, these categories were grouped as "other" for the analyses. The samples of the 8 rounds were also stable in terms of schooling—around 35% of the participants had primary education or less. Despite the slight increase in refusal rates, the samples were similar across surveys in terms of gender, age, skin color, and education.

Table 2 presents the unadjusted prevalence of participants with SARS-CoV-2, as well as the prevalence figures adjusted solely for the test's initial sensitivity and specificity (as used in our previous publication),[2] and the prevalence estimates further adjusted for the decay in antibodies over time identified in our validation study.[6] The number of positive tests increased from 2 out of 4151 in the first round to 62 out of 4500 in the eighth round, with a total of 197 over the 8 rounds. The corrected prevalence increased from 0.03% (95% confidence interval [CI] = 0.00, 0.34) in the first round in April to 1.89% (95% CI = 1.36, 2.54) in the eighth round in September. Prevalence figures were below 0.5% from April to May, and above 1.0% from July onward.

Table 3 presents the combined prevalence (number of positive tests across the 8 rounds divided by the number of tests performed across the 8 rounds) of antibodies against SARS-CoV-2

TABLE 1— Description of the Sample in Terms of Gender, Age, Skin Color, and Schooling: The State of Rio Grande do Sul, Brazil, April 11 to September 6, 2020

Variable	Round of Data Collection, % or No.							
	1 (Apr 11–13)	2 (Apr 25–27)	3 (May 9–11)	4 (May 23–25)	5 (Jun 26–28)	6 (Jul 24–26)	7 (Aug 14–16)	8 (Sep 4–6)
Gender								
Male	41.7	40.6	41.1	42.1	39.5	39.9	38.1	39.1
Female	58.3	59.4	58.9	57.9	60.5	60.1	61.9	60.9
Age, y								
0–4	1.7	1.1	1.1	0.8	1.1	0.8	0.8	0.8
5–9	2.0	1.5	1.5	1.3	1.8	1.7	1.3	1.3
10–19	5.4	5.1	5.9	5.4	5.2	5.6	5.7	5.6
20–39	27.5	28.3	28.0	29.2	26.0	27.5	27.4	27.4
40–59	33.3	32.5	32.4	33.3	33.4	32.8	33.6	33.3
60–79	25.7	28.0	26.6	26.4	28.4	27.4	27.2	27.6
≥ 80	4.4	3.5	4.5	3.6	4.1	4.2	4.0	4.0
Skin color[a]								
White	76.5	75.8	76.0	76.7	75.9	76.4	75.9	75.8
Brown	15.8	16.2	15.3	16.2	15.4	14.9	15.5	15.6
Black	6.6	6.7	7.4	6.1	7.4	7.2	7.2	7.5
Schooling								
Primary or less	40.9	34.2	36.1	34.1	36.4	35.0	35.5	35.4
Secondary	32.8	31.9	31.5	29.6	31.5	32.2	30.5	31.7
University or higher	26.3	33.9	32.4	36.3	32.1	32.8	34.0	32.9
Sample size	4151	4460	4500	4500	4500	4500	4500	4500

[a] Because of small numbers, Indigenous and Asians were not included in the analyses.

TABLE 2— Prevalence of SARS-CoV-2 Antibodies: The State of Rio Grande do Sul, Brazil, April 11 to September 6, 2020

Round (Date)	No. of Positive Tests / Sample Size	Uncorrected Prevalence, % (95% CI)	Prevalence Adjusted for Test's Validity, % (95% CI)	Prevalence Adjusted for the Decay in Antibodies, % (95% CI)
1 (Apr 11–13)	2 / 4151	0.05 (0.01, 0.17)	0.03 (0.00, 0.34)	0.03 (0.00, 0.34)
2 (Apr 25–27)	6 / 4460	0.13 (0.05, 0.29)	0.10 (0.01, 0.38)	0.10 (0.01, 0.40)
3 (May 9–11)	10 / 4500	0.22 (0.11, 0.41)	0.21 (0.06, 0.49)	0.21 (0.06, 0.51)
4 (May 23–25)	8 / 4500	0.18 (0.08, 0.35)	0.15 (0.03, 0.44)	0.16 (0.03, 0.46)
5 (Jun 26–28)	21 / 4500	0.47 (0.28, 0.72)	0.49 (0.27, 0.83)	0.55 (0.29, 0.94)
6 (Jul 24–26)	43 / 4500	0.96 (0.70, 1.27)	1.07 (0.75, 1.48)	1.18 (0.79, 1.68)
7 (Aug 14–16)	55 / 4500	1.22 (0.91, 1.60)	1.39 (1.01, 1.85)	1.56 (1.10, 2.14)
8 (Sep 4–6)	62 / 4500	1.38 (1.05, 1.77)	1.57 (1.17, 2.06)	1.89 (1.36, 2.54)

Note. CI = confidence interval; SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2.

according to gender, age, skin color, and education. There were no differences according to gender (0.54% in male and 0.61% in female participants; $P = .35$) or skin color (prevalence ranged from 0.55% to 0.68%; $P = .65$). Older adults (0.41%) were significantly less likely ($P = .028$) to present antibodies compared with children and adolescents (0.63%), and young (0.61%) and middle-aged adults (0.70%). The intermediate education group presented significantly higher ($P = .005$) prevalence (0.76%), compared with those with lower (0.45%) or higher schooling duration (0.56%).

TABLE 3— Combined Seroprevalence of SARS-CoV-2 According to Gender, Age, Skin Color, and Schooling: The State of Rio Grande do Sul, Brazil, April 11 to September 6, 2020

Variables	Seroprevalence,[a] % (95% CI)	P
Gender		.35
Male	0.54 (0.43, 0.67)	
Female	0.61 (0.51, 0.73)	
Age, y		.028
0–19	0.63 (0.38, 0.99)	
20–39	0.61 (0.46, 0.79)	
40–59	0.70 (0.56, 0.87)	
≥ 60	0.41 (0.30, 0.55)	
Skin color		.65
White	0.55 (0.46, 0.65)	
Brown	0.68 (0.48, 0.93)	
Black	0.65 (0.36, 1.08)	
Schooling		.005
Primary or less	0.45 (0.34, 0.58)	
Secondary	0.76 (0.60, 0.94)	
University or higher	0.56 (0.43, 0.71)	

Note. CI = confidence interval; SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2.

[a] Combined seroprevalence: number of positive tests across the 8 rounds divided by the number of tests performed across the 8 rounds.

Figure C (available as a supplement to the online version of this article at http://www.ajph.org) presents the number of daily deaths per million inhabitants in the 5 Brazilian regions (see Figure A for the Brazilian map), as well as the dates on which the 8 statewide surveys took place in Rio Grande do Sul, which is 1 of 3 states in the South region. The 3 states in the South Region are Rio Grande do Sul (population 11.3 million), Santa Catarina (population 7.2 million), and Paraná (population 11.1 million). This region was consistently below all other regions in terms of deaths from the beginning of the pandemic until around early September 2020, when our eighth survey took place. At that point, first-wave epidemic curves were descendent in all regions, except the South, where numbers were still increasing. From mid-November 2020 onward, the South showed the highest mortality rates among all regions. Table A (available as a supplement to the online version of this article at http://www.ajph.org) confirms these trends by comparing official statistics on cases and deaths per 100 000 inhabitants in Brazil and the State of Rio Grande do Sul.

Figure 1 shows reported social distancing practices in our samples. The proportion of participants who reported going out daily increased from 21.4% in April (round 1) to 30.4% in May (round 3), after which the proportion stabilized at around one third until the eighth round. The proportion of participants who reported staying at home all the time was reduced from 22.0% in April (round 1) to around 12% to 13% from June onward.

DISCUSSION

At the early stages of the SARS-CoV-2 pandemic, most countries relied solely on official statistics on cases and deaths.[13–15] It took a few months for population-based seroprevalence studies to start providing a more accurate picture of the burden of SARS-CoV-2 infection, including asymptomatic patients and those with mild symptoms. Spain and Brazil, 2 countries that were hit hard by COVID-19, published nationwide survey-based estimates in August and September 2020. The ENE-COVID study estimated that 5.0% of the Spanish population had been infected at that stage.[16] The EPICOVID-19 study in Brazil estimated that 3.1% of the Brazilian population had been infected with the virus at that time.[4] These results are not strictly comparable as different antibody tests were used. Both the Spanish and Brazilian surveys continued to take place, and decays in antibodies over time were reported after the first wave, as in many other studies.[17–20]

In Rio Grande do Sul, a multisectoral effort including universities, the state government, and the private sector allowed for the launch of a seroprevalence household survey only 18 days after the first death was reported. In addition to this early start, we were able to complete 8 survey rounds between April and September 2020. We are unaware of any other seroprevalence study that included 8 sequential rounds anywhere in the world. In August 2020, we published the findings of the first 3 rounds of this statewide survey; prevalence figures increased by 4-fold between the first and third rounds but remained well below 0.5%.[3] We now present updated information including data from 8 rounds of data collection,

