Supplement to

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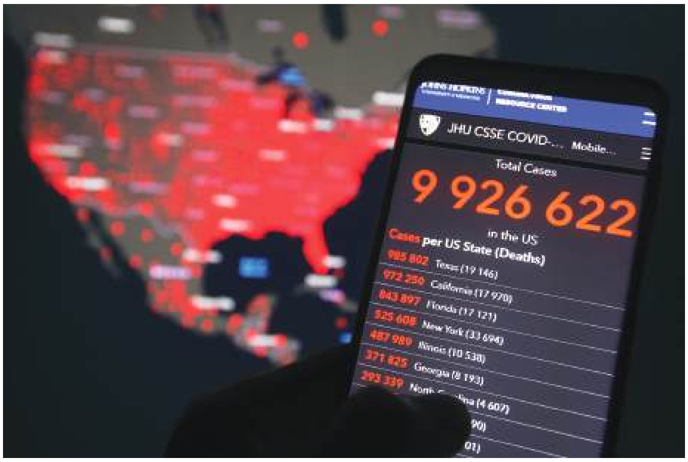

COVER: In this photo illustration, the statistics of COVID-19 spread in United States by Worldometer's Web site seen displayed on a smartphone with a background of a map by the Center for Systems Science and Engineering at Johns Hopkins University showing the COVID-19 global spread on a computer screen. The COVID-19 global cases passed 50 million and US cases passed 10 million, according to internet online trackers of the coronavirus spread.
Cover concept and selection by Aleisha Kropf. Photo by Pavlo Gonchar/SOPA Images/Sipa USA via AP Images. Printed with permission.

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Global Public Health Workers and Academics Must Step Up Response to War

Our young 21st century, already enduring 56 concurrent armed state conflicts, now witnesses the outrageous invasion of Ukraine. It is time for public health to step up on war prevention, and not merely relegate ourselves to cleaning up war's ravages.

Health professionals called out the dangers of nuclear weapons in the 1960s, and in the 1980s collaborating US and Soviet physicians won the Nobel Peace Prize for opposing war. The current moment in Ukraine should re-energize a global public health movement to prevent war.

Public health has much to offer. Our primary, secondary, and tertiary prevention framework is helpful. Weeding out the seeds of injustice, inequity, and weak governance prevents outbreaks of violence. Before war came to Ukraine, we failed to understand the history of competitive geopolitical alignments and missed real primary prevention opportunities to de-escalate them.

Once war is under way, public health has secondary prevention tools to analyze atrocities—weaponry, forced migration, corruption, violence against health workers, and destruction of health and other life-giving infrastructure. We intervene with harm reduction: caring for refugees and tending to soldiers' broken minds and bodies.

In tertiary prevention, we rebuild health systems, as in eastern Ukraine, already weakened from years of conflict-related damage. And we advocate treaties to prevent the worst harms, such as the 2008 Convention on Cluster Munitions and the 2017 Treaty on the Prohibition of Nuclear Weapons, signed by neither the United States nor Russia.

Crucially, public health must recognize war's many indirect consequences. We treat war as mere wallpaper in the background of our real public health work, but it fuels many ills on both sides of conflicts. In the United States, veterans are 50% more likely to be homeless. One in five cases of partner violence is attributed to combat exposure. Returning soldiers who join police forces are more inclined to use force. The US military is the single largest worldwide consumer of oil, fueling climate change. Substance use disorder and suicide are tied to military service. Funds are diverted from housing, health, and education to feed war.

Russia's soldiers, like US military forces, are conscripted very young. They will face the same neglect US veterans faced on returning from Vietnam, Iraq, and Afghanistan. Children of wealth do not join infantry forces. Returning veterans' despair and wounds are not a budgetary priority to the elites who profit from war.

Initially, new wars are enthusiastically embraced, but thirst for war fades fast, leaving long-lasting conflicts that drag on. Oligarchs on all continents profit from wars, every time. In the United States, arms sales to Ukraine seem to be cocaine to the Lockheed Martin Corporation and the Raytheon Technologies Corporation. Russian arms dealers also profit handsomely. It will take global citizen action to rein in the war machines built by the permanent members of the United Nation's Security Council, all nuclear weapons states.

Ukraine's refugees are many, and they are moving fast; supporting them is a daunting task. They found welcome in EU countries, but those who preceded them from the Middle East and Africa, sadly, did not. More than 40 000 Indian and African students in Ukraine are reporting inequitable access to European escape routes. Racism is both a contributor to and a consequence of war.

We health professionals everywhere can use our voices, values, expertise, and power to make important contributions to war prevention. This terrible moment should encourage us to speak out clearly about the drivers of war, including the corruption and greed of the war industry, to build a popular movement for peace.

For further reading, please see the supplemental bibliography, available as a supplement to the online version of this article at www.ajph.org. AJPH

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5 Years Ago

Public Health Surveillance for Communicable Diseases: From Rigid and Static to Flexible and Innovative

Innovative public health surveillance for communicable diseases today is a far cry from the rigid and static public health surveillance systems in the 1970s. . . . The use of handheld digital devices has opened the way for participatory real-time surveillance among entire populations [such as] Flu Near You in the United States and Flu survey in the United Kingdom [which] hold the potential to provide more timely and sensitive information for national and global alert, and to provide information to participants about vaccination and where to seek medical advice. . . . To reach their maximum potential of preventing illness and saving lives, . . . public health surveillance systems must ensure that the data they collect are freely shared with all those who are able to use them for the betterment of public health.

From AJPH, *June 2017, pp. 845–846, passim*

10 Years Ago

National Institutes of Health Approaches to Dissemination and Implementation Science: Current and Future Directions

With the availability of linked community health indicators, geospatial methodologies will make the use of alternative designs more feasible and robust given the explosion of publicly available and actionable data under Open Government Platform initiatives. . . . The major need is to develop methodologies that allow us to harmonize and integrate the enormous amount of data becoming available. . . . [R]ecent examples . . . demonstrate that these methodologies and practical tools can be created. For instance, vast amounts of information can be quickly collated and summarized in dashboard applications. Yet, we need new analytic methods to allow appropriate analyses and meaningful use of these large amounts of information. Methods are needed to guide detection of signal to noise or chance findings in such enormous data sets, to handle huge amounts of longitudinal data, and to guard against inappropriate inferences.

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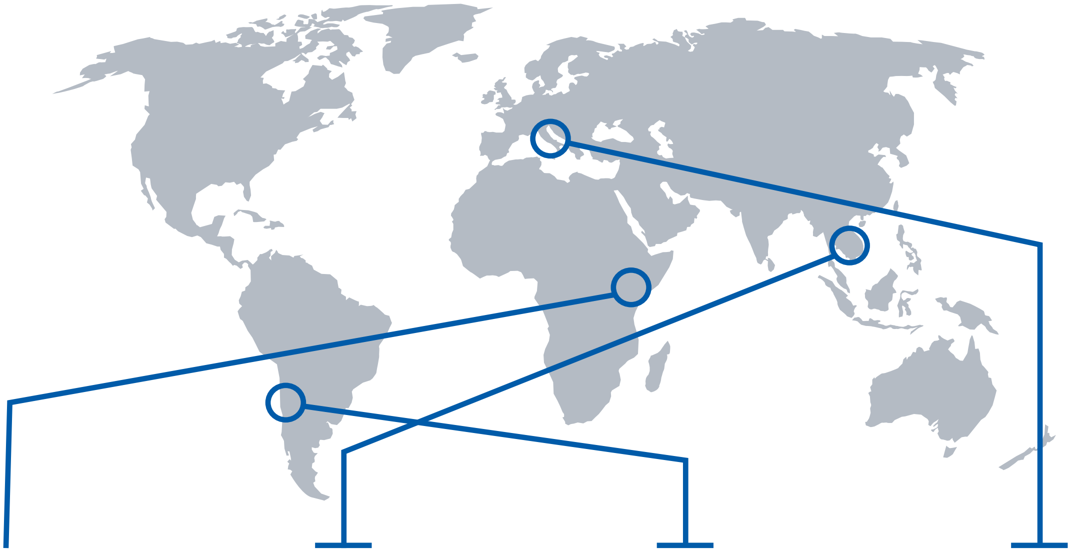

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Prepared by Stephen Lewandowski, Megan Marziali, and Vrinda Kalia. Columbia University, New York, NY. Correspondence should be sent to the AJPH Global News team at vk2316@cumc.columbia.edu.

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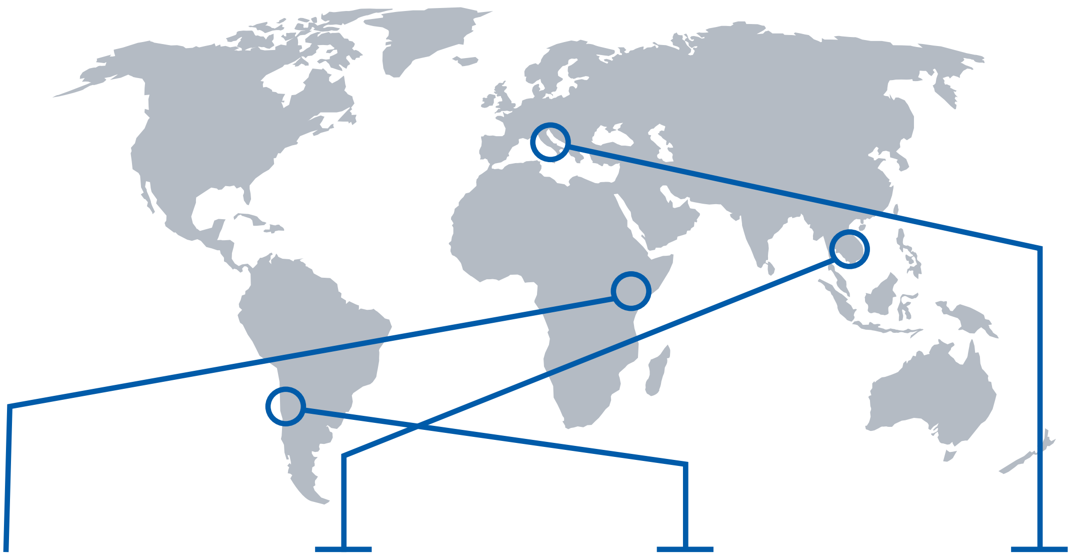

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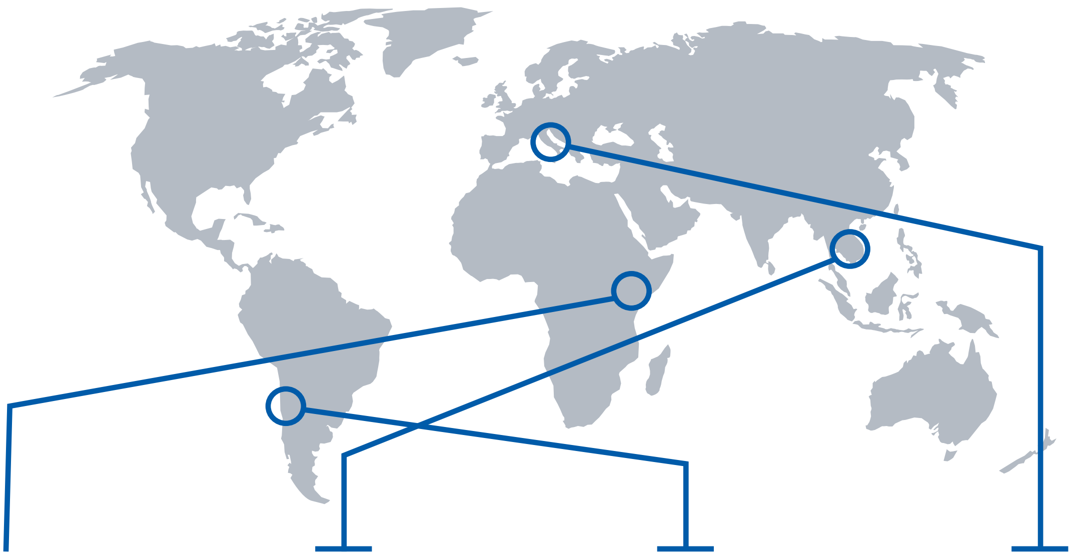

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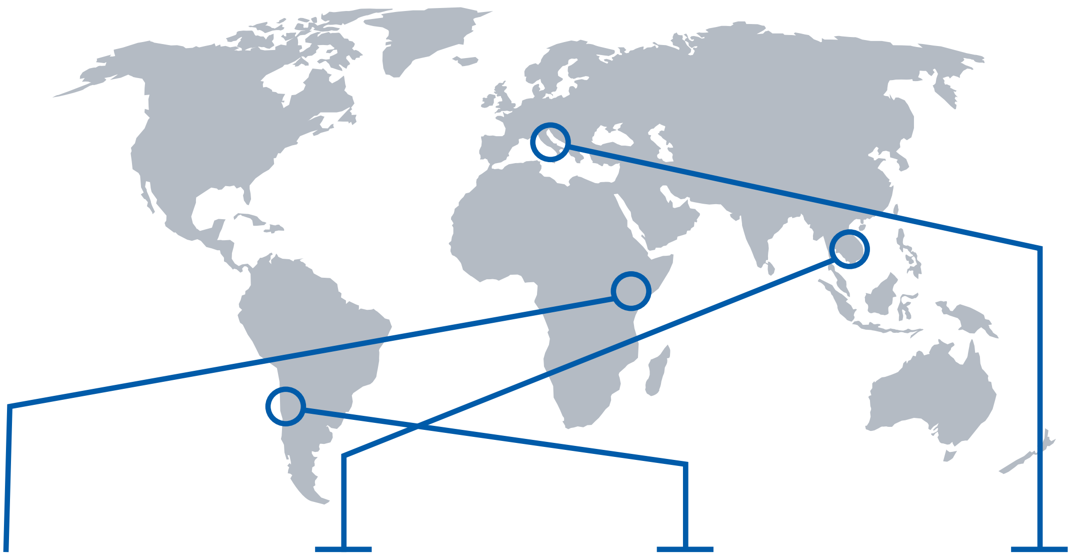

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Kenya

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Citation. Shikuku DN, Nyaoke IK, Nyaga LN, Ameh CA. Early indirect impact of COVID-19 pandemic on utilisation and outcomes of reproductive, maternal, newborn, child and adolescent health services in Kenya: a cross-sectional study. *Afr J Reprod Health*. 2021;25(6):76–87. https://doi.org/10.1101/2020.09.09.20191247

Occupational Health in a Tropical Climate

Thailand

Thailand's occupational heat exposure standard is based on a wet bulb globe temperature. To determine whether this standard protects workers, Phanprasit et al. monitored 168 construction and factory workers, collecting workload classifications, physiological responses, workplace heat stress factors, and self-reported heat stress symptoms. They found differences in body temperature and reported symptoms owing to workplace compliance status. They determined an odds ratio of 1.85 (95% confidence interval = 1.44, 2.48) for the presence of symptoms for each 1° centigrade increase in wet bulb globe temperature. The results indicate that current standards are protective when compliance is enforced; however, the authors recommend the addition of defined work–rest cycles as an improved policy measure.