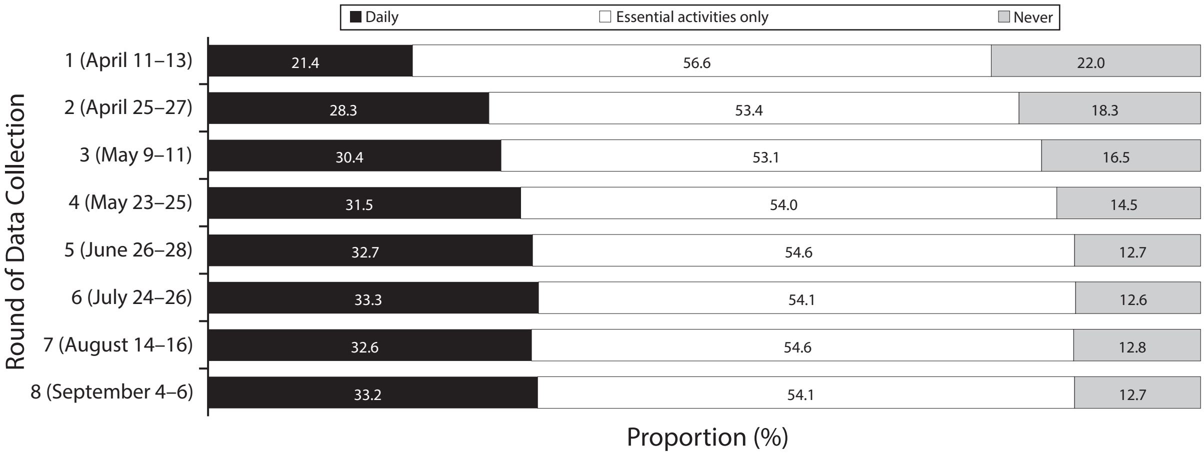

FIGURE 1— Social Distancing Practices Reported by the Population Between April and September 2020, in the State of Rio Grande do Sul, Brazil

Note. Values are the proportion (%) of the population that go out daily (black), for essential activities only (white), or stay at home all the time (gray).

confirming the slow spread of the epidemic that had been reported earlier.

A critical methodological challenge was to estimate the prevalence given the decay in antibodies over time, which was confirmed by most of the literature, and which we managed to quantify in our second validation study.[6] We applied a statistical model to correct for the decline in sensitivity over time, which used official statistics to model the progression of the epidemic in each of the cities included in the analyses. This strategy yields estimates that are more closely interpretable as the cumulative prevalence of infection when compared with the unadjusted estimates. However, both unadjusted and adjusted estimates presented similar trends, likely because of the slow spread of the virus in the State.

Limitations

Our study had some limitations. First, the proportion of refusals increased over time. As the pandemic hit other Brazilian states extremely hard, people became less willing to admit researchers to their homes. Nevertheless, the distributions of the samples in terms of sociodemographic and socioeconomic variables were similar across the 8 rounds of the study. Second, in the first rounds of the survey, we did not collect detailed information on socioeconomic status, so that analyses here use schooling as a proxy. Third, the sensitivity of the test declined over time,[6] a finding that we were unaware of when the survey started. At that time (April 2020), this test, which had been donated to the Ministry of Health by a private company, was the only test suitable for large-scale epidemiological studies in the country. By conducting 2 validation studies and correcting our estimates, we attempted to correct the test limitations. Fourth, because of low prevalence, the associations between SARS-CoV-2 infection and the sociodemographic and socioeconomic variables should be interpreted with caution.

The lack of association between prevalence of SARS-CoV-2 antibodies and gender was also observed in many seroprevalence studies.[2,16,21,22] Variations by age are less consistent in the literature. The Brazilian national study[2] reported higher antibody prevalence among middle-aged participants compared with younger or older participants. The Spanish national survey found children to be at a lower risk of SARS-CoV-2 infection,[16] but a survey in 10 US sites found no differences according to age.[21] Similarly to our findings, a Swiss survey reported older adults to be at lower risk of SARS-CoV-2 infection.[22] It is important to highlight that age patterns in antibody prevalence do not reflect disease severity. Case-fatality rates increase with age,[23,24] a finding that is confirmed by the fact that 81.2% of COVID-19 deaths in Rio Grande do Sul during 2020 occurred among individuals aged 60 years or older.[25]

Although early COVID-19 infections in most countries were observed among the rich, who are more likely to travel abroad, after community transmission starts, the scenario can change rapidly. The EPICOVID-19 study in Brazil found those in the bottom quintile of household assets to have a 2-fold increase in SARS-CoV-2 infection prevalence.[2] In August 2020, Khalatbari-Soltani et al.[26]

published a study on the importance of collecting data on socioeconomic determinants of COVID-19, because "disadvantaged socioeconomic position is widely associated with disease and mortality, and there is no reason to think this will not be the case for the newly emerged coronavirus disease."[26(p620)] In Spain, immigrant populations had a higher risk of SARS-CoV-2 infections compared with Spanish participants.[16] In our study, those with secondary education were more likely to present antibodies against SARS-CoV-2 than those with higher or lower education, a finding that was also observed in a study among blood donors in Saudi Arabia.[27] Unfortunately, a detailed questionnaire on household assets was not administered in the first rounds of the statewide surveys, impeding in-depth analyses of inequalities in SARS-CoV-2 infection. In addition, because of the low prevalence figures detected, statistical power was reduced for this specific analysis.

Although we did not find an association between seroprevalence and skin color, the EPICOVID-19 study in Brazil reported a 5-fold higher risk among Indigenous compared with White individuals, with intermediate levels of risk for Black and Brown participants.[2] Systematic reviews have confirmed the association between ethnicity and COVID-19 infections, hospital admissions, and mortality.[28] In Brazil, Black and Brown participants were more likely to present severe episodes.[29] The lack of association reported in our study is likely attributable to the fact that there were very few Indigenous participants in the sample and there was low prevalence of infection in the State up to September 2020, resulting in lack of statistical power to find differences.

One of the explanations for the slow progression of the COVID-19 pandemic during the first 6 months in Rio Grande do Sul might be the adoption of the Controlled Distancing Model, under the assumption that economic activities in each region of the state should be maintained at a level determined by the burden of infection and by health system preparedness to deal with incoming patients. Whenever prevalence rose or the occupancy of hospitals beds—particularly for intensive care—increased, economic activities were restricted up to complete lockdowns. Figure D (available as a supplement to the online version of this article at http://www.ajph.org) shows that, despite the slow spread of the virus reported in our article, the color-coded system tended to become more severe over time, with a clear increase in the number of regions being coded toward more severe colors. This finding is in accordance with data presented in Table A, showing that although the State started much better than the entire country in terms of daily new cases and deaths, the difference tended to be reduced until September 2020. By January 2021, numbers in Rio Grande do Sul were far above those for the entire country.

Determining cause and effect in the association between SARS-CoV-2 and the Controlled Distancing Model is challenging. Although the model may have had an impact on dissemination of the virus across the State, one should bear in mind that the algorithm relies on statistics about the burden of COVID-19 and, therefore, the model is also influenced by the spread of the virus. Another issue to keep in mind is that trends in Rio Grande do Sul are not that different from those observed in the neighbor states of Santa Catarina and Paraná, which adopted their own nonpharmaceutical strategies to respond to the pandemic.

With the benefit of hindsight and the availability of 8 seroprevalence surveys, it is possible to summarize the progression of the pandemic in Rio Grande do Sul. Compliance with social distancing recommendations was high during the first months of the pandemic, as confirmed by individual data collected in our surveys (Figure B) and publicly available mobility information (Figure E, available as a supplement to the online version of this article at http://www.ajph.org). Only 2 months after the pandemic had started in the State, the Controlled Distancing Model was launched, the state government was strongly engaged in our surveys, and donor funding was easy to obtain.

After a few months, however, the scenario started changing. First, the slow spread of the virus in the State in the first months generated a natural feeling of safety, despite warnings from scientists. Second, the pressure from businessmen and from the federal government to reopen the economy became stronger. Third, donor funding for new rounds of the statewide survey became difficult to obtain. Fourth, the government started allowing regions to appeal against the color-coded results of the algorithm—therefore, the model became reactive, instead of its original goal of being proactive. Particularly close to the 2020 elections, many city mayors started appealing against the results of the algorithm, always requesting the city to be reallocated to a less severe color so that they could adopt a more flexible model. Fifth, elections taking place in November were problematic, as many candidates did not follow public health guidelines. Because of a combination of these factors, most of the positive results found in our 8 surveys in terms of the slow spread of the virus in the State had been lost by the eighth round of data collection (Figure 1).

Conclusions

We observed a slow spread of SARS-CoV-2 between April and September 2020 in Rio Grande do Sul, differently from what was observed in other Brazilian states. Our research group was recently awarded funding to conduct rounds 9 and 10 of the statewide survey. Round 9 will take place in February 2021, and round 10 will be conducted in April 2021. As the vaccination of the Brazilian population has recently started, the April 2021 survey will likely find participants with antibodies generated by the vaccine, as well as individuals with antibodies from infection. Therefore, the 10th round of the study may serve as a population-based evaluation of the effectiveness of the vaccination campaign in the State.

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CONFLICTS OF INTEREST

The authors declared no conflicts of interest.

HUMAN PARTICIPANT PROTECTION

Ethical approval was obtained from the Brazilian National Ethics Committee (30415520.2.0000.5313), and written informed consent was obtained from all participants. A separate informed consent form was used to obtain permission from parents or legally authorized representatives for minors. Positive cases were reported to the statewide SARS-CoV-2 surveillance system.