Citation. Phanprasit W, Rittaprom K, Dokkem S, et al. Climate warming and occupational heat and hot environment standards in Thailand. *Saf Health Work*. 2021;12(1):119–126. https://doi.org/10.1016/j.shaw.2020.09.008.

Environmental Determinants of COVID-19 Transmission

Chile

Correa-Araneda et al. examined the role of environmental factors in COVID-19 infection rates using data from 360 cities representing 5 different climatic zones: desert, semiarid, Mediterranean, marine west coast, and tundra from February 23 to August 16, 2020. The authors defined infection rate as the ratio of number of infected inhabitants per week over the total population times 100 000. Using daily climatic data obtained from 159 meteorological stations, Correa-Araneda et al. found that transmission was affected the most by 3 factors: minimum temperature, atmospheric pressure, and relative humidity. Transmission was greater in colder and drier cities and when the atmospheric pressure was low. These results are in line with studies from other parts of the world where transmission has been found to be enhanced in colder and drier climates.

Citation. Correa-Araneda F, Ulloa-Yáñez A, Núñez D, et al. Environmental determinants of COVID-19 transmission across a wide climatic gradient in Chile. *Sci Rep*. 2021;11:9849. https://doi.org/10.1038/s41598-021-89213-4

A Dashboard to Analyze Italy's COVID-19 Data

Italy

Parolini et al. created a new dashboard named epiMOX that gathers historical epidemiological data from 19 Italian regions and 2 autonomous provinces. The dashboard provides a comparative analysis of the 2 COVID-19 waves in Italy in 2020 and predicts the expected trend of the pandemic in the near future. Using the dashboard, Parolini et al. noted that (1) stringent nonpharmaceutical interventions in the early phase of an outbreak can slow transmission, and (2) the second wave of the epidemic in Italy had a slower transmission rate but had more widespread effects in the country, leading to greater death rates and a greater need for intensive care. Using a compartmental epidemiological model, the dashboard can predict the evolution of the pandemic that can help decision making for implementation of nonpharmaceutical interventions in Italy.

Citation. Parolini N, Ardenghi G, Dede' L, Quarteroni A. A mathematical dashboard for the analysis of Italian COVID-19 epidemic data. *Int J Numer Method Biomed Eng*. 2021;37(9):e3513. https://doi.org/10.1002/cnm.3513

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A Modern Primer for Effective Public Health Advocacy

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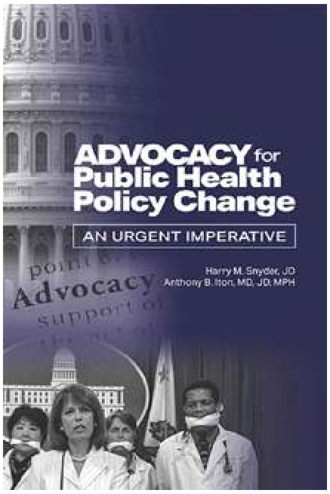

Advocacy for Public Health Policy Change: An Urgent Imperative
By Harry M. Snyder and Anthony B. Iton
250 pp.; $69.00
Washington, DC: APHA Press, 2020
(softcover and e-book)
ISBN: 978-0-87553-313-1

Public health practice necessitates effective advocacy for policies that improve the conditions of our society and thus the health of our communities. *Advocacy for Public Health Policy Change: An Urgent Imperative* by Harry Snyder and Anthony Iton is a concise yet thorough work that outlines the importance of advocacy for public health practice and includes practical steps on how to advance policy change through advocacy. The book walks readers through critical components of designing and implementing an advocacy strategy.

The first half of the book sets the stage with the foundational skills needed for advocacy. Readers are coached through developing an advocacy plan, gathering data, creating effective communication strategies, and building support through coalition building and community organizing. The second half of the book delves into different spheres of advocacy including advocacy through legislation, administrative advocacy, administrative petitions, use of ballot and referendum processes, and use of courts. The book also examines how advocacy can function in a private-sector or multinational organization setting and how direct action can be used as part of an advocacy strategy. The important issue of funding and sustainability for advocacy work is addressed as well.

The strengths of the book are its readability and how the authors expertly contain a large amount of helpful information in a very manageable length of text. Thus, this book would be a perfect addition to a graduate-level course on advocacy and could also be pleasurable reading for anyone who wants to gain more knowledge about the complex workings of public health advocacy. The book skillfully uses many diverse real-world examples of advocacy in action that serve to solidify the principles described and make the lessons all the more memorable for readers. The text provides many practical resources for those who want to dive deeper into specific topics.

The authors' years of experience show not only in their ability to distill very complicated work into digestible parcels of information but also in the nuggets of wisdom scattered throughout the book. Many of these wise words are "the sort of thing they don't teach you in a textbook"; however, the authors have made sure to include the kind of savvy advice one gets from a wise and seasoned colleague over coffee. The authors do a great job of providing insights into the perspectives of policymakers, why advocacy efforts may be met with resistance, and ways to use an understanding of policymakers' interests to achieve advocacy goals.

The book is skewed heavily toward advocacy in the context of the United States, although toward the end it does broaden its scope to make connections to global health advocacy. Readers who are primarily working in non-US settings may benefit from supplementing this work with readings more focused on the global health context or the country in which they are working.

This book is an excellent primer for effective policy advocacy in public health and a helpful refresher on key concepts for those steeped in such work. The authors do a good job of demystifying the advocacy process and drive home the fact that anyone, no matter their skill set or resources, can find a way to engage in advocacy. Armed with the knowledge within the book's pages, readers will be able to engage in effective advocacy for public health. AJPH

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Implementing Quality of Care Measures: Lessons from a Standardized Patient Study in Seven Provinces of China

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See also Xu et al., p. 913.

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In this *AJPH* issue, Xu et al. (p. 913) helpfully detail an impressive implementation advancement of the unannounced standardized patient (USP) method as part of a large project to longitudinally track the quality of primary care across a large geographic area. New constraints imposed by the COVID-19 pandemic required the team to design new and resilient techniques to ethically and safely conduct a large, representative data collection effort in China, the most populous country in the world. The authors' initiative, the Primary heAlth Care quAlity Cohort In ChinA (ACACIA), was launched in 2017 with the original protocol published by the authors elsewhere.[1] ACACIA uses USPs to collect data on the quality of primary care, allowing the evaluation of the appropriateness of care based on the true underlying condition the USPs simulate in clinical encounters with providers.[2] Using representative sampling, the study overcomes selection issues prominent in most "real patient" data. These learnings have implications for how future studies can develop resilient data collection infrastructure in postpandemic primary care environments.

CONTEXT: STANDARDIZED PATIENT STUDIES

Western societies are largely familiar with standardized patients (SPs) as a training tool for medical students, but around the world (especially in resource-constrained settings and those without easily accessible and routinely collected data), the USP method has increasingly become a popular option for obtaining reliable care quality data. SPs are locally recruited individuals who undergo training to portray—often unannounced—a standardized, simulated case scenario to a sample of practicing providers at health facilities. After the visit, the SP recalls elements of the encounter through a structured questionnaire, and the data captured are translated into quality-of-care measures. Procedures are strictly followed to ensure all research conduct is ethical, and the data reveal levels of appropriate and inappropriate care provided.[3]

It is important to recognize how these data differ from medical records and why USP data should not be considered a substitute for real-patient data or vice versa. Because of standardization, USP data allow researchers to examine the care provided in response to the same patient presentation by different providers composing an intentionally designed sample. Because the underlying condition is known (predetermined) by the researchers, several crucial advantages exist over other data types. First, the correct (and incorrect) diagnosis and the appropriate (and inappropriate) treatments are known by design. Second, how a provider arrives at a specific diagnosis through the process of analyzing patient history and conducting physical examinations, known as differential diagnosis, can be accurately evaluated. Third, provider practice can be benchmarked to existing guidelines and the protocol(s) for the condition(s) of interest. These nuances of appropriateness of care are difficult to ascertain when examining quality of care data derived from real patients, because the underlying conditions of real patients are not known; only the diagnosed conditions (if any) are available, and validated USP data have regularly shown that most interactions result either in no formal diagnosis or in incorrect diagnosis. For this and other reasons (such as case-mix confounding) described elsewhere, the USP method has opened the door for researchers to understand new and critical dimensions of quality of care.[3]

Before COVID-19, the evidence base in global health for quality of care was rapidly expanding thanks to innovations in USP study design. Government commitments to improve health reflected a critical understanding that achieving universal access to health care could be detrimental if that care is not high quality or equitable. Specifically, USP studies across countries in Asia and Africa (totaling more than 20 000 observations) amassed evidence shedding new light on a wide variety of quality-of-care topics, including primary care patterns, patient–provider dynamics, the role of patient characteristics, laboratory quality issues, overuse of antimicrobial medicines, provider decision-making, private sector engagement, public and private sector differences, and new evaluation approaches to quality improvement interventions.[3–5]

LESSONS: ACACIA DURING COVID-19

In their article, Xu et al. detail three particularly notable elements related to using USPs for health care research: scale, scope, and use of technology. In terms of scale, the study covers seven Chinese provinces where nearly 400 million people—28.2% of China's 2020 population—reside.[6] For scope, where other published SP studies typically present one to five health conditions, the team developed 12 SP case scenarios and implemented 11 presenting conditions while laudably expanding the available conditions to mental health with a postpartum depression scenario. Last, the use of technology throughout the entire SP implementation process from design to data collection, including monitoring, appeared essential for reducing expenditures without sacrificing implementation fidelity.

In addition to building a resilient data structure for capturing quality of care measures, Xu et al. document lessons and cost-conscious processes that extend existing resources within the field on how to implement the USP method for health care quality research.[3,7] Despite the wide scope of case scenarios, the authors estimate that, by the end of the project, the effort will cost less than two million Chinese yuan (approximately US $300 000–$350 000 for 2200 planned SP visits, or US $136–$159 per visit), falling within the lower bound of average cost per visit in other studies conducted in other settings.[3]

In addition to the implementation learnings, Xu et al.'s study shows that only 27.3% of SP visits have received accurate diagnoses and 19.2% have received entirely incorrect diagnoses. If these trends persist, there is a case to be made that these figures should replace the findings from a 2007 systematic review reporting that providers were performing 40% to 60% of recommended guidelines; however, more careful discussion is warranted on outcome definitions, selection bias in analyzing medical record data, and the ability to generalize to other settings. Nonetheless, analyses derived from the ACACIA project will certainly contribute to the global understanding of why quality of care is low and varied and what mechanisms may improve the appropriateness of care.

IMPLICATIONS: FUTURE STANDARDIZED PATIENT STUDIES

Not all SP studies will be able to replicate the techniques mentioned with the same level of efficiency, nor will all SP studies be able to leverage the same avenues as Xu et al. did. For example, in the Quality of Tuberculosis Care surveillance study conducted in two Indian cities, voice recording SP–provider encounters was impossible in clinics we sampled because of noise pollution and the inability to decipher what "take this medicine" and "that one twice a day" referred to when listening to recordings.[8] In addition, technology use for capturing data after SP visits proved difficult in monsoon season.

In terms of scale, not many studies will be able to have an impact on such a large population without spanning data collection efforts across multiple countries. On USP study implementation costs, a formal multistudy costing analysis will illuminate the extent to which upfront training and technology costs and recurring human resource and transport costs accounting for distance and spatial spread influence USP study expenses. Certainly, the shared learnings revealed through Xu et al.'s experience can both provide a cheaper way to conduct additional waves or expand ACACIA in the future, and they can provide ideas for other teams to draw from when implementing small- or large-scale studies of this kind.

CONCLUSION

A successful outcome of the COVID-19 pandemic may be that we are able to better understand mechanisms to improve quality of care, particularly for subpopulations that continue to experience disparities. This cannot happen without robust, cost-effective data structures that collect and monitor quality improvement efforts. With these systems in place to collect USP data across a large geographic area, China will be equipped with additional data to move the needle on its pledge to "provide all citizens with equal access to basic health care with reasonable quality and financial risk protection" as long as it has the will to continue to be able to respond to the issues identified from the data.[9] Xu et al.

provide a critically important exposition into what it takes to put quality-of-care data first at a time when the world grapples with how fragile health and health care can be. The full results of the ACACIA study and other postpandemic USP studies will be essential to understand primary care environment changes and levels of quality as governments, providers, and care seekers adapt to new public health realities. AJPH

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CONFLICTS OF INTEREST

The author has no conflicts of interest to declare.

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Setting the Stage for the Next Phase of Social Determinants of Health Research

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See also Udalova et al., p. 923.

Although social determinants are increasingly recognized as important influences in health outcomes, obtaining accurate data about social determinants of health (SDH) is often a challenge. Publicly available data may be too coarse to be applicable to individual patients, and screening programs to collect individual-level determinants, although expanding, are not yet optimized. In addition, the debate about the usefulness of community-level versus self-reported SDH data remains open, with the former seen as more useful for policymakers or population health and the latter seen as more useful at the individual clinical encounter level.[1]

In this issue of *AJPH*, Udalova et al. (p. 923) demonstrate an approach to fortifying the utility of community-level data by linking Census Bureau data to clinical data at the individual level. The authors accomplished this through a process that began with a complicated data use agreement that required education, negotiation, and specification on both sides and ended with greater than 94% linkage between protected identification keys from the Census Bureau and the patients in the clinical data set. Although 90% of the patient matching was based on Social Security numbers, the algorithm performed nearly as well when Social Security number information was removed from the data set. The authors note that microlevel Census Bureau data may be useful for health systems in determining whether they are serving a representative population, correcting for bias in data sources, and evaluating estimates based on larger area statistics (e.g., Census blocks).

FACILITATING ACCESS TO PUBLIC DATA

Although the authors are to be commended for their perseverance, the complicated process for obtaining a data use agreement and exchanging data, on both sides, is an opportunity to increase access to data—obtained through taxpayer funding—that can be important in health care decision-making. In addition, even though the health care system in the article represents a variety of settings, including urban areas, one wonders if the approach is scalable to a more densely populated urban environment or to systems in which patient address data are not updated regularly or more likely to contain errors. One potential outcome from this project could be a template data use agreement or an accessible, formal set of processes that can further democratize access to Census Bureau data, because institutions without the commitment and expertise of the authors may be missing out on these types of opportunities. The Census Bureau could also work with clinicians or health researchers to determine how best to use or integrate clinical and Census Bureau data, as the authors note in their future plans.

The authors have clearly demonstrated the intersections of the missions of the Census Bureau and their health care system. The project provided a great deal of two-way learning for both parties. Ideally, this will be the first step in greater cooperation, with the Census Bureau receiving and developing methods to analyze more expansive data sets from electronic health records and researchers receiving data sets that cover a large portion of their population. These types of partnerships are great opportunities to demonstrate the value of investment in data collection important to public health and innovative approaches to its use.

THE NEXT PHASE IN SOCIAL DETERMINANTS RESEARCH

In implementing data collection related to SDH, as in this article, institutions should explore several pertinent questions. How will they present the data or the results of its analysis to the relevant stakeholders? How will the insights provided by the data be put into practice, through either population-level or individual clinical interventions? At the patient level, do patients want their physicians or other health care providers to know this much information about them, regardless of its potential beneficial impact?[2] At the system level, if the data show gaps in social needs, are community resources available and sufficient to provide services to fill the gaps?

The realization of the impact of SDH has paralleled health care systems' stepping into traditional public health and social services[3] in areas such as establishing supportive housing.[4] The partnership with the Census Bureau gives a roadmap for government, with a focus on its own data and access to complementary health data, to reinvest in its traditional role as a provider of many services that health systems and community organizations are currently providing.[5] These partnerships are also opportunities for health care systems and medical training programs to broaden their understanding of the role of public health and social determinants in their patients' overall health, ideally leading to improved coordination between these traditionally siloed sectors in improving outcomes.

Now that the authors have shown how to obtain American Community Survey data and link it to individuals, they are poised to contribute to the literature and to help resolve the debate around the real benefits and impacts of obtaining data on SDH. As screening and other data collection programs around SDH have taken off, the literature about the impact of the data and the ability to put the data to use to improve patients' lives and outcomes remains sparse. Most of the literature remains focused on process measures (i.e., screenings or referrals completed) rather than on health outcomes. With access to plentiful data, now is the time for the community to move to the next phase and establish robust evaluation programs to measure the impact of these programs, from data collection to interventions addressing social determinants, on patient and community outcomes. AJPH

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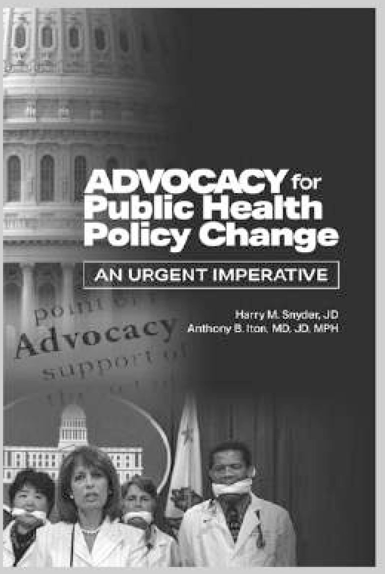

Cost-Attributed Medical Care Disruptions Are a Concern Among US Adults With Food Insecurity During the COVID-19 Pandemic

Yibin Liu, PhD, CPH, and Heather A. Eicher-Miller, PhD

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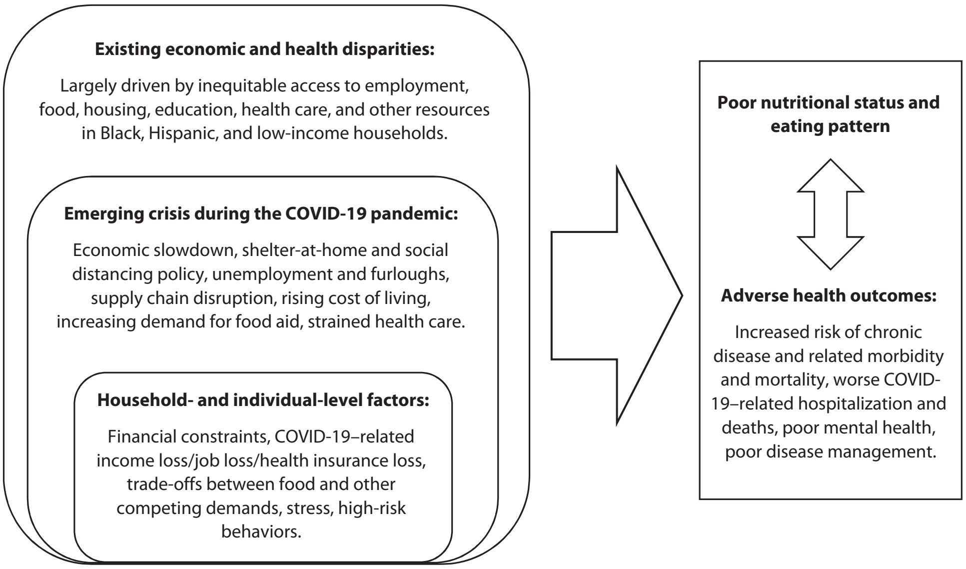
In 2020, an estimated 10.5% of US households were food insecure, which refers to not having access at all times to enough food for an active, healthy life.[1] Certain groups were disproportionately affected, including households with children, Black and Hispanic households, and households with income below 185% of the poverty threshold.[1] Food insecurity is a known risk factor for poor nutrition and chronic disease burden and is conceptualized to have an impact on health through various levels and sources of factors (Figure 1).[2,3] For example, less money may constrict resources allocated to food, health care, housing, and other basic needs, all of which could ultimately influence health outcomes.

FOOD INSECURITY–RELATED INEQUITIES DURING COVID-19

These existing disparities may be magnified in the short term during the COVID-19 pandemic because of rising unemployment, economic disruptions, social distancing policies, and overwhelmed food-assistance programs, despite long-term overall US household food insecurity stability from 2019 to 2020.[1,2,4,5] In the May issue of *AJPH*, Bertoldo et al. (https://bit.ly/3FhVxCa) examine the food insecurity prevalence in the United States and the associations with underuse of medical care during the COVID-19 pandemic because of cost, using a nationally representative sample. A major finding of the study was that, because of cost concerns, forgoing eight types of medical care utilization was linked to food insecurity experienced during the COVID-19 pandemic; the odds of skipping a treatment or medical test recommended by a doctor and skipping a prescription refill because of cost concerns were the greatest among food-insecure adults compared with their food-secure counterparts. The underuse of medical care can have an impact on the management of existing chronic diseases, treatment of acute complications from COVID-19 and other health conditions, and screening and other preventive care, all of which may have short- and long-term health implications.

Regardless of food-security status, a high frequency of forgone care (41%) was reported in the overall US adult population from March to mid-July 2020.[6] The decision to forgo medical care may have been influenced by varied individual and societal factors, such as the emergency stay-at-home orders, cancellation on elective surgeries, temporary and voluntary closure of medical practices, the shift to telehealth delivery, and avoidance because of fear of viral exposure. Individuals may have weighed risks versus benefits, especially for preventive care, while facing an overwhelmed health system and increased risk of viral exposure.

Among the various reasons, forgoing medical care because of cost, and especially treatment of disease (not prevention) is more concerning as these individuals might face greater barriers and trade-offs between medical care and other competing demands. Food insecurity compounded by the unique hardships generated by COVID-19 can add to an individual's vulnerability and to adverse health effects experienced during the pandemic.[2] Indeed, not only were low-income adults and racial/ethnic minority groups among the hardest hit, but they also experienced worse COVID-19–related hospitalizations and deaths.[2,4,7] Evidence suggested that Black and Hispanic populations were 1.5 to 4 times more likely to be hospitalized and had 3.2 times the mortality risk compared with White populations.[7]



Existing economic and health disparities:

Largely driven by inequitable access to employment, food, housing, education, health care, and other resources in Black, Hispanic, and low-income households.

Emerging crisis during the COVID-19 pandemic:

Economic slowdown, shelter-at-home and social distancing policy, unemployment and furloughs, supply chain disruption, rising cost of living, increasing demand for food aid, strained health care.

Household- and individual-level factors:

Financial constraints, COVID-19–related income loss/job loss/health insurance loss, trade-offs between food and other competing demands, stress, high-risk behaviors.

Poor nutritional status and eating pattern

Adverse health outcomes:

Increased risk of chronic disease and related morbidity and mortality, worse COVID-19–related hospitalization and deaths, poor mental health, poor disease management.

FIGURE 1— Conceptual Model for Understanding the Impact of Food Insecurity in the Context of COVID-19 on Nutrition and Health

Source. Modified from the framework published by Leddy et al.[2]

IMPLICATIONS FOR FUTURE RESEARCH

Reference period is a key considering factor for investigating the relationship between food insecurity and medical care disruptions; essentially, the reference period should be parallel for these measurements. On average, households classified as food insecure in the annual US estimates using the 12-month reference period experienced food insecurity in seven months during the year, and about one fourth of food-insecure households experienced the associated conditions almost every month.[1] This illustrates the episodic nature of food insecurity; thus, estimates based on a 30-day versus 12-month reference period may vary considerably. In fact, in the measurement of 30-day household food insecurity from mid-November to mid-December 2020, the Economic Research Service reported an estimated household food insecurity rate of 5.7% that was much lower compared with the 12-month measure.[1] A substantially higher prevalence is only reported among households with a reference person who was unable to work because of the pandemic (16.4% food insecure in the 30-day period) and households with a reference person who was unemployed and was prevented from looking for jobs because of the pandemic (20.4% food insecure in the 30-day period).[1]

Together, such evidence suggests that the reference period has a critical influence on the resulting estimates. During COVID-19, food-insecurity episodes may have spiked in the beginning and fluctuated over time when government responses and community efforts were put in place to combat food insecurity. Therefore, the 18.8% adult food insecurity noted in the Bertoldo et al. results offers a snapshot at a brief timepoint during the COVID-19 pandemic that may not easily be compared with other national estimates.

By January 2022, the COVID-19 hospitalizations reached record-breaking numbers and hospitals were strained across the United States because of the highly transmissible Omicron variant.[8] Hospital admissions and shortage of heath care workers reaching crisis levels could affect anyone in need of medical care but particularly those with ongoing chronic disease and individuals without equitable access to care. In light of the findings of Bertoldo et al. indicating disparities in medical care linked to food insecurity, additional forgone treatment because of cost in the current situation may occur. Additional studies to examine the extent of COVID-19–related disruptions in preventive care versus ongoing treatment and disease management in the food-insecure population are important to inform potential policy to mitigate disparities. Furthermore, investigating other reasons besides costs could help uncover the most important drivers for forgoing care during the pandemic and how these reasons may differ across food-security status in the long term. Comparing the pandemic versus prepandemic prevalence of cost-related medical care underuse in food-insecure populations would also be informative.