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The Effect of Overdose Education and Naloxone Distribution: An Umbrella Review of Systematic Reviews

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See also Smart and Davis, p. 1382.

Background. Opioids contribute to more than 60 000 deaths annually in North America. While the expansion of overdose education and naloxone distribution (OEND) programs has been recommended in response to the opioid crisis, their effectiveness remains unclear.

Objectives. To conduct an umbrella review of systematic reviews to provide a broad-based conceptual scheme of the effect and feasibility of OEND and to identify areas for possible optimization.

Search Methods. We conducted the umbrella review of systematic reviews by searching PubMed, Embase, PsycINFO, Epistemonikos, the Cochrane Database of Systematic Reviews, and the reference lists of relevant articles. Briefly, an academic librarian used a 2-concept search, which included opioid subject headings and relevant keywords with a modified PubMed systematic review filter.

Selection Criteria. Eligible systematic reviews described comprehensive search strategies and inclusion and exclusion criteria, evaluated the quality or risk of bias of included studies, were published in English or French, and reported data relevant to either the safety or effectiveness of OEND programs, or optimal strategies for the management of opioid overdose with naloxone in out-of-hospital settings.

Data Collection and Analysis. Two reviewers independently extracted study characteristics and the quality of included reviews was assessed in duplicate with AMSTAR-2, a critical appraisal tool for systematic reviews. Review quality was rated critically low, low, moderate, or high based on 7 domains: protocol registration, literature search adequacy, exclusion criteria, risk of bias assessment, meta-analytical methods, result interpretation, and presence of publication bias. Summary tables were constructed, and confidence ratings were provided for each outcome by using a previously modified version of the Royal College of General Practitioners' clinical guidelines.

Main Results. Six systematic reviews containing 87 unique studies were included. We found that OEND programs produce long-term knowledge improvement regarding opioid overdose, improve participants' attitudes toward naloxone, provide sufficient training for participants to safely and effectively manage overdoses, and effectively reduce opioid-related mortality. High-concentration intranasal naloxone (> 2 mg/mL) was as effective as intramuscular naloxone at the same dose, whereas lower-concentration intranasal naloxone was less effective. Evidence was limited for other naloxone formulations, as well as the need for hospital transport after overdose reversal. The preponderance of evidence pertained persons who use heroin.

Author's Conclusions. Evidence suggests that OEND programs are effective for reducing opioid-related mortality; however, additional high-quality research is required to optimize program delivery.

Public Health Implications. Community-based OEND programs should be implemented widely in high-risk populations.

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PLAIN-LANGUAGE SUMMARY

Overdose education and naloxone distribution (OEND) programs are crucial for preventing opioid fatalities. These programs provide training to people likely to witness an overdose and deliver critical information about overdose prevention, recognition, and response. However, given the proliferation of ultrapotent synthetic opioids such as fentanyl in illicit drug supplies, uncertainties exist concerning optimal naloxone formulation and patient management. Furthermore, although several reviews on the impact of these programs have been published, evidence regarding the effectiveness of these programs and their impact on vital public health measures remains uncertain. Therefore, we synthesized 6 systematic reviews to provide a broad-based conceptual scheme of the effect and feasibility of OEND programs and to identify areas for possible optimization. We found unanimous evidence suggesting that OEND programs produce long-term knowledge improvements, improve participants' attitudes toward naloxone, provide sufficient training for participants to manage overdoses safely and effectively, and effectively reduce opioid-related mortality. We also found that high-concentration intranasal naloxone was as effective as intramuscular naloxone at the same dose, whereas lower-concentration intranasal naloxone was less effective. Most evidence concerned persons who use heroin. This study suggests that OEND programs effectively reduce opioid-related mortality and should be implemented widely in high-risk populations to prevent harm.

In North America, the rate of drug overdose deaths involving opioids has risen 5-fold over the past 2 decades.[1] Presently, opioids are the leading cause of injury-related deaths, resulting in more than 60 000 fatalities in the United States annually.[2] While several strategies have been put forward to prevent opioid-related mortality, one of the main strategies is naloxone distribution. Naloxone is an opioid-receptor antagonist that reverses overdose-induced respiratory depression, preventing secondary cardiac arrest and death. Overdose education and naloxone distribution (OEND) programs provide naloxone to individuals at risk for witnessing an overdose and training in 3 key areas: prevention, recognition, and response. However, given the proliferation of ultrapotent synthetic opioids in the illicit drug supply, uncertainties exist concerning optimal naloxone dosing and patient management.[3–5] While the World Health Organization has recommended the expansion of public access to naloxone, evidence supporting the effectiveness of OEND programs remains unclear.

Several systematic reviews on the impact of these programs and their effectiveness on various outcomes have been published. However, to our knowledge, there have been no attempts to synthesize and critically evaluate the evidence from these systematic reviews on key questions of public health to date. Therefore, we conducted an umbrella review of systematic reviews to provide a broad-based conceptual scheme of the effect and feasibility of OEND and to identify areas for possible optimization. We reviewed the effects and feasbility associated with OEND in adults, assessed the efficacy of different naloxone formulations and the need for after-overdose hospital transport, and considered the implications of our findings for the development of future programs.

METHODS

An umbrella review is a comprehensive review of reviews that evaluates all evidence associated with a particular topic.[6] In the conduct of an umbrella review, the analytical unit of inclusion and data analysis is the systematic review. We followed a protocol submitted to PROSPERO,[7] but, because of delays, the protocol was transferred to Open Science Framework[8] (https://osf.io/rfzbm). This umbrella review was reported in accordance with the Preferred Reporting Items for Overviews of Systematic Reviews reporting benefits and harms checklist.[9]

We addressed the following public health questions:

1. Are OEND programs effective at improving participants' knowledge of overdose symptoms, risk factors, and response strategies; attitudes toward naloxone (e.g., willingness to accept or support public distribution); or ability to correctly manage a suspected overdose?
2. Are OEND program participants likely to administer naloxone, how effective is bystander naloxone use, and are there any potential harms with bystander naloxone use or distribution?
3. What are the optimal formulations for naloxone, and should overdose victims rescued in out-of-hospital

settings receive hospital transport for additional care and monitoring?
4. Are OEND programs effective or cost-effective at reducing the incidence of opioid-related mortality?

After data extraction and in response to themes reflected in systematic reviews identified in our search, we modified our protocol to address questions regarding public attitudes, after-overdose care, and cost-effectiveness.

Search Strategy

We used a broad search for interventions addressing the opioid crisis. An academic librarian searched PubMed, Embase, PsycINFO, Epistemonikos, and the Cochrane Database of Systematic Reviews from database inception to October 31, 2019. The search algorithm is reported in detail in Appendix A (available as a supplement to the online version of this article at http://www.ajph.org). Briefly, we used a 2-concept search, which included opioid subject headings and relevant keywords with a modified version of the PubMed systematic review filter.[10] We also manually searched reference lists of relevant articles for additional reviews. Citation management was done with EndNote ×9 (Clarivate Analytics, Philadelphia, PA).

Study Selection

Two reviewers (A. R., J .G.) independently screened the titles and abstracts of reviews against prespecified criteria. Reviews marked as potentially eligible proceeded to full-text assessment, with disagreements resolved by consensus. Eligible reviews (1) described comprehensive search strategies and inclusion and exclusion criteria, (2) evaluated the quality or risk of bias of included studies, (3) were published in English or French, and (4) reported data relevant to either the safety or effectiveness of OEND programs or optimal strategies for the management of opioid overdose with naloxone in out-of-hospital settings. We present our inclusion and exclusion criteria in Appendix B (available as a supplement to the online version of this article at http://www.ajph.org). Conference abstracts were excluded as they contain insufficient information for quality assessment.

Data Extraction and Quality Assessment

Two reviewers (A. R., J. G.) independently extracted the first author, publication year, outcomes reported, number of primary studies, and characteristics (i.e., design, follow-up, results) by outcome and review from eligible publications. Disagreements between reviewers were resolved by consensus or, when necessary, by a third reviewer (S. B. W.). The quality of included reviews was similarly assessed in duplicate using AMSTAR-2, a critical appraisal tool for systematic reviews.[11] Reviews were rated critically low, low, moderate, or high quality based on 7 critical domains: protocol registration, literature search adequacy, exclusion criteria, risk of bias assessment, meta-analytical methods, result interpretation, and presence of publication bias.

Data Synthesis

We constructed summary tables for the included reviews, synthesizing evaluated outcomes and the primary studies contributing to these outcomes. Confidence ratings were provided for each outcome using a previously modified version of the Royal College of General Practitioners' clinical guidelines.[12] Evidence was classified as strong (⋆⋆⋆: high- or moderate-quality reviews with consistent results from multiple randomized controlled trials), moderate (⋆⋆: high- or moderate-quality reviews with consistent evidence from non–randomized controlled trials or less consistent evidence from randomized controlled trials), limited or contradictory (⋆: mixed or inconsistent evidence from low- or moderate-quality reviews), or inconclusive (?; inconclusive evidence with theoretical support). One reviewer (A. R.) performed the initial confidence assessments, and final ratings were determined by consensus among members of the project team. Given heterogeneity among the systematic reviews' primary studies, synthesis was qualitative only.