Overall, investigating the impact of COVID-19 on food insecurity and its association with underuse of medical care is critical in directing resources and programs to the most at-risk groups. In response to COVID-19, the federal government has passed temporary policies, including changes and additions to unemployment benefits, nutrition assistance programs, stimulus payments, and moratoriums on evictions.[1] Additional relief was provided in the American Rescue Plan Act of 2021, including expansion of the Affordable Care Act that improves marketplace access and affordability, subsidization of health insurance continuation coverage for laid-off workers, and incentivization for states to expand their Medicaid programs, in addition to issuing more direct payment, extended unemployment benefits and paid sick leave, housing assistance, and additional resources for the COVID-19 public health response.[9] In 2021, the US Department of Agriculture also updated the Thrifty Food Plan, which led to a permanent increase in the Supplemental Nutrition Assistance Program benefits.[10] While causal evidence is not available, these policies are likely to have been influential in the stable overall US prevalence of food insecurity and suggest their potential to reduce hardship and improve equity. Research and political will is further needed to determine effectiveness of national and local policies to build a stronger safety net to eliminate food insecurity and related adverse outcomes in the socioeconomically disadvantaged groups.[2] AJPH

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Structural Interventions That Reduce HIV Vulnerability: A Public Health of Consequence, June 2022

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See also Baker et al., p. 860, and Onwubiko et al., p. 881.

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In the world of HIV prevention and intervention, it is well recognized that structural drivers such as political, economic, and environmental contexts increase individual-level HIV vulnerability. Extensive evidence also documents how the interplay between structural drivers and social forces including stigma, discrimination, and harmful cultural norms can thwart HIV prevention efforts that would otherwise reduce population-level HIV incidence and prevalence. For example, structural interventions such as drug policy reforms have struggled in the face of implementation gaps driven by stigma and discrimination.

Similarly, there is substantial evidence that individual-level biomedical prevention and intervention efforts such as early and routine HIV testing do not achieve their full preventive potential when implementation efforts lack consideration of the sociostructural drivers of HIV vulnerability. This review spotlights two public health practice pieces describing distinct HIV prevention initiatives and discusses how they integrate, or need to integrate, intervention efforts at the social and structural levels to meet the goal of ending the HIV epidemic in the United States and globally.

REDUCING ABUSIVE POLICING OF PEOPLE WHO USE DRUGS

A key structural intervention to reduce harms associated with injection drug use is removal of legal barriers to safer injection practices. These barriers include, but are not limited to, legalization of syringe possession and decriminalization of drug possession. The movement to eliminate these barriers is in response to the failure of criminal and carceral models to prevent injection drug use, the unsustainable cost and resource burden associated with maintaining these systems, and the multiple levels of stigma and discrimination that these punitive models perpetuate. Legalization of syringe possession and decriminalization of drug possession signal a structural shift in drug policy, one toward a harm reduction model that at its core prioritizes public health good for disenfranchised people.

Given this context, Mexico has decriminalized syringe possession, legalized syringe sales at pharmacies, and decriminalized the possession of small amounts of drugs. Despite the enactment of these policies, abusive policing practices in areas of high drug activity, such as the US–Mexico border town of Tijuana, have weakened the population-level impact of these structural interventions. To intervene and reduce such practices, Baker et al. (p. 860) describe an initiative conducted in partnership with the Tijuana Municipal Police Department and the town's police training academy to improve knowledge of syringe possession laws, enhance occupational safety by focusing on preventing needlestick injuries, and reduce negative attitudes toward people who inject drugs by providing information on the value of harm reduction strategies. The intervention, embedded in the police academy and led by trained police officers, reached 80% of the police force (1806 officers) and, among officers with correct knowledge of syringe laws, resulted in 37% lower odds of reports of arrests for syringe possession.

This type of initiative serves as a reminder that structural interventions such as drug policy reforms cannot effect positive change in isolation. To realize the population-level benefit of policy interventions such as drug policy reforms, we cannot neglect institutional cultures, practices, or social norms that will otherwise undermine these reforms. Also, as evidenced by Baker et al., training initiatives for local police officers are a necessary social intervention that affects not only abusive policing practices but drivers of those practices—stigma, discrimination, and lack of education—that must be eliminated to create social environments supporting and sustaining drug policy reforms.

INCREASING ACCESS TO HIV TESTING

The second practice piece in this issue addresses access to HIV testing among people experiencing homelessness (PEH). Onwubiko et al. (p. 881) describe a collaboration between the Fulton County Board of Health in Georgia and a community-based partner organization to expand HIV screening in Atlanta homeless shelters by adding mobile testing units and field teams. Increasing access to HIV testing, in and of itself, remains a cornerstone of HIV prevention and intervention efforts.

First, increased access to HIV testing can mitigate individual-level HIV vulnerability as well as population-level risk by increasing knowledge of HIV serostatus. Second, Black and Hispanic/Latino/a/x as well as transgender people of color are overrepresented among PEH and are at heightened HIV vulnerability. By increasing access to routine HIV testing among PEH, we can strive to reduce racial inequities in access to testing and knowledge of HIV serostatus. Third, routine HIV testing programs available via community-based partnerships outside of medical or clinical settings can target hard-to-reach PEH who are both at heightened HIV vulnerability and less likely to engage with traditional care settings and can reduce structural barriers to accessing much-needed health care and social services.

But is increasing access to HIV testing alone enough to move the needle in HIV prevention? Clearly, HIV prevention and intervention for PEH cannot and must not stop at individual-level testing. Biomedical and behavioral interventions that include referral to accessible HIV medical care, uptake of and adherence to antiretroviral therapies, and social support and treatment services for substance use or abuse, mental health needs, and alcohol dependence are the wrap-around clinical and social services that PEH require. Equally important is access to safe, affordable, stable, and supportive housing; such structural interventions can not only reduce HIV vulnerability but also improve overall long-term health and well-being among PEH living with HIV. We need to advocate for and develop intervention agendas that weave together the biomedical and the behavioral and are nested within structural interventions that meet the specific needs of the population of interest. For PEH, failure to address the more challenging obstacles to housing solutions will continue to undermine advances in biomedical and behavioral interventions.

WE NEED SOCIAL AND STRUCTURAL HIV INTERVENTIONS

The reality of declining budgets and shifting priorities means that we need HIV interventions that will fundamentally change the underlying vulnerabilities that have fueled HIV risks and poor health for far too long. Social interventions that reduce stigma and discrimination and disrupt negative cultural and social norms, in concert with structural interventions to change the economic, political, and environmental determinants of HIV, will foster an environment that allows biomedical and behavioral interventions to achieve maximal efficacy. In short, we need coordinated interventions that impart changes in real life and for real people to achieve a public health of consequence. AJPH

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Impact of COVID-19 on People Experiencing Homelessness: A Call for Critical Accountability

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See also Dentzer, p. 832.

In January 2021, the US Interagency Council on Homelessness (USICH) published a report detailing outcomes of its efforts to address the effects of the COVID-19 pandemic on people experiencing homelessness (PEH) in 2020.[1] USICH consists of leaders from 19 federal agencies and was authorized by Congress in 1987 to coordinate the federal response to homelessness.[2] The council's stated mission in its COVID-19 response, which its report claims to have achieved, was to "save lives and not crash the emergency medical system."[1]

We write as an interdisciplinary team conducting ongoing community-based research in partnership with homelessness service organizations in Indiana. Since April 2020, we have examined the challenges faced by PEH during the COVID-19 pandemic and the organizational-, community-, and system-level responses with respect to risk and impact mitigation.[3] Our findings, although specific to Indiana, raise critical questions about the conceptual framings, methodologies, and conclusions presented in the USICH national report.

Although the USICH report was published under the previous administration, whose attempts to defund the council and multiple low-income housing programs have been well documented,[4] it nonetheless continues to be the latest available federal report on the effects of the pandemic on homeless populations in the United States. Given its authoritative position as a governmentally sourced communication, we urge new USICH leadership to critically interrogate how these data on PEH were conceptualized, collected, and used[5]; to be clear about the report's limitations; and to provide a more nuanced and evidence-based update on the status of the council's ongoing efforts.

TROUBLING CLAIMS

The USICH report suggests that homeless populations have fared better than expected as a result of "early and firm action" by federal agencies and claims that COVID-19 cases and deaths among PEH have been "significantly and dramatically lower than had been originally projected."[1] Death counts, described as more precise than reported cases, serve as the primary indicator of COVID-19's impact on PEH.

Preliminary data from the Centers for Disease Control and Prevention (CDC) indicate that there were 224 deaths among PEH in 2020, which the report augments by 15% to correct for an estimated undercount based on unexplained "field observations."[1] These calculations formed the basis of USICH's assertion that the US government successfully accomplished its mission to save homeless lives. USICH then applied a ratio of 1.72, calculated according to the ratio of deaths (344 497) to cases (19 943 605) within the general public in 2020, to the reported number of PEH deaths and estimated that the likely number of cases among PEH was between 14 241 and 15 737. The report concluded that the lower than expected number of cases among PEH reported to the CDC (12 111), relative to how high it allegedly could have been, indicates that the government's efforts "made a significant difference in reducing the number of positive cases and deaths among PEH," which were, notably, "lower relative to the general public."[1]

These claims are conceptually and methodologically unsound, especially in light of overwhelming evidence showing how structural inequities have contributed to the unequal burden of COVID-19 on disenfranchised communities and individuals. For example, the COVID-19 pandemic has been especially deleterious for communities of color and incarcerated populations.[6] For similar reasons, the pandemic has had devastating effects on PEH, as this population chronically faces various forms of systemic oppression (e.g., economic precarity, social stigma, and discrimination) that exacerbate health disparities and marginalize them from health and social services.[7,8] PEH also encounter heightened risk of community transmission because of their congregate living conditions.

Given that the pandemic has disparately harmed the most vulnerable, we ask the following: By what logic would a standard ratio based on the general public in any way represent the experience of homeless populations? By which measures, and as a result of which actions, could PEH have fared "better than expected"?

Undercounts of COVID-19 deaths and positive cases are widespread within the US health system,[9] which, for PEH, is worsened by inconsistent data collection practices and data management systems. The report omits any mention of how imprecisely housing status is registered in health systems[10] and the extent to which homelessness is underrecognized in emergency hospital settings.[11] Furthermore, the report fails to provide a definition of homelessness and focuses narrowly on unsheltered individuals and those in homeless shelters, ignoring the growing numbers of hidden PEH who "couch surf" or are otherwise unstably housed.[12]

Only half of providers that are part of the Department of Housing and Urban Development (HUD) Continuum of Care program report using HUD's Homeless Management Information System,[13] and in May 2020, 12% reported that pandemic data were not being systematically collected, citing HUD's delayed requirement for COVID-19 data collection.[14] Nearly a third of these providers have service populations of 1000 people or more at any point in time who are mobile and, thus, difficult to reach and test.[14] Agencies reporting to the CDC have not been able to systematically test members of this population, which may have elicited a clearer picture of incidence and mortality rates among PEH. Missing from the USICH report is transparency of and accountability for the limitations of the reported numbers. Rather than drawing conclusions based on ratios applied to partial figures, we encourage USICH to acknowledge what is—and is not—supported by existing evidence.

COUNTERING CLAIMS: VIEWS FROM THE FRONT LINE

Findings from our ongoing community-based research in partnership with frontline homelessness service organizations in Indiana provide a divergent view. Our data include in-depth interviews with the staff of homeless shelters and other community-based organizations as well as the PEH they serve.[15] It is evident that the burdens faced by PEH and the general population are not equivalent, and thus applying a general ratio of deaths to cases is fundamentally flawed. Our data reveal that PEH are more likely to present with preexisting health issues, suffer from poor mental health, experience high rates of substance use, and report low health literacy, contributing to low adherence to COVID-19 safety measures such as mask wearing and social distancing.[3] As one service provider explained,

> Not only do they not have homes, they all have horrible health. So, you know the targeted criteria for those who are at high risk for COVID? . . . Well, that's almost everybody in here [shelter].

Moreover, USICH's assertions about PEH being "tested more often and at a higher rate than the general public"[1] are unsubstantiated. Our research, as well as a national study conducted by the National Alliance to End Homelessness, indicates that the opposite is true.[3,14] Shelters throughout the country have experienced staffing and supply shortages,[8] making testing and contact tracing exceptionally difficult. More than half of Continuum of Care providers reported having no testing capacity in May 2020, and only 14% reported sufficient capacity to test all individuals in a shelter where someone had tested positive.[14] By November 2020, 46% of these providers reported testing sheltered people with known exposures, and only 15% reported doing so for unsheltered people.[14]

Our qualitative data corroborate these findings. As of December 2020, Indiana homelessness service providers reported "just doing temperature checks" as a way to screen guests, a method that fails to identify asymptomatic individuals and does not reflect CDC guidelines on COVID-19 testing. According to one provider,

> the only avenue that we have is to call an ambulance and have [clients] tested through the emergency room. . . . But [they've] been sitting in the same room together, so they've already been exposed to each other.

Testing capacities among homeless populations were severely hindered; therefore, data from service providers reported to the CDC should be acknowledged and treated as partial and incomplete.

PROTECTION *FROM*, NOT *FOR*, THE MOST VULNERABLE?

The USICH report highlighted a mission to "protect the emergency medical system." The report presented emergency hospital visit numbers to claim that homeless populations used health services less frequently than expected throughout the pandemic: "in relative percentage terms, the community of homelessness has been visiting the hospital for COVID-19 significantly and dramatically less than the general public."[1]

Absent from the report is a discussion of the social, structural, financial, emotional, and geographic barriers faced by PEH when seeking health care. PEH report that patient–provider encounters often feel dehumanizing, disrespectful, and dismissive.[16] As one service provider taking part in our research stated, "They don't trust [medical providers] . . . they've never felt welcome there [hospital]." Pandemic-related challenges such as service disruptions and transitions to telehealth, the latter of which require technology largely unavailable to homeless and other disadvantaged populations, lead to health care encounters being even more inaccessible to PEH.[3] The report also does not specify whether PEH sought care beyond emergency medical services, nor does it acknowledge that many hospital systems saw reduced patient visits across all populations during the pandemic.[17]

We are critical of USICH's stated goal of "saving life" by protecting the emergency medical system from the incursion of use by PEH. Saving is commonplace rhetoric that supports the defense of something deemed valuable and vulnerable while inflicting harm by treating others, such as marginalized communities, as invulnerable and unworthy of protection.[18] Striving to protect the emergency medical system *from* PEH conveys a harmful message that it should be preserved *for* those presumably deemed more deserving. In this context, USICH's saving rhetoric exacerbates the dehumanizing health care encounters PEH report by celebrating the underuse of health services by a vulnerable population during a pandemic. Regardless of the rate at which PEH used health care during the pandemic, underuse should be considered an indicator not of public health success but, rather, of enduring forms of systemic neglect.

TOWARD CRITICAL ACCOUNTABILITY

We draw attention to the USICH report to consider the consequences of who is—and is not—being counted.[5] As a federal council, USICH's claims are positioned authoritatively and thus require close scrutiny and accountability, especially when countered by first-hand, frontline accounts.

Political motivation throughout the pandemic has incentivized underreporting or misrepresenting of data in the United States to show a rosier picture.[19] Reports such as that of USICH result from a dangerous line of thinking that no data means no problem. The reality is that homeless communities are systemically undernoticed as a result of poorly originated and inaccurate representations of their multidirectional needs. Slipping through the cracks is part of being homeless in the United States, where social safety nets have failed to keep 600 000 people from homelessness.[20] Four months after Congress allocated $4 billion in funding for PEH as part of the CARES Act, just 29% had reached those in need.[21] Barriers to accessing relief resources have largely excluded PEH from stimulus funding. As one PEH stated,

> The system has become so inadequate to people like us, the homeless . . . the government doesn't care. . . . The ones that are getting income, the ones on unemployment, they're getting the stimulus check. But true people that are homeless, they ain't getting shit.

The USICH report demonstrates how PEH also slip through the cracks of research theories and methods. Rather than hastening to embrace lower than expected estimates of incidence, death, or use of hospital services as evidence of success, we encourage interrogating the numbers further for what else they may convey, such as barriers to care, erasures, and not counting.[5] Critical reconceptualizations of research on homelessness may elicit alternative "metrics" that tell fundamentally different stories. Such considerations should inform data-driven policies (e.g., the latest CDC eviction moratorium order that applied exclusively to counties with high COVID-19 transmission rates during the Delta variant wave[22]), which can be effective only if data are robust and actually representative. With eviction moratoriums ending and homelessness projected to increase,[23] a rigorous understanding of the long-term effects of COVID-19 on PEH has become even more crucial.

Thus, we call on the current administration and new USICH leadership to invest in robust and critical data collection practices that elucidate the individual, community, and systemic realities of homelessness. We call on public health scholars to help redress the marginalization of homelessness within research on health disparities, which contributes to the dearth of reliable data on PEH that culminates in flawed reports such as that of USICH.

Specifically, we call for rigorous community-based, qualitative research with PEH and homelessness service providers around the country to contribute experiential, observational, and attitudinal insights toward a richer understanding of the pandemic's effect on homeless populations. Pandemic and disaster response efforts must center the voices of vulnerable communities and the frontline providers who best understand their specific needs and contexts. In addition to envisioning federal responses to public health crises that are dramatically more inclusive of the communities most affected, we call for broader acknowledgment of homelessness as a systemic condition that requires stronger commitment and investment if it is to be ended rather than simply mitigated. AJPH

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CONFLICTS OF INTEREST

Natalia M. Rodriguez is a member of the board of directors of a nonprofit homelessness service organization in Indiana.

HUMAN PARTICIPANT PROTECTION

This study was approved by Purdue University's institutional review board. Informed consent was obtained from all participants.

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Not Counting Homelessness in All Its Forms Is Not Acceptable

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See also Rodriguez et al., p. 828.

The editorial by Rodriguez et al. in this issue of *AJPH* (p. 828) recounts an episode in which the prior US administration took credit—based on flawed data and analysis—for a sharply lower rate of COVID-19 deaths among people experiencing homelessness than had been projected early in the pandemic. Just one day before President Trump left office in January 2021, in fact, the Trump appointees at the US Interagency Council on Homelessness (USICH)—the federal coordinating entity made up of leaders from 19 agencies with different roles in responding to homelessness—issued a report[1] claiming success in preventing the nation's emergency medical system from "crashing." This triumph supposedly stemmed from keeping homeless populations out of that system because they were relatively free of COVID-19. The report further claimed that homeless populations had fared better than expected because of "early and firm action" by those same federal agencies.

These "conceptually and methodologically unsound" claims about lower death rates were almost certainly neither true nor verifiable, Rodriguez et al. argue—not least because of undercounts of both COVID-19 cases as well as deaths. The authors also draw on their own experience conducting community-based research with frontline homeless service organizations in Indiana during the pandemic, citing facts on the ground that refute the argument that proactive strategies such as COVID-19 testing were keeping sheltered homeless populations safe.

As the editorial notes, the same administration also attempted to defund USICH, the interagency homelessness council, which has never been permanently authorized by Congress and limps by on a trifling annual budget of less than $4 million annually. It is therefore not surprising that a government entity that the administration held in so little regard, and treated so poorly, would issue a report so lacking in credibility. But the far more important point that the editorial implicitly raises is the broader problem of "not counting" in homelessness: the systematic undercollection of data that shed holistic light on "the individual, community, and systemic realities of homelessness." This problem has transcended federal administrations and extends across nearly all state and local boundaries. It is also worsening, even as the pandemic recedes and gives way to postpandemic realities, such as housing unaffordability, that threaten to make homelessness only grow.

At a time when data are often termed the "new oil"—an extremely valuable resource in its own right—the existing stock of data about homelessness has for years been of questionable worth. One long-standing reason is that different federal agencies—among them, the Departments of Education, Health and Human Services, and Housing and Urban Development (HUD)—use different definitions of homelessness that are inscribed into law, such that children and families are included in some definitions but excluded from others.[2] A 2010 Government Accountability Office (GAO) report concluded that this definitional ambiguity was one of several reasons that homelessness data "are incomplete, do not track certain demographic information well over time, and are not always timely."[3] More than a decade later, the pandemic and its aftermath have made the GAO's critique truer than ever.

Consider HUD's annual Point-in-Time count, which surveys the number of people both inside and outside of shelters who are experiencing homelessness on a single night every January. The pandemic seriously disrupted the January 2021 count, as many of the nation's more than 400 Continuums of Care—the regional or local planning bodies that coordinate housing and services for homeless families and individuals—chose not to count unsheltered persons because of the high risk of COVID-19 transmission.[4] As USICH itself noted on its Web site in February 2022, in the end, "40 percent of communities—including the places with the highest levels of homelessness and almost the entire state of California—did not conduct a full unsheltered count of people living in tents, cars, or streets" (https://bit.ly/3JT5VRp). As a result, the nation will never have reasonable estimates of the likely surge in pandemic-driven homelessness that occurred despite eviction moratoriums and other valiant attempts to prevent it.

One might surmise that the receding of the pandemic will ease some of these data collection problems, but in fact the growing challenge of housing unaffordability[5] could make matters worse. For example, it is simply unknown how many Americans who lack affordable housing are among the so-called "hidden homeless"—frequently or permanently "couch surfing" with friends, relatives, or even strangers willing to rent a bed for the night—but it's a good guess that many of those waiting in line to collect federal housing subsidies are doing so.[6] Even if they are captured as being part of a "household" in Census Bureau surveys, they will never show up in other federal statistics about homelessness—impairing both the nation's understanding of the dimensions of housing unaffordability and potentially limiting policy interventions to address it.

In the end, housing and homelessness are clear social determinants of health, and having accurate and timely data about the multiple dimensions of these issues is critical to determining both the health impact and the relative contributions that various policies could make to curtailing or ending homelessness. In addition to the call of Rodriguez et al. for "rigorous, community-based, qualitative research with people experiencing homelessness and homeless service providers," there should be greater federal, state, and local investment and innovation in various forms of homelessness data collection. As USICH—now in the hands of a different administration—finalizes its new federal strategic plan to prevent and end homelessness, its plans for improving the counting—as opposed to not counting—the people experiencing the many facets of homelessness should be at the top of the agency's checklist for action. AJPH

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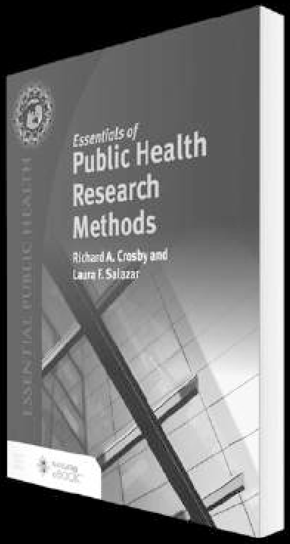

Associated Costs Are a Barrier to HIV Preexposure Prophylaxis Access in the United States

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HIV preexposure prophylaxis (PrEP), a biomedical HIV prevention intervention, reduces the risk of HIV acquisition by upwards of 90% for sexual encounters and 70% for injection drug use. If widely used, PrEP has the potential to help end the HIV epidemic in the United States.[1] In 2015, the Centers for Disease Control and Prevention (CDC) estimated that approximately 1.2 million people were at high risk of acquiring HIV and had a clinical indication for PrEP.[2] One of the four pillars of the federal government's Ending the HIV Epidemic (EHE) initiative is increasing access to and use of PrEP; in fiscal year 2021, $386 million was appropriated for the EHE initiative, of which $102 million was allocated to provide "HIV testing, linkage to care, and prescription of PrEP."[1] Additionally, an objective of the National HIV/AIDS Strategy for the United States (2022–2025) is to increase PrEP coverage to 50% from a 2017 baseline of 13.2%.[3] Despite the first PrEP antiretroviral being approved by the US Food and Drug Administration in 2012, less than 20% of those at high risk of HIV received a PrEP prescription in 2019.[4]

There are inequities in PrEP uptake across communities at higher risk for HIV—Black and Hispanic communities, cisgender women, transgender women, and people living in the South—because of high brand-name medication costs and limited access to financial resources to cover costs of PrEP-associated medical visits and laboratory tests, among other factors.[5] Counterintuitively, the most updated available PrEP-utilization data demonstrate that health systems and public health efforts have been less effective at reaching those most at risk for HIV. Black and Hispanic individuals are estimated to have higher rates of clinical indications for PrEP, at 43.7% and 24.7%, respectively.[6] Despite this, in 2016, almost 70% of PrEP users were White, whereas only 11% were Black and 13% were Hispanic.[6] There are also disparities across gender, age, and geography. PrEP uptake among men was 14 times higher than uptake among women in 2016, and people aged 25 to 44 years were more likely to be PrEP users than people of other ages.[6] The US South accounted for over half of new HIV diagnoses in 2016 but represents only 30% of all PrEP users.[7] Overall, Southern states had the lowest levels of PrEP utilization relative to HIV diagnoses.[7]

Although many programs provide access to PrEP medication, there are few programs that address PrEP-associated services, which include laboratory tests and medical visits that are integral components of the PrEP intervention as outlined by CDC guidelines.[8] The high cost of the initial PrEP medications has necessitated reliance on a fragmented PrEP access system that is not able to provide integrated PrEP-associated services. Manufacturer assistance and donation programs are necessary to provide access for uninsured individuals, but these programs do not cover other PrEP services. Entities that are able to secure 340B discounts for the purchase of drugs (and generate revenue when they are reimbursed at a higher price for those drugs) have also been at the center of PrEP access and financing, creating another set of access points and programs. This variety of federal, state, and local programs provide piecemeal access to PrEP services (Box 1). These fragmented systems and services create consumer complexity and confusion, not to mention multiple burdensome eligibility and application processes.