RESULTS

Our literature search yielded 8119 citations (Figure 1). Of these, we retrieved 491 full-text articles on any interventions addressing the opioid crisis. Six systematic reviews evaluated the use of naloxone for overdose rescue and were included in the umbrella review. Excluded citations are cataloged in Appendix C (available as a supplement to the online version of this article at http://www.ajph.org). The year of publication of the included reviews ranged from 2014 to 2019, and their primary studies ranged from 1996 to 2018 (Table 1). After we excluded primary study overlap (Appendix D, available as a supplement to the online version of this article at http://www.ajph.org), the reviews included 87 unique studies with randomized controlled trial, time-series, cohort, case–control, or cross-sectional designs. One review included most of the included primary studies (n = 65; Table 1); however, only 11 were included in their narrative synthesis. All primary

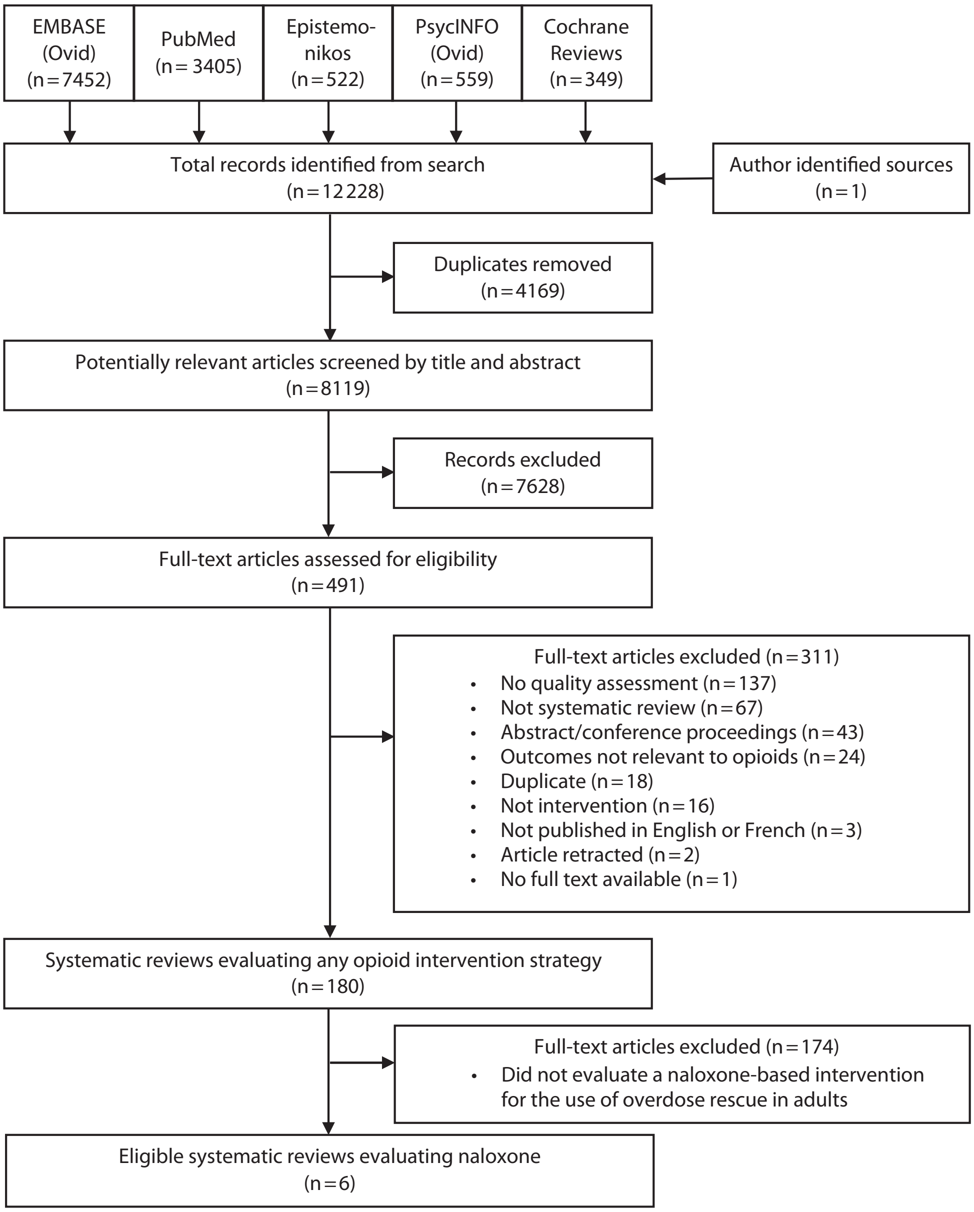

FIGURE 1— **PRISMA Flow Diagram of Study Selection for Systematic Reviews Evaluating the Use of Naloxone-Based Interventions for Overdose Rescue**

studies were conducted in high- or upper-middle-income countries (Australia, Canada, Denmark, Finland, Germany, Iran, Russia, United Kingdom, and United States). However, all but 1 of the primary studies specifically evaluating OEND program implementation were conducted in the United States or the United Kingdom.

The 6 included reviews[13,15,16,18,19,21] evaluated a wide range of outcomes associated with the implementation of OEND programs. Five reviews[13,15,16,18,21] evaluated the effectiveness of OEND programs through diverse outcomes, while the sixth review[19] evaluated different modes of naloxone administration and the need for hospital transport (i.e., secondary care) after overdose reversal. Most reviews did not specify their target population; participants of included studies were thus primarily self-identified persons who use heroin unless stated otherwise in the results that follow. Because of substantial heterogeneity across the primary studies, only 1 review conducted a meta-analysis.[15] We report the level of evidence and summary statements for each outcome identified in our umbrella review in Table 2.

TABLE 1— Characteristics of Systematic Reviews Evaluating the Use of Naloxone-Based Interventions for Overdose Rescue

Authors, Country	Focus	Context	Outcomes Examined	Primary Studies	Primary Study Quality Assessment	Data Synthesis	Review Quality[a]
Clark et al.,[13] United States	OEND program effectiveness	Community-based programs	Naloxone safety and efficacy, knowledge improvement, bystander overdose response, overdose mortality	19 (2001–2013)	Checklist adapted from Jinks et al.[14]	Qualitative	Low[b]
Giglio et al.,[15] United States	OEND program effectiveness	Community-based programs	Bystander naloxone efficacy, knowledge improvement	8 (2006–2014)	Checklist adapted from Jinks et al.[14]	Quantitative	Critically low[c]
EMCDDA,[16] Portugal	OEND program effectiveness	Community-based programs	Naloxone safety and efficacy, knowledge improvement, bystander overdose response, participant attitudes, overdose mortality	21 (2001–2014)	Cochrane Handbook for Systematic Reviews of Interventions[17]	Qualitative	Moderate
McDonald and Strang,[18] United Kingdom	OEND program effectiveness	Community-based programs	Naloxone safety and efficacy, causality,[d] feasibility of OEND implementation[e]	22 (2001–2015)	Checklist adapted from Jinks et al.[14]	Qualitative	Low[f]
Chou et al.,[19] United States	Optimal overdose management	Out-of-hospital emergency response	Optimal naloxone formulation, need for hospital transport after overdose rescue	13 (1996–2016)	Methods Guide for Effectiveness and Comparative Effectiveness Reviews[20]	Qualitative	High
Haegerich et al.,[21] United States	Various harm-prevention strategies	Community-based programs, EDs, primary care	Knowledge improvement, public and participant attitudes, overdose mortality	65[g] (2005–2018)	Study design and sample size examination adapted from GRADE[22]	Qualitative	Critically low[c]

Note. ED = emergency department; EMCDDA = European Monitoring Centre for Drugs and Drug Addiction; EMS = emergency medical services; GRADE = Grading of Recommendations, Assessment, Development, and Evaluations Framework; OEND = overdose education and naloxone distribution.

[a] Assessed in duplicate using AMSTAR-2, a critical appraisal tool for systematic reviews on health care interventions.
[b] Downgraded from moderate because authors did not mention study preregistration or justification for restricting the literature search to English-language studies.
[c] Downgraded from low because authors did not mention study preregistration, give justification for restricting the literature search to English-language studies, or provide a list of excluded studies.
[d] Evaluated through 9 criteria developed by Sir Bradford Hill to assess the causal effects of public health interventions in the absence of experimental research.[23]
[e] Evaluated through 5 criteria developed by the World Health Organization to assess feasibility and implementation of public health interventions.[24]
[f] Downgraded from moderate because authors did not mention study preregistration or provide a list of excluded studies.
[g] From a total of 251 primary studies on various interventions addressing the opioid crisis, 65 reported on overdose education and naloxone distribution.