According to data from National Average Drug Acquisition Cost, the undiscounted cost of a 30-day bottle of branded tenofovir/emtricitabine (TDF/FTC) is $1790.91 and branded emtricitabine/tenofovir alafenamide (FTC/TAF)

BOX 1— Fragmented Preexposure Prophylaxis (PrEP) Financial Assistance System

Gilead Manufacturer Assistance Programs	Ready, Set, PrEP	State PrEP-Assistance Programs	340B Entities
Medication			
Provides medication (Truvada and Descovy) for uninsured individuals with income up to 500% of federal poverty level	Provides medication (Truvada and Descovy) for uninsured individuals	Refers individuals to manufacturer assistance programs and Ready, Set, PrEP	Provides medication to uninsured by purchasing at discounted price
Laboratory Tests			
Laboratory tests not covered	Laboratory tests not covered	Laboratory tests are covered through free schedule or public/grant funding	Laboratory tests are covered (sliding scale) or 340B revenue
Medical Services			
PrEP medical and ancillary services not covered	PrEP medical and ancillary services not covered	PrEP medical and ancillary services are covered through fee schedule or grant funding	PrEP medical and ancillary services are covered (sliding scale)

is $1875.93, whereas generic TDF/FTC is $35.37.[9] FAIR Health estimates that the cash cost of PrEP care for the initiation of PrEP is $2666.90 for uninsured patients, of which approximately $1000 is encompassed in laboratory tests and medical visits (Table A, available as a supplement to the online version of this article at http://www.ajph.org).[10] These cost projections include the cost of the daily medication, quarterly primary care physician visits, and recommended laboratory tests. Importantly, this does not factor in additional testing that would be recommended based on risk, such as hepatitis C screenings or HIV RNA tests for patients with symptoms of acute HIV. The prices charged to uninsured consumers may vary depending on the practice of individual providers and pharmacies; however, these monthly costs offer an objective estimate of the total cash cost of PrEP services.

The gaps in financial assistance for PrEP-associated services remain a significant anticipated barrier to PrEP access among poor or underinsured persons. Because of the actual and perceived cost barrier, there may be lower uptake of PrEP in at-risk communities, increasing the likelihood of transmission and prevalence of HIV.[4] Not addressing the low uptake of PrEP in the United States could lead to an outcome that is neither cost-effective nor preventive at the population level. This article focuses on the consequences of the financial inaccessibility of PrEP and recent policy efforts to address gaps in assistance by reducing cost-sharing, and it explores two potential policy strategies to improve financing for PrEP-associated services.

CONSEQUENCES OF INACCESSIBILITY

The federal government spends approximately $20 billion in annual direct health expenditures for HIV prevention and care.[11] Direct costs include outpatient visits to HIV specialists, medication costs, laboratory costs, hospitalizations, and other health care expenses. The cost averted by avoiding one new HIV transmission amounts to over $400 000 in lifetime costs.[12] Quantifying externality costs for social and economic loss incurred by a person with a new HIV diagnosis is more nuanced.

In a simulated model, PrEP was shown to reduce lifetime HIV risk in populations at high risk for infection. With an assumed PrEP efficacy of 90%, the analysis modeled a significant reduction of lifetime infection risk among a high-risk population of men who have sex with men, from 43.5% to 5.8%.[13] Although this simulation does not account for the varying PrEP uptake among racial subpopulations, which is particularly important considering the current inequities in uptake among Black and Hispanic communities, it demonstrates that the relative cost-effectiveness of PrEP as an intervention is strongly dependent on drug cost.[13] For example, TDF/FTC uptake may prove to be more cost-effective than uptake of branded PrEP products; one study comparing the cost-effectiveness of branded FTC/TAF to generic TDF/FTC found that the generic was far more cost-effective at current prices in the United States than the branded FTC/TAF, even for those at high risk of adverse TDF/FTC effects.[14]

Regarding social costs, lack of access to PrEP can increase the risk of HIV transmission in communities with high HIV incidence. Most new US HIV diagnoses are concentrated in socially marginalized communities, where social determinants of health and stigma are often a deterrent to PrEP utilization.[4,15,16] Clinicians in areas with social stigma surrounding PrEP may be less likely to prescribe PrEP. Social stigma, the need to change one's routine, administrative barriers, and patient-level stress also act as barriers to PrEP adherence.[4]

RECENT POLICY EFFORTS TO ADDRESS COVERAGE AND COST-SHARING

Studies indicate that reducing cost-sharing for PrEP medication may help promote access to the drug.[17] The US Preventive Services Task Force (USPSTF) provides recommendations for a range of evidence-based preventive services. The Affordable Care Act (ACA) requires insurance plans to cover USPSTF Grade A- and B-rated services without cost-sharing.[4] In June 2019, the USPSTF finalized a Grade A recommendation for PrEP, meaning PrEP must be covered by most private insurance plans and Medicaid expansion programs without cost-sharing beginning in January 2021.[16,18] In July 2021, the federal government released additional guidance clarifying that PrEP is a comprehensive intervention composed of medication and essential support services (e.g., laboratory services, provider visits) and that plans must cover the medication and the essential support services without cost-sharing.[19]

Despite this recent development, there are still gaps in coverage for public insurance programs and private plans. Following the USPSTF recommendation, Medicaid expansion states are required to cover, without copays, both the PrEP medication and associated services, whereas coverage for associated services is more limited in traditional Medicaid states. In addition, Medicare Part D is not subject to the ACA coverage and cost-sharing requirements for USPSTF Grade A- and B-rated services, meaning that PrEP medications and associated services may still have cost-sharing.[16] Although the USPSTF rating enabled PrEP and the associated services to be covered by the vast majority of health plans without cost-sharing, those with grandfathered commercial coverage and those with non-ACA-compliant plans may still face steep cost-sharing barriers for PrEP-associated costs.[17]

Although the USPSTF Grade A rating for PrEP expands financial access to clinical and laboratory services, it is contingent on cost-sharing protections being enforced. Despite most health plans being required by law to cover PrEP without cost-sharing, research has shown that many insurers are failing to adhere to guidelines through a lack of enforcement.[20] Further research is necessary to ascertain state-level policy enforcement of the federal law and guidance.

POTENTIAL POLICY AND FINANCING STRATEGIES

A growing body of literature seeks to identify policies and programs that can increase the financial accessibility of PrEP, but less is known about financial barriers for PrEP-associated medical visits and laboratory tests.[16] We explore two potential policy approaches to improve access and reduce financial barriers to PrEP-associated medical visits and laboratory costs: (1) public payer models and (2) changes to CDC funding restrictions. We identify the strengths and limitations of existing evidence and what remains unknown.

Policy Strategy 1: Public Payer Programs

A study has indicated that although the high cost of PrEP was a perceived barrier to access, this concern was alleviated by medication assistance programs.[15] These programs are supported by various health care sectors, including industry sponsors (Gilead Sciences Inc), nonprofit foundations (Patient Advocate Foundation), and federal ("Ready, Set, PrEP") and state agencies. These programs provide PrEP to those without insurance and assist with medication copayments related to drug cost-sharing for those who are insured. Although the literature highlights medication assistance programs as mechanisms to make PrEP more accessible to people with lower incomes and to underinsured individuals, the failure of these programs to cover PrEP-associated services may make them less effective.[13] Because Medicaid provides far more comprehensive access to the full gamut of PrEP services, the gap in access to PrEP-associated services is even more pronounced in states that have not expanded Medicaid under the ACA, most notably in the South.[17]

This strategy suggests developing a state or federally funded PrEP-assistance program that covers PrEP-associated services and leverages a payer-of-last-resort provision to maximize public health funds. Some states already use a public payer-of-last-resort model for PrEP financing, developing comprehensive programs for PrEP access using nonfederal and local funding.[21] States where this model is in place include California, Colorado, the District of Columbia, Illinois, Indiana, Massachusetts, New York, Ohio, Virginia, and Washington.[21] In California, eligibility criteria for the program include having an income less than 500% of the federal poverty level (as determined by the Department of Health and Human Services), California residency, and not having other PrEP coverage. If a patient is uninsured, the program will pay for all medical costs, including medical visits and laboratory tests. If a patient is insured, the program will pay for all PrEP-associated medical out-of-pocket costs and cover any medication costs not covered by the drug manufacturer's copay assistance program.[22] Currently, these programs are limited in their dependency on state investment because non-EHE HIV surveillance and prevention CDC funds cannot fund medical visits and laboratory tests associated with PrEP, nor can they be used to purchase PrEP medications.[22]

A federally funded PrEP-assistance program model could be incorporated into the EHE "Ready, Set, PrEP" initiative at the federal level. To receive PrEP through this initiative, an individual must (1) test negative for HIV, (2) have a valid prescription from a health care provider for the medication, and (3) not have health insurance for outpatient prescription drugs.[23] Expanding the program to cover the medical visits and lab tests would increase the program's effectiveness by addressing persistent gaps in access. Despite extensive literature about mechanisms of public payer models,[24] there is not yet sufficient evidence suggesting a causal relationship between these models and PrEP accessibility.

Policy Strategy 2: Federal Funding to Cover Costs

Although much progress has been made for insured individuals through the UPSTF Grade A recommendation and the federal guidance released in July 2021, there are still significant gaps in access for uninsured individuals. Until the implementation of EHE, the CDC had a longstanding policy that these federal funds cannot pay for medications, most laboratory tests, and medical visits associated with PrEP. This policy was meant to preserve limited federal funding and focus HIV prevention funding on services for which there are no other payers. However, in 2019, the CDC EHE implementation awards authorized the use of $4.5 million in federal funds to cover PrEP lab services in three "Jumpstart Sites" with EHE jurisdictions—East Baton Rouge Parish, Louisiana; DeKalb County, Georgia; and Baltimore City, Maryland.[25] Through the expansion of CDC federal funding, The Open Health Care Clinic in East Baton Rouge Parish acquired a new lab site and increased PrEP laboratory testing capacities. DeKalb County's sexually transmitted disease clinic implemented a PrEP awareness campaign and expedited their testing capabilities.[25] The CDC EHE funding released in 2020 included a similar relaxation of the previous policy surrounding paying for PrEP-related services for uninsured or underinsured people receiving PrEP in not-for-profit or governmental clinics.[1] Similarly, in 2020, the Health Resources and Services Administration's Bureau of Primary Health Care funded 195 community health centers to support access to and use of PrEP in EHE jurisdictions, expanding access to nearly 50 000 people. The program was expanded to a second cohort of community health centers beginning in August and September 2021.[26] Most recently, the CDC has further reinforced this shift and encouraged health departments' Integrated HIV Surveillance and Prevention Programs funded by PS18-1802 to allocate HIV prevention funding to support PrEP ancillary services when needed.

This expansion of federal funding to include PrEP laboratory tests could be applied across all HIV prevention CDC funds, instead of solely EHE jurisdictions, and could include PrEP-associated clinical visits and allowances to purchase low-cost PrEP for uninsured individuals. Given that these awards were recent and localized in scope, there are limited empirical analyses regarding the impact of federal funding expansion on PrEP financial access. Further analysis is required to assess the efficacy of federal funding streams on decreasing financial barriers to PrEP as well as schemes for PrEP prioritization.

CONCLUSIONS

Although there is a growing body of literature on financing strategies for PrEP-associated medical visits and laboratory costs, there is limited evidence assessing the options within public health and health care systems at large. First, with increased clarity about cost-sharing protections for insured individuals through the USPSTF recommendation, enforcement will be key to alleviating the burden of high out-of-pocket costs for patients across health insurance groups. Second, the implementation of a national PrEP-assistance program covering all PrEP-associated costs could alleviate out-of-pocket costs for insured patients, increase access for uninsured individuals, and promote equity of access to preventive services across health care coverage. Comprehensive federal funding is imperative given states' varying political and social investment in HIV prevention. Last, the expansion of federal funding streams to cover the generic drug and PrEP-associated medical visits and laboratory costs through existing categorical funding could reduce financial barriers facing high-priority PrEP candidates.

Further economic modeling to predict the impact of these potential policy solutions is needed. These analyses should account for the impact of social determinants on access and include national and state-level political considerations. The urgent call to end the HIV epidemic and address health equity must include innovative strategies that decrease current financial barriers for PrEP-associated services, so no one is left behind.

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Collaborative Hubs: Making the Most of Predictive Epidemic Modeling

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The COVID-19 pandemic has made it clear that epidemic models play an important role in how governments and the public respond to infectious disease crises. Early in the pandemic, models were used to estimate the true number of infections. Later, they estimated key parameters, generated short-term forecasts of outbreak trends, and quantified possible effects of interventions on the unfolding epidemic.[1,2] In contrast to the coordinating role played by major national or international agencies in weather-related emergencies, pandemic modeling efforts were initially scattered across many research institutions. Differences in modeling approaches led to contrasting results, contributing to confusion in public perception of the pandemic. Efforts to coordinate modeling efforts in so-called "hubs" have provided governments, healthcare agencies, and the public with assessments and forecasts that reflect the consensus in the modeling community.[3–6] This has been achieved by openly synthesizing uncertainties across different modeling approaches and facilitating comparisons between them.

USING MODELS TO SEE INTO THE FUTURE

Epidemic models can give insight into the future course of an epidemic, either through short-term forecasts or through the creation of longer-term planning scenarios that assume a set of future conditions (Figure A, available as a supplement to the online version of this article at http://www.ajph.org).

Forecasts are explicit quantitative statements about probabilities of specific events in the future, such as incidence rates of cases, hospitalizations, or deaths. Such statements can be compared with eventual observations and can be rigorously assessed to demonstrate model accuracy in real time. However, reliable pandemic forecasts can be made for only a short period into the future. This is because of uncertainties about the underlying epidemic process, challenges in anticipating outbreak-altering events (e.g., emergence of a new variant), difficulties in predicting human behavior, and future interventions, which may change in response to the forecasts themselves.

Scenario modeling acknowledges these limitations and gives plausible future epidemic trajectories under a well-defined set of conditions (or assumptions), which in turn can provide stakeholders information to aid in long-term planning. These planning scenarios can be designed to inform a range of decisions, from choosing between different disease control policies to a business determining what must be done to weather coming epidemic disruptions. However, because the assumptions of scenarios are unlikely to occur in exactly the way they have been defined, it is difficult to objectively assess the performance of models making these projections.