TABLE 2— Summary Results of Systematic Reviews Evaluating the Use of Naloxone-Based Interventions for Overdose Rescue

Outcome	No. Unique Studies[a]	Main Conclusions and Comments	Level of Evidence[b]
Knowledge improvement	4 systematic reviews[13,15,16,21] 11 NRSI (n = 19–525) 2 RCT (n = 187–197)	Strong evidence that OEND training produces long-term knowledge improvements regarding overdose recognition, overdose risk factors, overdose response, and naloxone administration. Assessments were primarily test-based. All retrieved research provided positive results.	⋆⋆⋆
Attitudes toward naloxone	2 systematic reviews[16,21] 6 NRSI (n = 19–525) 2 RCT (n = 187–1598)	Moderate evidence to suggest that educational interventions improve attitudes toward naloxone use among users of opioids. In the general public, factual information and a sympathetic narrative is most effective at producing positive attitudes. Conclusions are primarily based on 2 trials.	⋆⋆
Management of overdose	2 systematic reviews[13,16] 14 NRSI (n = 19–1942) 0 RCT	OEND training may improve OEND participant's ability to respond to overdose; however, it is unclear which educational components are most effective. Results varied considerably across included observational studies.	⋆
Likelihood of naloxone use	1 systematic review[16] 10 NRSI (n = 19–385) 1 RCT (n = 187)	Moderate likelihood that two thirds of OEND participants will administer take-home naloxone in the event of a suspected opioid overdose. Conclusions are based primarily on 7 observational studies with active participant follow-up.	⋆⋆
Safety and efficacy	3 systematic reviews[13,15,18] 21 NRSI (n = 24–2912) 0 RCT	Strong evidence bystander-administered naloxone is both highly efficacious and safe. Consistent results were found across all retrieved studies in this domain. Ethical limitations (e.g., consent) bar the conduct of RCTs.	⋆⋆
Optimal naloxone formulation	1 systematic review[19] 4 NRSI (n = 93–609) 3 RCT (n = 100–182)	At the same dose, high-concentration intranasal naloxone is as effective as intramuscular naloxone, whereas lower-concentration formulations (2 mg/5 mL; > 0.5 mL/nostril) are less efficacious but associated with less risk of agitation. Conclusions are based on 2 medium risk of bias RCTs. Evidence was insufficient to compare other modes of naloxone administration.	⋆⋆
Need for hospital transport	1 systematic review[19] 6 NRSI (n = 84–2241) 0 RCT	The need for secondary care (e.g., hospital transport) after successful overdose reversal is inconclusive. Primary studies were at high risk for bias and did not examine linkage to treatment programs for opioid abuse.	?
Overdose-related mortality	4 systematic reviews[13,16,18,21] 2 NRSI (n = NR[c] to 2912) 0 RCT	Moderate evidence that OEND implementation significantly reduces overdose-related deaths in communities with high participant uptake. Evidence is primarily based on a quasi-experimental interrupted time-series analysis with low risk of bias.	⋆⋆
Cost-effectiveness	1 systematic review[18] 2 NRSI (n = NR) 0 RCT	OEND implementation is accessible and cost-effective even under conservative circumstances (e.g., rising naloxone prices; decreased number of observed opioid overdoses). Conclusions are based on consistent results from 2 cost-effectiveness modeling studies simulated in Russia and the United States.	⋆

Note. ⋆⋆⋆ = strong evidence: high- or moderate-quality systematic reviews demonstrating consistent results from multiple randomized controlled trials; ⋆⋆ = moderate evidence: high- or moderate-quality systematic reviews demonstrating consistent evidence from nonintervention studies or less consistent evidence from randomized controlled trials; ⋆ = limited or contradictory evidence: mixed or inconsistent evidence from multiple low- or moderate-quality reviews; ? = limited or inconclusive evidence: inconclusive research evidence at present, but some theoretical support; NR = not relevant; NRSI = nonrandomized studies of interventions; OEND = overdose education and naloxone distribution; RCT = randomized controlled trial.

[a] The primary studies assessing each outcome and overlap between reviews are provided in Appendix D (available as a supplement to the online version of this article at http://www.ajph.org).

[b] Levels of evidence are based on a previously modified version of the Royal College of General Practitioners' clinical guidelines.[12]

[c] Approximately 3500 vials of naloxone were distributed by Chicago Recovery Alliance's outreach workers to an unknown number of individuals.

Quality Assessment

We rated 1 review as high quality,[19] 1 as moderate,[16] 2 as low,[13,18] and 2 as critically low[15,21] (Appendix E, available as a supplement to the online version of this article at http://www.ajph.org). Critical domains with the lowest adherence were protocol registration (33%) and literature search adequacy (33%). The 4 reviews that received lower quality ratings did not preregister their reviews, did not provide justification for primarily including English-language articles, or did not provide a list of excluded studies. The majority of reviews (83%) justified the selection of primary study designs, accounted for risk of bias when interpreting and discussing results, and reported potential sources of conflicts of interest.

Key question 1: Are OEND programs effective at improving knowledge, attitudes, or overdose management?

Knowledge (confidence, ⋆⋆⋆). Four reviews[13,15,16,21] assessed changes in knowledge after overdose education on risk factors, response strategies, and signs of opioid overdose. All reviews concluded that overdose education demonstrated a strong association with participant's improvement in knowledge about overdose symptoms, prevention, and care. These conclusions were based on consistently favorable test results across the available primary research, which included 2 randomized controlled trials[25,26] conducted among individuals prescribed opioids and family members of people who use heroin (Appendix F, available as a supplement to the online version of this article at http://www.ajph.org). In the trial[26] (n = 197) specifically identified by Haegerich et al.,[21] the mean percentage of correct responses from individuals using prescription opioids increased from 41.8% to 73.8% when comparing pretest and posttest scores about overdose knowledge and response. Evidence from 4 studies[27–30] included in the review by Clark et al.[13] further suggest that knowledge improvements are retained long term (at least 2–6 months). The results suggest that educational interventions can result in substantial knowledge improvements among people likely to witness overdose. However, it remains unclear which of the tested curriculums were most effective.

Attitudes (confidence, ⋆⋆). Two reviews[16,21] assessed the effect of education on naloxone attitudes (e.g., willingness to accept and use naloxone or support public distribution). The first review by the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA)[16] focused primarily on users of injection drugs and concluded that there is weaker but consistent evidence that education produces naloxone-positive attitudes (Appendix F). The EMCDDA reported similar findings from 1 randomized controlled trial[31] (n = 187) that found significantly higher attitude scores among family members of persons who use heroin compared with controls (mean difference = 7.5; 95% confidence interval [CI] = 3.1, 11.8; Appendix F). The second review by Haegerich et al.[21] assessed interventions targeting the public's attitudes to naloxone distribution. They found that educational communications that delivered information with a sympathetic narrative were most effective at increasing public support for naloxone policies when compared with factual information alone (e.g., support for naloxone distribution; odds ratio [OR] = 2.0; 95% CI = 1.4, 2.9). This conclusion was based on a large randomized controlled trial (n = 1598), thus giving strength to their conclusion. Overall, the results from the included reviews suggest that overdose education can produce positive attitudes toward the acceptance, use, and public distribution of naloxone in users of injection drugs and the public.

Overdose management (confidence, ⋆). Two reviews[13,16] assessed the impact of overdose education on participants' capacity to correctly manage a suspected overdose. Both reviews concluded that educational interventions appear effective at improving participants' use of recommended response strategies (e.g., attempting to restore consciousness using a sternal rub, cardiopulmonary resuscitation, placing victims in the recovery position), compared with no previous training. These conclusions were based primarily on prospective self-reported participant data (Appendix F) without comparison groups, thus limiting confidence in these results. In addition, when considering the impact of educational interventions on the rate of emergency medical service (EMS) calls, both reviews reported mixed findings and separately concluded that most participants do not call EMS. As a result, although training interventions may potentially improve participants' capacity to manage overdose, these interventions probably do not address barriers that avert further patient care.

Key question 2: Are OEND participants likely or able to safely and effectively use naloxone?

Likelihood (confidence, ⋆⋆). One review[16] assessed the likelihood that program participants administer naloxone in the event of a witnessed overdose. The review by the EMCDDA[16] concluded that approximately 67% of participants who witnessed an overdose administered rescue naloxone. Data were based on 7 nonrandomized studies with prospective pre–post designs and active participant follow-up (n = 387 witnessed overdoses; Appendix F). Data from their 1 included randomized controlled trial were excluded given the small number of overdoses witnessed among study participants (n = 13). Reasons for nonadministration were not readily reported, but 1 primary study suggested that most participants did not carry naloxone with them regularly; thus, it was not always available for use.[28] Taken together, these results suggest that OEND programs provide sufficient training for participants to confidently administer naloxone in the event of an overdose emergency. However, potential barriers to naloxone administration remain unclear.

Safety and efficacy (confidence, ★★). Three reviews[13,15,18] assessed the effectiveness of bystander naloxone administration. All 3 reviews analyzed the outcomes of reported naloxone administrations and given the consistent and favorable results across all the retrieved studies, concluded that bystander naloxone administration was highly effective (Appendix F). The review by McDonald and Strang[18] synthesized all the available data (n = 2336 naloxone administrations), yielding a conservative overdose survival rate of 96.3% (95% CI = 95.5, 97.1) with naloxone administration. Two reviews[13,18] assessed the incidence of adverse events and found a weak association with bystander naloxone administration. The only reported physiological risks associated with naloxone were precipitated cases of opioid withdrawal, vomiting, agitation, and rare instances of seizure. Nonphysiological adverse events including problems with police, treatment programs, first responders, and shelters because of naloxone possession were also reported. Overall, conclusions regarding effectiveness are interpreted with caution given that most included studies utilized uncontrolled prospective study designs and self-reported participant data (Appendix F). Bearing in mind this limitation, it is not ethically possible to conduct a randomized controlled trial on the effectiveness of emergency bystander naloxone administration.

Key question 3: What are the optimal formulations for take-home naloxone, and should overdose victims be transported for hospital care?

Optimal formulation (Confidence, ★★). One review[19] assessed the comparative benefits and harms of different routes and doses of naloxone administration. Chou et al.[19] found that at the same dose (2 milligrams [mg]), high-concentration intranasal naloxone (2 mg per milliliter [mL]) was as effective as intramuscular naloxone (OR = 0.7; 95% CI = 0.3, 1.5) at reversing overdose-induced respiratory depression, whereas lower-concentration intranasal naloxone (2 mg/5 mL) was found less effective than intramuscular injection (OR = 0.4; 95% CI = 0.2, 0.8), but associated with lowered risk of agitation. These findings were based on 2 randomized controlled trials (n = 327) conducted in Australia by paramedics before the rise of ultrapotent synthetic opioids (Appendix F). As a consequence, the generalizability to the present North American epidemic is unclear. The authors could not compare other modes of naloxone administration because of methodological limitations.

Hospital transport (Confidence, ?). Chou et al.[19] also assessed the need for hospital transport after the reversal of overdose with naloxone in out-of-hospital settings. Chou et al.[19] synthesized the data from 6 retrospective studies (n = 4397 overdose events; Appendix F) and found low risks of death and other serious adverse events (0%–1.3%) among nontransported victims after overdose rescue by paramedics or mobile emergency physicians. Reported follow-up periods varied widely among the included studies (12 hours to 1 year). The authors concluded that the risks associated with overdose victims refusing transport are likely to be low. However, given the lack of comparison groups across the included studies, the evidence is insufficient to compare the risks associated with transport versus nontransport.

Key question 4: Are OEND programs effective and cost-effective at reducing opioid-related mortality?

Opioid-related mortality (confidence, ★★). Four reviews[13,16,18,20] assessed the impact of OEND programs on population-level opioid-related mortality and concluded that their implementation effectively reduces mortality in community settings. The supporting evidence comes predominantly from a single interrupted time-series analysis[32] (n = 2912), which was included in all 4 reviews (Appendix F). This quasi-experimental study assessed the annual rate of opioid-related deaths across 19 communities in Massachusetts that implemented OEND programs over a period of 7 years. Communities with high or low OEND program recruitment experienced substantially greater reductions in overdose mortality than communities without OEND programs (high vs none: adjusted risk ratio [ARR] = 0.5; 95% CI = 0.4, 0.8; low vs none: ARR = 0.7; 95% CI = 0.6, 0.9). The large magnitude effect with high implementation and observed dose–response relationship provided substantial strength to the review's conclusions. One of the reviews, by McDonald and Strang,[18] assessed the validity of the conclusion using the Bradford Hill criteria for causation, which was developed to assess causality when only observational data exist.[23] The authors concluded that evidence from their review adhered to all 9 criteria (e.g., temporality, strength of association) and, thus, supported a causal relationship between OEND program implementation and decreased opioid mortality.

Cost-effectiveness (confidence, ⋆). McDonald and Strang[18] similarly assessed the cost-effectiveness of OEND programs as part of a 5-criterion feasibility checklist developed by the World Health Organization for public health interventions.[24] The authors concluded that OEND programs are cost-effective even under markedly conservative circumstances (i.e., when the cost of naloxone rises and rates of opioid overdose decrease) on the basis of consistent findings between 2 cost-effectiveness modeling studies[33,34] (Appendix F). Their conclusion was interpreted with caution given the limited amount of primary research. Separately, McDonald and Strang[18] found that OEND programs fully or partially met the remaining 4 feasibility criteria: (1) absence of negative consequences, (2) feasibility of program expansion and coverage, (3) unanticipated benefits, and (4) capacity to reach high-risk populations (e.g., medical detoxification patients, prison inmates, homeless injection drug users, and methadone patients).

DISCUSSION

Our umbrella review was designed to synthesize and appraise evidence from systematic reviews pertinent to 4 key public health questions regarding the implementation of naloxone-based interventions for overdose rescue. Our results suggest that there is credible evidence that OEND programs produce long-term knowledge improvements regarding opioid overdose, improve attitudes toward naloxone use and distribution, provide sufficient training for participants to safely reverse overdose, and effectively reduce opioid-related mortality at the population level. In terms of naloxone administration, higher-concentration intranasal formulations (e.g., > 2 mg/mL) appear to be as effective as comparable intramuscular doses, while lower-concentration intranasal formulations are less effective. Evidence was inconclusive for other modes of naloxone administration, as well as the need for hospital transport after overdose reversal. The majority of available evidence pertained to self-identified persons who use heroin, with limited data available for persons who use prescription opioids. Together, the previously studied associations with the greatest internal validity suggest that OEND programs are an effective strategy to address the opioid crisis, although some knowledge gaps remain.

Increasingly, the United States and Canada have expanded legal routes for public access to naloxone. This includes third-party prescription laws, which allow health care providers to issue naloxone prescriptions to individuals likely to be first responders in the event of an overdose and standing orders that permit pharmacists to prescribe and educate persons who use opioids about naloxone. These policies have been associated with substantial increases in naloxone distribution.[35] Coprescription laws, which mandate clinicians to coprescribe naloxone to patients who are at high overdose risk from a prescribed medication (e.g., doses greater than 50 mg of daily morphine equivalent), have similarly increased public access.[36] Based on our findings, the continued expansion of these initiatives alongside existing OEND programs is likely to contribute substantially to reducing the incidence of opioid mortality.

Despite the recent expansion in public access to naloxone, additional research is needed to optimize OEND programs, particularly in epicenters of the opioid crisis where the presence of synthetic opioids (e.g., fentanyl) has caused disproportionate harms. More data are needed concerning barriers to naloxone administration: only two thirds of OEND program participants reported using their naloxone kits when witnessing an overdose. The distribution of more portable intranasal naloxone kits may improve responder rates as bystanders may be more willing to carry and administer convenient needle-free systems.[37–39] We found that higher-concentration intranasal naloxone (2 mg/mL) had similar efficacy to intramuscular naloxone at the same dose (2 mg). The US Food and Drug Administration has recently approved use of an ultraconcentrated nasal spray (Narcan; 4 mg/0.1 mL) based on bioavailability comparable with the highest recommended intramuscular injection dose (2 mg).[40] The transition to needle-free intranasal systems would have the added benefit of preventing needle-stick injuries and, thus, the transmission of bloodborne diseases including hepatitis C and HIV.[41–43] Future research should also focus on determining the optimal timing and need for repeat naloxone administration if adequate respiration or consciousness are not restored following an initial dose. Naloxone titration techniques that result in more gentle reversal of overdose may prevent debilitating withdrawal symptoms, which may precipitate further opioid-seeking behavior and impede naloxone acceptance among people who inject drugs.[37,38] There is some evidence that lower initial doses and routes of administration with a slower onset could minimize these effects.[44,45]

Furthermore, additional research is required to inform the development of educational interventions that more effectively improve bystander response to the witnessed overdose. We found that while OEND programs may increase appropriate first-aid responses to overdose (e.g., use of sternal rubs, rescue breathing, recovery position), the vast majority of trained bystanders did not call EMS.[13,16] While observational data suggest that individuals who are not transported to the hospital following a naloxone-treated overdose have a low likelihood of related adverse events, evidence remains insufficient to conclude that transport is not needed.[19] Contact with secondary care for overdose victims may improve linkage to treatment of problematic substance abuse and testing for infectious diseases (e.g., HIV, hepatitis C).[46,47] Therefore, future studies should assess barriers to contacting EMS and evaluate the effect of remediating strategies such as Good Samaritan laws. Despite the limitations of observational data, we found that OEND programs remain an effective strategy for reducing opioid mortality.

Strengths and Limitations

Umbrella reviews facilitate the efficient evaluation of large bodies of evidence and the production of comprehensive overviews, enabling evidence-informed decision-making and policy practices. Our study's strengths included utilizing systematic reviews as the analytical unit for inclusion and data analysis, providing evidence addressing a range of key questions regarding the effects associated with OEND, and feasibility considerations that are required for program implementation and optimization. Our overview specifically provides a direct qualitative analysis of a multitude of outcome domains that have not previously been covered, to our knowledge, in any individual or pair systematic reviews. As a result, our umbrella review represents an evidence map of the highest available evidence regarding naloxone-based interventions for fatal overdose prevention. This report can thus facilitate evidence-based decision-making practices in this field, which may have been previously hindered by fragmented literature.

Nevertheless, by their nature, umbrella reviews have several limitations. First, the quality of evidence in an umbrella review is dependent on that of the included systematic reviews, of which the majority here were rated low. This limitation was addressed by considering the quality of included reviews when producing confidence ratings for our principal findings based on the adapted Royal College of General Practitioners' clinical guidelines.[12] Second, we did not evaluate the risk of bias or quality of the individual primary studies, as this is typically outside the scope of umbrella reviews. As part of our inclusion criteria, however, we required that eligible systematic reviews include an assessment of their primary studies, which we found all but 1 review explicitly considered when drawing their conclusions.

Third, overlap between the included primary studies could have placed undue emphasis on the conclusions of commonly cited articles. However, study overlap was considered in our synthesis and citation matrices by review and outcome were reported to enhance transparency. Fourth, overviews can obscure substantial clinical and methodological heterogeneity in the included reviews and primary studies (that is, differences in baseline characteristics of participants, including age and sex, and differences in study design such as variable inclusion of comparison groups).