Different types of methods may be suitable for generating forecasts and scenarios. On the one hand, statistical and simple mechanistic models often perform particularly well at short-term forecasting. On the other hand, more complex mechanistic approaches sometimes struggle with making accurate short-term forecasts because of challenges in accounting for uncertainty about the underlying state of the system. For longer-term planning scenarios, models must be able to encode scenario assumptions (e.g., waning immunity, behavior changes). This requires structural complexity that many statistical or simple mechanistic models lack.

Whether aimed at forecasting or planning scenarios, there is a lot of variation in how epidemic models are composed. For example, models can vary in terms of what data they use, what they assume about transmission, and what analytic approach they use to produce projections. Because of this, relying on one model is dangerous because there is no guarantee that one model's choices and assumptions will yield an accurate prediction.

In many fields, there is a long tradition of combining multiple models to mitigate this limitation by providing a single prediction that summarizes the view of the participating models.[7] There has been a growing interest in using ensemble methodologies in epidemiology, with notable efforts in forecasting, risk prediction, causal inference, and decision-making.[8–12]

COORDINATION, COLLABORATION, AND EVALUATION

A modeling "hub" is a consortium of research groups organized around a particular scientific challenge. Hubs in many fields, including climatology and ecology, have helped to build consensus and translate individual model outputs into collective quantitative wisdom. This process often takes place in close collaboration with partners who will ultimately benefit from the modeling output.

Collaborative, multiteam infectious disease modeling efforts have existed in various forms for at least 10 years and have played a central role in the COVID-19 response (Figure B, available as a supplement to the online version of this article at http://www.ajph.org). COVID-19 hub efforts (including forecasting and scenario hubs in the United States and Europe) have leveraged research networks, software, and techniques developed for forecasting efforts around dengue,[8] influenza,[10] and Ebola.[11] These COVID-19 hubs aimed to (1) create real-time modeling systems that provide useful information to partners; (2) create "feedback loops" for modelers by encouraging model development, evaluation, and comparison; and (3) foster a modeling community with an open science ethos.

Despite differences between forecasting and scenario projections, there is still value in taking a "hub approach" to both tasks. Over time, ensembles of multiple models have provided more reliable information than any one model. In the US COVID-19 Forecast Hub, an ensemble was the most consistently accurate forecaster of mortality over the course of the COVID-19 pandemic (through December 2021).[3] This finding echoes previous outbreak forecasting research, where ensembles consistently performed well, if not the best, on all evaluated metrics.[8,10,11]

It is harder to assess performance, or even to define what we mean by *accuracy*, for long-term scenarios because these projections are made under specific sets of assumptions that may or may not come to pass. Nonetheless, the hub approach provides critical benefits by ensuring that models are focused on the same broad assumptions about the future. Here, too, appropriate ensemble methods can distill results to facilitate interpretation and inform action (Figure A).[12]

MODELS NOT ORACLES

The ensemble or hub approach is not a guarantee of accuracy or utility. The US COVID-19 Forecast Hub ensemble (including many component models) has struggled to produce accurate forecasts of cases and hospitalizations during periods of rapidly changing epidemic dynamics, such as the US peak of the winter wave in early 2021 or the rapid increases associated with the Delta variant in summer 2021 or in winter 2021–2022.[3] Likewise, although longer-term projections from the COVID-19 Scenario Modeling Hub projected a Delta-associated resurgence in the United States, the ensemble significantly underestimated its speed and size, even though there were no clear deviations from scenario assumptions.[13]

However, even when projections are wrong, the hubs play a role in enhancing the scientific rigor and integrity of epidemic modeling. The coordination provided by hubs ensures that approaches may be prospectively and objectively evaluated in uniform, fair, and unbiased comparisons. Furthermore, by evaluating many models simultaneously, we can gain insight into whether successes and failures are properties of individual approaches or represent a challenge to the field as a whole.

THE SHARED CHALLENGE OF DATA

In contrast with weather forecasting, which has seen sustained investment in data collection infrastructure for decades, public health surveillance systems lag far behind. The lack of timely, granular, and relevant data limits model performance. By partnering with parallel data curation efforts, hubs can help the community access critical data sources and overcome challenges together.

Data challenges are present even in the most seemingly straightforward of model inputs, such as the number of reported COVID-19 cases in a geographic area or jurisdiction. Case definitions can vary by geography and time, and reporting frequencies and rates of testing have changed over time. These issues have led to fundamental changes in what a reported case represents during the pandemic.

To help mitigate these data issues, COVID-19 modeling hubs have developed close relationships with data curation teams.[14,15] These relationships have been critical to COVID-19 hubs, both in providing a source of common "ground truth" data on which models can be fit, evaluated, and compared and in being stores of expertise in dealing with heterogeneous and inconsistent data streams. Active communication between data and modeling communities has proved critical. This process ensures that modeling teams have information about data anomalies and changes in reporting that could fundamentally alter apparent case trajectories and hence lead to distorted model projections.

Curated data repositories can also help provide modeling teams with easy access to granular data on the wide array of other phenomena that might affect the subsequent course of the epidemic. These include mobility statistics, genomic sequences, wastewater surveillance, government responses, and behavioral data.

CONCLUSIONS

During the pandemic, model and data curation evolved in real time. This is far from optimal; we do not learn how to forecast a cyclone while it is happening. The value proposition of the hub coordination model is two-fold. First, scientifically, there is value in building infrastructure with standing capability to evaluate which models, ensemble approaches, and data were most useful at different times during the outbreak response. Second, operationally, there is value in developing procedures that harness the insights of a diverse network of scientists while guarding against groupthink and overconfidence.[12]

As researchers, system developers, and public health officials who have been deeply involved in the real-time operation of modeling hubs during the COVID-19 pandemic and prior epidemics, we believe the hub approach is a vital path forward for predictive disease modeling efforts. Bringing together multiple modeling teams to answer pressing questions can provide partners with important information during emerging outbreaks. At their best, hubs provide the leadership and operational structure to ensure that model outputs are solicited widely, stored centrally, synthesized efficiently, communicated clearly, and evaluated honestly.

Modeling hubs and public data curation are and will remain crucial pieces of infrastructure for supporting public health decision-making in outbreak crises. It will be important to extend these approaches so they can be adopted in low- and middle-income countries to inform decisions in resource-constrained settings. Critical issues include building local capacity for modeling and strengthening global connections between modelers and policymakers.

In all, the systems developed before and matured during the COVID-19 pandemic are just a beginning. They must be nurtured and sustained between epidemics so they can help turn the tide the next time human populations face a pandemic. AJPH

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CONFLICTS OF INTEREST

J. Lessler has served as an expert witness in cases where transmission of SARS-CoV-2 and the length of the pandemic were of issue. The remaining authors have no conflicts of interest to declare.

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Lack of Sexual Orientation and Gender Identity Data Masks Important Health Disparities in Department of Defense Surveys

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Lesbian, gay, bisexual, and transgender (LGBT) people face a plethora of health disparities in the United States. Previous studies have demonstrated that LGBT populations face disparities in food security, health insurance coverage, sexual assault, and mental health outcomes. Although LGBT health and economic disparities are well documented in the US general population, there is very little information about the experience of LGBT individuals serving in the US military, the disparities they face, and whether such disparities affect their health, readiness to serve, or retention in the military.

The Department of Defense (DOD) has only recently allowed LGBT individuals to serve openly without the threat of disciplinary action or discharge. In 1994, the Don't Ask, Don't Tell policy permitted lesbian, gay, and bisexual (LGB) persons to serve in the military but prohibited them from disclosing their sexuality. The DOD rescinded this policy in favor of unrestricted service of LGB persons beginning in 2011.[1] Before 2016, the DOD prohibited accession and retention of transgender individuals based on medical conditions, psychiatric diagnoses, and administrative judgments regarding fitness for duty. The DOD lifted the ban on transgender individuals serving openly in 2016, partially reimposed it in 2017, and then lifted it again in 2021.[2]

Although LGBT individuals may now serve openly in the military, DOD policy and practice have prohibited the collection of military personnel's sexual orientation and gender identity (SOGI) demographic data unless a waiver is granted. The 2011 DOD memorandum controlling sexual orientation data, which has not been publicly retracted, states:

> DOD components, including the Services, are not authorized to request, collect, or maintain information about the sexual orientation of Service members except when it is an essential part of an otherwise appropriate investigation or other official action.[1]

A similar restriction exists for the collection of gender identity data.[3]

In the absence of SOGI demographic data for military personnel, it is impossible to determine whether LGBT military personnel experience disparities that interfere with their health or mission effectiveness. Findings from the recent Secretary of Defense Independent Review Commission on Sexual Assault in the Military acknowledged this deficiency. The commission concluded that the current policy is an obstacle for prevention experts and other researchers who wish to study the unique risks and experiences of LGBT military personnel and that prevention research on these important populations must not be restricted.[4]

Only a few recent DOD-led surveys have collected SOGI data, including the Workplace and Gender Relations Surveys of Active Duty Members (WGRA) and the Health-Related Behaviors Surveys (HRBS). The 2018 WGRA reported that 3.7% of LGB men were victims of sexual assaults in the past year compared with only 0.4% of non-LGB men.[5] This disparity was similar for women, with 9.0% of LGB women reporting sexual assault victimization in the past year compared with 4.8% of non-LGB women.[5] RAND delved further into these data and found that the 12% of respondents who identified as LGB or did not identify as heterosexual, accounted for 43% of service members reporting sexual assault in the 2018 survey.[6] Demographic data were collected for transgender respondents in the 2016 WGRA (only), but outcomes were not reported. In an analysis of the 2015 HRBS, LGB respondents were more likely to report unwanted sexual contact, lifetime suicide attempt, sexually transmitted infections, smoking, and marijuana use than were non-LGB respondents.[7] Similar to the WGRA survey, the HRBS did not report outcomes for transgender respondents. Given the stark disparities revealed in the few DOD-led surveys in which SOGI data were collected, it is imperative that military surveys be permitted to collect SOGI data in the same manner that demographics are collected for birth sex, age, race, and ethnicity.

US medical and public health authorities have long endorsed the routine collection of SOGI data as a best practice. The Institute of Medicine validated the importance of this practice in 2011, the same year that Don't Ask, Don't Tell was repealed, when it recommended that data on sexual and gender minorities be included in demographic information collected in federally funded surveys and electronic health records. Similarly, *Healthy People 2020* and *2030* have endorsed expanded collection of LGBT demographics in health surveys and population-based data systems. In October 2020, the US Government Accountability Office recommended that the Veterans Health Administration (VHA) routinely collect SOGI data, stating:

> Until VHA can more consistently collect and analyze sexual orientation and self-identified gender identity data for the veteran population served, it will have a limited understanding of the health care needs of LGBT veterans, including any disparities they may face.[8]

Most recently, the Biden administration issued Executive Order 14035 directing the secretary of defense to promote equitable health care for LGBT military personnel, their beneficiaries, and their dependents. It is not clear how the DOD can comply with this mandate if enumeration of LGBT service members is subject to an approval process that effectively puts data collection beyond the reach of military health organizations and practitioners.

The current DOD policy barriers to collecting SOGI data should be removed. Military surveys should be permitted to collect SOGI data in a manner consistent with other demographic information that is relevant to service member health and well-being, with an option for respondents to decline if they choose to do so. This approach would enable more detailed population surveillance, remove a policy that compels disparate treatment, and shift control of privacy to those most able to discern its necessity: LGBT individuals.

Repeal of restrictions should be accompanied by additional strategies to increase service member confidence about disclosing their SOGI data. First, the military should engage with experts on LGBT populations to formulate standardized, culturally competent language for SOGI questions. Second, demographic intake on military surveys should include a statement on the intent of the data and a reminder that no individual responses will be reported. Third, marketing materials and resource pages should be updated to show LGBT positive imagery, including partners and children, to demonstrate affirmation and visibility of LGBT personnel and their families. Fourth, a DOD-wide resource page should be established to inform service members, their dependents, and DOD civilians about LGBT culturally competent resources.

The control of LGBT demographics may have been a well-intentioned measure to protect military personnel from undue scrutiny and discrimination; however, it has had the unintended consequence of obscuring the health disparities experienced by military personnel who identify as LGBT and potentially interfering with the optimization of their military readiness. Furthermore, the disparate treatment is itself a form of discrimination that has the potential to negatively affect the health and well-being of those who are treated differently. As long as the demographics of LGBT military personnel are treated differently from their non-LGBT counterparts, the vestiges of Don't Ask, Don't Tell will persist. AJPH

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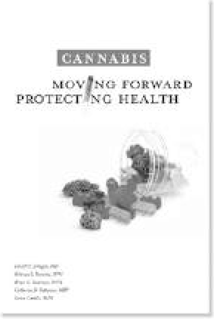

Revisiting the Protective Value of Barrier Face Coverings After the COVID-19 Pandemic

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The core public health measures of handwashing, wearing face masks (recently reclassified as "barrier face coverings," or BFCs),[1] and avoiding crowding through physical distancing proved their value as we awaited the development and global distribution of COVID-19 vaccines.[2–4] These practices demanded significant attention in the professional community as well as by the public regarding their utility, optimal practice, and duration to foster public health in various, evolving scenarios.