Finally, the majority of data available were from pre–post studies conducted in self-identified persons who use heroin; therefore, our findings may be considered limited if approached from the perspective of traditional evidence hierarchies. However, randomized controlled trials or cluster randomized trials to evaluate the impact of OEND on various outcomes described previously would likely present formidable practical and ethical challenges.[48] With our use of the umbrella review methodology, our findings indicate that there are numerous reviews that provide unanimous support regarding the effectiveness of OEND programs. While these results may be difficult to generalize to persons who use prescription opioids, injection drug use—particularly with heroin in communities with illicit drug supplies contaminated with superpotent opioids—is the largest contributor to opioid mortality.[49] As a consequence, OEND programs are likely to have the most significant impact within these high-risk populations.

Conclusions

Our umbrella review was designed to provide a comprehensive overview of the available evidence from systematic reviews pertinent to the development and implementation of OEND programs in response to the opioid crisis. We found credible evidence that OEND programs improve individuals' knowledge and attitudes about opioid overdose, enable participants to safely and effectively use naloxone, and reduce opioid-related mortality in community settings. Additional research is needed to identify and minimize the barriers to naloxone use and to better understand the need for after-overdose care. Community-based OEND programs should be implemented widely in high-risk populations to reduce the burden of the opioid epidemic. AJPH

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CONTRIBUTORS

A. Razaghizad contributed to conceptualization, methodology, investigation, and writing the original draft. S. B. Windle contributed to methodology, project administration, and reviewing and editing the article. K. B. Filion contributed to methodology and supervision. G. Gore contributed to the search methodology. I. Kudrina, E. Paraskevopoulos, J. Kimmelman, and M. O. Martel reviewed and edited the article. M. J. Eisenberg contributed to conceptualization, supervision, and reviewing and editing the article.

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CONFLICTS OF INTEREST

The authors have no conflicts of interests to declare.

HUMAN PARTICIPANT PROTECTION

Human participant protection is not applicable as this study did not involve human participation.

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Self et al. Respond

Julie L. Self, PhD, MPH, Martha P. Montgomery, MD, MHS, and Emily Mosites, PhD

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The authors are with Centers for Disease Control and Prevention, Atlanta, GA.

We thank Ralli et al. for their important comments in the reply to our article. We are grateful to them for providing insight into their experiences and data related to testing people experiencing homelessness in Rome, Italy.

The authors identified what might be a higher prevalence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) positivity among people experiencing homelessness who were tested in Rome. SARS-CoV-2 positivity among people experiencing homelessness in different locations is influenced by several conditions that fluctuate throughout the COVID-19 pandemic (e.g., differences in community transmission rates, selection of individuals for testing, access and adherence to recommended prevention measures). In addition, direct comparisons between those sleeping in shelters and those sleeping outside in Atlanta, GA, demonstrated lower SARS-CoV-2 prevalence among those sleeping outside.[1]

We agree with the authors that SARS-CoV-2 testing is an important part of a comprehensive strategy, along with isolation and quarantine, to reduce the risk of SARS-CoV-2 transmission in homeless shelters. US Centers for Disease Control and Prevention (CDC) guidance recommends that health departments and health care partners consider providing weekly facility-wide ("universal") testing at homeless shelters when community transmission is high. During moderate and substantial community transmission, community partners can consider active surveillance strategies for subsets of people accessing homeless services (for additional information, see the CDC's interim guidance for SARS-CoV-2 testing in homeless shelters and encampments[2]).

People who stay at homeless shelters come and go frequently and are active in their communities with respect to work and other activities, necessitating testing for everyone at homeless service sites on a regular basis. We have encouraged homeless service providers not to require a negative test of new entrants to homeless shelters, as it might create a barrier to accessing critical homeless services.

We are grateful to Ralli et al. for their contributions to the discussion of how to protect people experiencing homelessness during the COVID-19 pandemic, and we look forward to learning more as additional data become available. AJPH

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Letter to the Editor *Self et al.* e1

COVID-19 and Homelessness: Prevalence Differences Between Sheltered and Unsheltered Individuals

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We read with interest the article by Self et al.[1] that assessed the prevalence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), along with shelter characteristics and prevention practices, in 63 homeless shelters in seven US urban areas. The authors reported an infection prevalence of 2.9%; furthermore, they highlighted the importance of adequate sleeping arrangements and staffing policies in reducing virus spread and the fact that shelters with medical services were less likely to have a high prevalence of infection.[1]

The topic discussed in this article is notable, and the prevalence rate and the suggested control measures reported by the authors are in line with available evidence.[2–4] However, the reported prevalence may significantly vary when the focus is not only on homeless individuals being hosted in shelters but also on the fraction of them living in the streets.

In our experience of homeless individuals regardless of their living arrangements, we have found a slightly higher infection prevalence. Since the beginning of the pandemic, we have evaluated SARS-CoV-2 prevalence in the homeless population in downtown Rome, Italy, through the primary care services of the Eleemosynaria Apostolica of the Vatican City, Holy See. As of March 2021, we had evaluated 1411 homeless individuals (1029 males and 382 females) using antigen (940 tests) and reverse transcriptase–polymerase chain reaction (617 tests) tests. Individuals' average age was 62 years, and they came from 96 different countries. A total of 1350 patients tested negative and 61 tested positive; the positivity rate was 4.32% (Figure 1).

Our higher prevalence rate might be explained by the different homeless sample, one that also included unsheltered people. Whereas prevention and control measures such as use of hygiene protocols, adequate distancing and sleeping arrangements, daily symptom screening, and routine testing for SARS-CoV-2 were routinely applied in homeless shelters, they could not be guaranteed for individuals living on the street.

Because homeless shelters often have rapid resident turnover, sometimes from uncontrolled settings, it is of utmost importance to pay special attention to new admissions.[5] This is highlighted by the fact that significant numbers of COVID-19 patients are asymptomatic and could cause infection outbreaks.[6] Therefore, to identify and isolate positive cases, it is important to perform careful surveillance with rapid antigen and polymerase chain reaction nasopharyngeal tests for SARS-CoV-2 among current

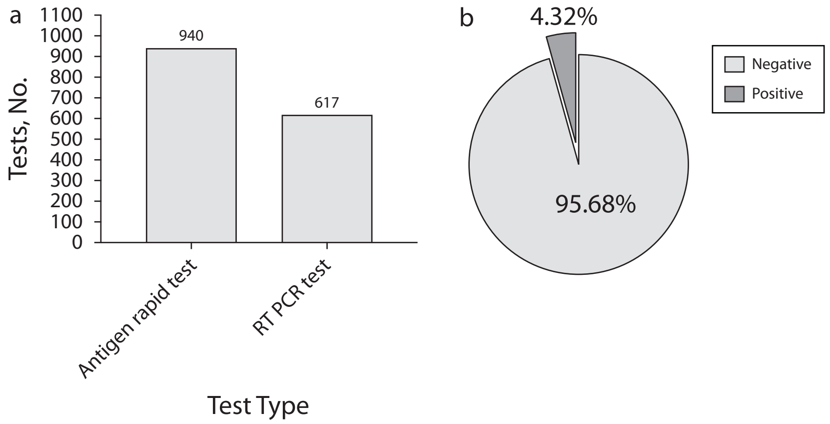

FIGURE 1— Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Testing (a) Types and Number Performed and (b) Results: Rome, Italy, 2021

Note. RT PCR = reverse transcriptase–polymerase chain reaction.

and, especially, new admissions to homeless shelters in addition to applying the suggested control measures.

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CONFLICTS OF INTEREST

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Self et al. Respond

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Uganda Is Not a Role Model for Pandemic Containment in Africa

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Sarki et al.[1] claimed that Uganda has handled COVID-19 "admirably" and should serve as a role model for pandemic containment in Africa. The evidence suggests that this is not the case. Many of the measures Uganda took—restricting travel from high-risk countries, quarantining arrivals, closing schools and churches—were instituted by other countries the world over. The other measures listed by Sarki et al., particularly testing, quarantine, and isolation, are barely taking place. According to a recent evaluation, the isolation and quarantine centers set up by Uganda's district task forces were quickly overwhelmed with cases and lacked supplies of all kinds, including personal protective equipment and even food.[2] Personal protective equipment and oxygen are also in short supply in Uganda's hospitals, placing patients and health workers at grave risk.[3]

The Johns Hopkins University coronavirus database suggests that Uganda's COVID-19 rate is relatively low: roughly 47 000 cases and 362 deaths in a population of 43 million.[4] However, it is highly unlikely that these numbers reflect reality. Uganda has one of the lowest COVID-19 testing rates in the world.[5] A voluntary test costs $50, roughly the monthly income of the average Ugandan. According to a senior presidential advisor on epidemics, Uganda's testing rates are so low that it is likely that only 10% to 15% of cases are being detected in the country (https://bit.ly/3fP6AHX).

These shortcomings are almost certainly the result of the diversion of hundreds of millions of dollars in donor funding intended for Uganda's COVID-19 response to the security forces.[6] Meanwhile, social distancing regulations have been highly politicized. Whereas the ruling party has held indoor meetings of up to 4000 people, outdoor opposition gatherings have been met with arrests and even killings.[7] AJPH

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The author has no conflicts of interest to declare.

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Sarki et al. Respond

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We read with interest and disappointment the submission by Epstein refuting the fact that public health measures taken by Uganda during the first wave of the COVID-19 pandemic and documented in our editorial were sufficient to rate Uganda as a role model for pandemic containment in Africa. Her contentions are that actions reportedly taken by Uganda were also "instituted by other countries the world over" and "are barely taking place" and that "personal protective equipment and oxygen are also in short supply." In addition, COVID-19 testing rates were low, testing was expensive, and donor resources for COVID-19 response were diverted to security forces.

Epstein ignored the fact that many countries around the world were not testing enough, especially in low-resource settings such as sub-Saharan Africa. As detailed in our editorial, "Uganda has the eighth highest number of people tested in Africa"; a cumulative positivity rate 0.98% as of September 10, 2020; and a higher number of tests per million population than the average for Africa.[1]

Epstein should be fully aware that a small difference in national public health response could make all the difference in the course of a pandemic. We noted that Uganda imposed some of the restrictions before the country recorded its first COVID-19 case, and as soon as the first case was recorded, many more restrictions followed and there was a substantial amount of adherence. More important, Epstein conveniently ignored most of Uganda's unique responses to the pandemic, including the community-based disease surveillance that was applauded by the World Health Organization,[2] the risk communication strategy, and district task forces, all elaborated in our editorial.

Regarding claims that donor funds for Uganda's COVID-19 response were diverted to security forces, our editorial made no assumptions regarding accountability of donor funds. However, we should not fail to recognize the great efforts of the government and the sacrifices 46 million Ugandans made in their initial response to the pandemic.

In summary, we recognize Epstein's profile as a human rights and global health expert who has written extensively about Uganda and President Yoweri Museveni. In this instance, however, we disagree with her judgment admonishing a national public health response wherein many individuals sacrificed to keep the country relatively safe in the midst of a global pandemic. Our submission was merely emphasizing the facts of the Ugandan COVID-19 response devoid of politics or reference to human rights abuses. AJPH

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CONFLICTS OF INTEREST

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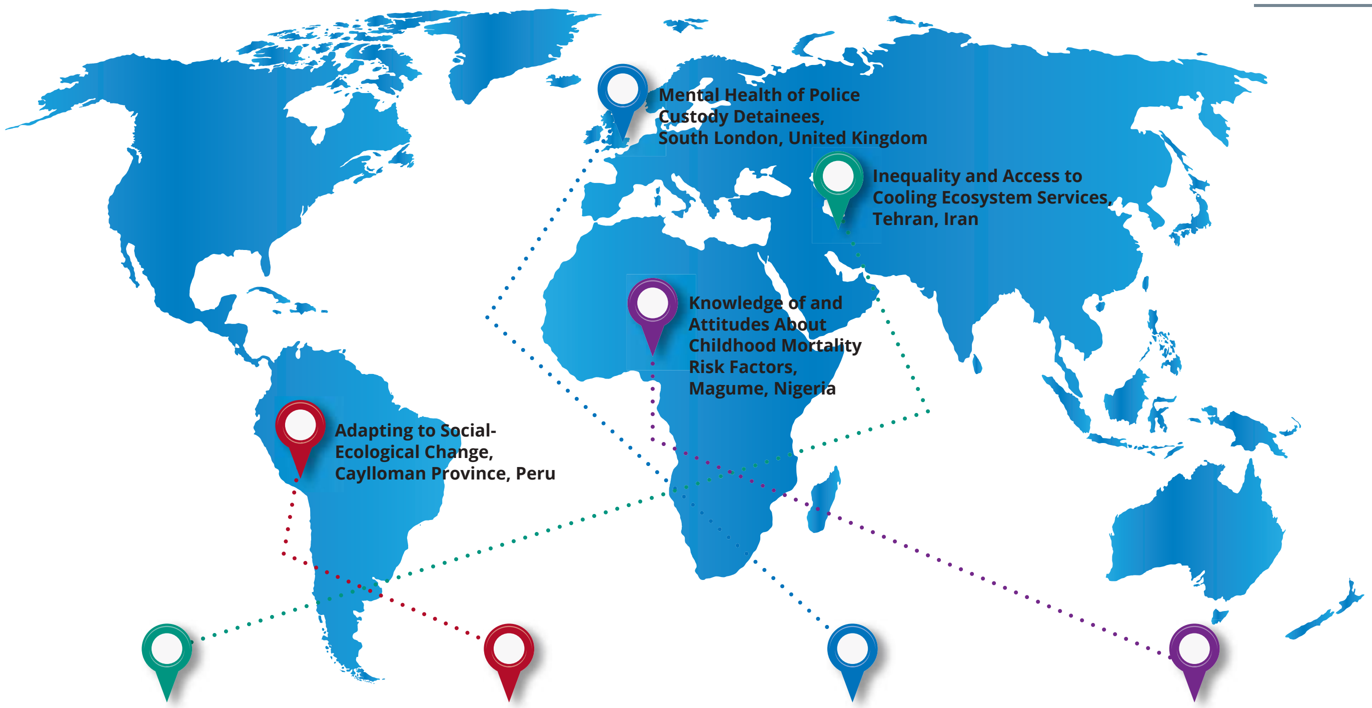

Inequality and Access to Cooling Ecosystem Services in Tehran, Iran

Ghorbani et al. applied distributive justice analysis to investigate how inequality affects access to cooling ecosystem services in Tehran, Iran. Such ecosystem services promote well-being and protect against heat-related illnesses. The researchers mapped socioeconomic status from 11 indicators of housing, employment, and education using TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution) decision analysis. They classified supply of ecosystem services from remote sensing of tree canopy densities and land surface temperatures and defined access through network analysis reflecting actual travel patterns. Demand was based on population, traffic, urban density, and altitude. The study identified stark injustice in the distribution of cooling ecosystem services in the metropolis, with inequitable distribution to southern and central regions.

Citation. Ghorbani S, Salehi E, Faryadi S, Jafari HR. Analyzing urban environmental justice based on supply, demand, and access to cooling ecosystem services in Tehran, Iran. *J Environ Plan Manag. [Published online April 12, 2021].* https://doi.org/10.1080/09640568.2021.1882964

Adapting to Social–Ecological Change: Compounded Influences of Intersectionality

Communities' futures depend on their ability to adapt to social–ecological changes such as water scarcity. Erwin et al. conducted an intracategorical analysis using interviews of individuals from the Caylloma Province in Peru who are involved in agricultural work, mining, and water management to determine the role of intersectionality in the ability to adapt to social–ecological change. Sex, age, language, livelihood, migration status, and land ownership influenced adaptation to social–ecological changes. Currently, community institutions are designed to assist Spanish-speaking men who own land with adapting to change, whereas other groups of individuals confront additional barriers such as decreased water access. The results of this study underscore the importance of altering current social–environmental infrastructures to account for inequities compounded by intersectionality.

Citation. Erwin A, Zhao M, Ruxandra P, et al. Intersectionality shapes adaptation to social–ecological change. *World Dev.* 2020;138:105282. https://doi.org/10.1016/j.worlddev.2020.105282

Mental Health of Police Custody Detainees

High rates of mental disorders among police custody detainees have been shown worldwide. Samele et al. examined psychiatric and developmental morbidity among policy custody detainees by interviewing a 40% sample of people (n = 134) entering policy custody in a South London police station over a 2-week period. They used a standardized screen to check for the presence of mental illness, general health, and social care needs. In their population, nearly one third had a current mental illness, 21% screened positive for a personality disorder, 11% screened for attention deficit disorder, almost one fifth were at risk for suicide, and the most frequent unmet need was for housing accommodation. The authors argue that their findings support the need for mental health services in police stations and for extending accommodation capacity.

Citation. Samele C, McKinnon I, Brown P, et al. The prevalence of mental illness and unmet needs of police custody detainees. *Crim Behav Ment Health. 2021;31(2):80–95.* https://doi.org/10.1002/cbm.2193

Knowledge of and Attitudes About Childhood Mortality Risk Factors

Childhood mortality remains a concern in sub-Saharan Africa. Ibrahim et al. note that there is a gap in the literature examining knowledge among men about the risk factors of childhood mortality. To address this gap, Ibrahim et al. recruited men aged 18 years and older (n = 170) in 2017 who reside in Magume, Nigeria. The majority of participants (83.5%) had poor knowledge of risk factors influencing childhood mortality. Regarding attitudes toward preventing childhood mortality, most men (83.5%) agreed that female education can reduce the burden of childhood deaths; a lower percentage (58.2%) agreed that childhood immunization can reduce or prevent childhood deaths. The authors concluded that the risk factors of childhood mortality were not well identified, but attitudes regarding prevention were positive. This suggests a need for the increased involvement of men in child health issues to improve health outcomes.

Citation. Ibrahim MJ, Sani ZM, Olorukooba AA, Usman NO, Ahmad AI, Mohammed-Idris ZK. Knowledge and attitude of men toward factors influencing childhood mortality in a semiurban community in Northwestern Nigeria. *Journal of Community Medicine & Primary Health Care.* 2021;33(1):1–13. https://doi.org/10.4314/jcmphc.v33i1.1

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