The COVID-19 pandemic represented a crisis for both the professionals who strived to give guidance and the public who tried to interpret its value relative to social and economic sacrifices. More specifically, what have the months of pandemic taught us for the future as we slowly try to make the world safer? Physical distancing, initially termed social distancing, will slowly return to a quasi-normal level. Hand hygiene vigilance will hopefully not atrophy, but rather become an elevated norm. Face masks, a daily part of our lives throughout the current pandemic, can be relegated to the wastebasket.

But should they really?

WILL WE EVER LEARN?

After an initial period of wavering, BFCs rapidly emerged as a crucial tool for source control in the pandemic fight, and in the process they became a standard item of daily apparel for most.

This perspective highlights the scientific as well as social rationale for why BFCs should continue to have a role in our postpandemic lives. Perhaps the most compelling reason to keep BFCs at hand stems from our recent experiences with non-COVID respiratory disease infections. In the 2003 SARS outbreak in Toronto, Canada, major spreading events occurred in hospitals, including emergency room waiting areas.[5] In South Korea, the spread of the MERS virus was based in 83% of transmission events attributed to five "super spreaders," and 44% of the total cases represented patients whose exposures occurred in hospitals.[6] Given these experiences, one can easily see the value of requiring patients and visitors to hospitals and clinics, including emergency rooms, to wear BFCs on a default basis. Such low-probability, high-risk transmission events warrant a precautionary approach.[7,8]

We also had to "retake" our failed examination in applied aerosol physics. Specifically, many elements around BFC and respirator use were highlighted as key learnings from SARS in Toronto[5] and from H1N1 in the United States,[9] but these learnings atrophied over the years.[10] Following Canada's SARS outbreak, authorities highlighted the debate on viral transmission mode as a basis to inform the requirements for respiratory personal protective equipment (e.g., N95 respirators). In fact, the debate was not only unhelpful, but likely harmful.[5] This gave way to the strong recommendation in the Spring of Fear report[5] for invoking the precautionary principle without delay in any future outbreak. Unfortunately, these lessons, along with the need for clear and honest communication, were forgotten with the COVID-19 outbreak. The unproductive scientific debate found new oxygen with COVID-19.[11] Rather than accept a somewhat messy scientific continuum of aerosols versus droplet hazard, experts strove for a false dichotomy, and we, once again, suffered for it.

Rather than being immediately forthright that potential medical mask shortages should prompt primary allocation to frontline health workers,[12] mask wearing was initially disclaimed by public health authorities as unnecessary, even harmful, based on the idea that it may exacerbate fomite transmission with the hands near the respiratory and ocular surfaces.[13–15] Within weeks, however, this position was reversed and recommendations to wear masks (or an array of other types of face coverings, including knitted “gators” and flexible plastic shields) was implemented.[14,15] Based on the initial assumption of a primary droplet transmission model, BFCs absolutely should have been mandated much earlier in the pandemic following the precautionary principle. This delay, and the conflicting messaging, undoubtedly contributed to further delays in the adoption of face coverings and may well have contributed to the early case counts.

The lesson here (and epidemiological evidence has since borne it out) is that BFCs substantially reduce SARS-CoV-2 transmission, even in the setting of a disease whose transmission mode is increasingly thought to include smaller aerosols. The preventive efficacy extends to other respiratory illnesses such as colds, flu, and respiratory syncytial virus in children.[7,8] And aside from relatively minor inconvenience, mask wearing seems to have a relatively small downside for most of the population. We suggest a turn to practicality in BFC use after the pandemic emergency subsides.

IS THERE A RATIONALE FOR ROUTINE MASK USE AFTER COVID-19?

The physical barrier, or filter, between pollution, irritants, and pathogens in the ambient environment and the airway’s ports of entry of the mouth and nose makes practical sense. We have a quasi-autonomic response to irritants, ranging from reflex apnea to harsh chemicals to covering one’s mouth with hands, elbows, or part of a shirt or coat when exposed to a sensed inhalational hazard. Occupational exposure to dust prompts standard use of face masks, which are similarly used in a surgical suite to protect an open wound from surgeons’ and nurses’ microbes. A factory worker, a painter sanding, or a surgeon wearing a mask comes as a normal sighting. When properly used, BFCs have greatly contributed to a reduction in SARS-CoV-2 transmission.[2–4] Two distinct mechanisms support this function:

1. Personal Protection. Occupational health professionals have long used masks and respirators to provide personal protection for the wearer from hazardous airborne particles. To achieve this purpose, highly efficient filtration of the particles in question is required. In addition, and perhaps more importantly, the device needs to fit the wearer’s face to prevent hazardous particles from simply slipping around through leaks at the perimeter of the face piece. Without these features, it may lessen the benefit to the wearer, potentially (and counterintuitively) increasing risk by emboldening the wearer.
2. Population Protection. For many years, the medical community recognized another very important function of masks and respirators when worn by caregivers: they greatly reduce the patient’s exposure to potentially hazardous microbes shed by health care providers. Filtration efficiency and fit are substantially less important when BFCs are used for population protection because of the close proximity of the filtration medium to the wearer’s nose and mouth and the large initial size of the emission. The effectiveness of widespread BFC use to minimize COVID-19 transmission primarily relies on the latter effect, although protection is observed both ways.[3]

The concept of wearing a mask or respirator to protect yourself is an intuitive one; however, the idea of wearing such a device to protect others is far less so. Although it may be difficult to accurately predict the fractional etiologic contribution of BFCs, handwashing, and distancing, the contribution of masks is evident. For example, in ecologic-type studies of jurisdictions with and without mask-wearing mandates, the value of masks was clear—not only against COVID virus but also influenza virus.[16,17] This was corroborated by various laboratory evaluations that showed the value of BFCs and the importance of fit.[2,3] Early in the COVID-19 pandemic, the public, as well as experts in the public health community, made decisions framed by similar intuitive expectations of the mask benefits that overemphasized personal protection while vastly underappreciating the importance of population protection.

There are many occupations in which individuals work in close physical proximity, and the use of face coverings could become a more standardized practice in these settings. The same is true for members of the public in high-density settings. Wearing masks in theaters or other indoor settings is unlikely to take hold broadly, but why shouldn’t it? One does not remove Band-Aids before curtain time. Crowded public transportation, such as subways and buses, and commercial airline flights may be additional appropriate settings for continuing with BFCs.

In addition to congregate settings in hospitals where the shedding of respiratory microbes might be expected (e.g., waiting rooms in emergency rooms and physicians' offices), one may consider the value of masks in periods of higher potential exposure risks, such as flu season and periods of elevated air pollution. Flu was dramatically reduced during the COVID-19 pandemic.[17] Should these practices, in parallel with HVAC audits and improvements, be part of the rewrite of post-COVID-19 procedures in vulnerable environments such as long-term care facilities and prisons?

In South Korea, the regular appearance of clouds of brown dust from China has long prompted widespread mask use as a natural reaction.[18] Interestingly, sales of face masks in South Korea between the MERS and COVID-19 outbreaks reflected year-over-year increases in the absence of a pandemic[19] and prompted a fashion movement,[20] which undoubtedly has aided their acceptance and popularity. In North America, for example, there are periods throughout the year when particulate matter exceeds air quality standards, especially during wildfires. Given the unprecedentedly normalized state of BFC use in the general population, is now the time to highlight the potential broader benefits of BFC use?

BUT EVERYONE IS TIRED OF IT ALL!

Except for handwashing and the opportunity to support a "new hygiene normal" postpandemic, COVID-weary humans are craving for interaction and freedom from mandates, however effective they have been. While respecting the need for renewed social normalcy in due course, let's not overlook a critical opportunity to leverage what has been learned. For example, the US Department of Health and Human Services and the National Institute for Occupational Safety and Health have created a mask innovation challenge, prompting designs that address cost and ease of production, effectiveness against SARS-CoV-2 and similar viruses, readable facial expression, intelligible speech, compatibility with eyewear, nonirritation of skin, long-use comfort, and ease of breathing.[21]

In conclusion, there are several areas where BFCs are likely to remain highly useful after the COVID-19 pandemic and anxiety about the emergence of new variants subside. These opportunities need to consider environmental settings, periods of higher risk, and evidenced-based rationale. Mandates may not be necessary, but common sense will be helpful. As noted by Lee and Lee,[22] those who believe that crisis is a combination of danger and opportunity may take guidance from Winston Churchill's words that "a pessimist sees the difficulty in every opportunity; an optimist sees the opportunity in every difficulty."

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Critical Race Theory for Public Health Students to Recognize and Eliminate Structural Racism

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Common approaches to medical and public health pedagogy that are grounded in the biomedical model and social determinants of health theory often fail to address structural racism as a root cause of health inequities.[1] Structural racism refers to how societies foster discrimination through inequitable systems.[2] These pedagogical approaches tend to promote reductionist views of disease, suggest that social determinants of health are immutable, and neglect the role of White power and privilege in driving unfair differences in health outcomes.[1] Critical theoretical frameworks for public health education are needed to enhance understanding of how the field may be failing to address and eliminate health inequities and that contextualize health within power structures that marginalize and oppress.[1] With its emphasis on the evolving practice of interrogating the roles of race and racism in society, critical race theory (CRT) is an important framework for informing how and what we teach the next generation of public health leaders to eradicate health inequities and drive social change.[3]

Striking racial disparities in rates of COVID-19 morbidity and mortality,[4] recent surges in cases of police brutality against people of color, and public debate over teaching about racism have brought renewed attention to CRT. Generated by scholars of color in the 1980s, CRT promotes the development of solutions in research, policy, and practice that bridge gaps in the conditions in which people live and work to eliminate health disparities.[5] CRT is focused on understanding complex racial concepts and "challenging power differentials."[5(pS34)] Attempts to integrate CRT into K-12 and college curricula have prompted hostile backlash from lawmakers, educators, and parents. At least 35 states have passed into law or imposed restrictions on teaching about race and racism, arguing that these concepts deviate from our country's founding principles of liberty and equality.[6,7]

Despite this divisiveness, as public health educators, we must support and lead the movement to train our students and ourselves to recognize and counter systems of oppression, including those that exist within and outside of academic public health. We present three teaching recommendations for public health faculty: (1) underscore an authentic commitment to antiracism and health equity in course materials, (2) account for intersectionality, and (3) engage in critical self-reflexivity. The key tenets of CRT provide an optimal foundation for operationalizing these three practices.

KEY TENETS OF CRITICAL RACE THEORY

CRT provides a paradigm for equipping public health students with the knowledge and skills needed to recognize and eliminate social structures, practices, and discourses that perpetuate racism and health disparities.[1,3,5] Key tenets of CRT include recognizing that race is socially constructed; understanding that racism is embedded throughout institutions, systems, structures, and policies; and embracing the lived experiences of people of color, including their experiences of oppression.[1,3] Intersectionality involves conceptualizing and understanding how an individual's multiple marginalized social identities (e.g., related to gender identity, race, socioeconomic status) and intersecting structures of power and inequality shape their worldviews and lived experiences.[1,8] Application of CRT to health instruction involves attending to how an individual's or group's unique "layered identities" converge with systems of oppression (e.g., racism, sexism) to better understand their health outcomes.[1]

APPLICATION TO PUBLIC HEALTH EDUCATION

The following are our three teaching recommendations for public health faculty.

Commit to Antiracism and Health Equity

Consistent with CRT, as public health educators, it is imperative that we recognize racism as manifesting differently across contexts and as embedded throughout systems of power, including education systems, that drive disparities.[1,3] In most cases, a student's first exposure to a course is via the instructor and a course description or syllabus. Continued efforts to increase the representation of minority faculty are essential for promoting racial and ethnic diversity in the academic public health pipeline and dismantling structural racism in academic public health.[9]

The course description and syllabus provide ample opportunity for educators to convey their commitment to fostering an antiracist and inclusive learning environment.[8] To what extent does a course description reflect how issues of systemic racism and health equity will be addressed? Are there learning goals or objectives that are explicitly linked to antiracism and equity? A statement in the beginning of a syllabus conveying a commitment to equity and antiracism has been linked to student perceptions of a warm and supportive learning environment.[8] This statement can include a proclamation of the instructor's respect for diversity, their expectations with respect to classroom climate, and a note that micro- and macroaggressions will not be tolerated.[8] This statement can also be used to contextualize the course readings and materials, such as by acknowledging the subjectivity of science and the potential for overt and covert biases in course material.[8,10] Similarly, we should explore how to "decolonize" our public health syllabi by disavowing those structures that reinforce superiority and exclusion, promoting critical consciousness, and centering the public health work of those from marginalized backgrounds.[8]

Account for Intersectionality

Intersectionality is a key aspect of CRT that involves reflecting on identity and its relationship to power.[11] Individuals' multiple socially constructed identities (e.g., race, sex, sexual orientation) exist within a matrix characterized by interlocking systems of oppression that may heighten their vulnerability to bias and how they experience that bias.[1,8,11] We must define this concept in our course syllabi and commit to teaching approaches that promote "matrix thinking" through interrogation of how individuals' multiply marginalized identities converge with sociocultural systems that are mutable.[11] Our courses must prioritize critical and multidimensional examination of how different forms of inequality, power structures, and oppression intersect to shape the health outcomes of all people and identify potential solutions to address these inequities.[8,11]

Wide-ranging social systems that inequitably distribute power and privilege need to be explicitly examined in all public health courses. The concept of intersectionality can help to frame teaching and learning activities in different areas of study. This integrated approach may enhance students' understanding of how inequitable social and environmental conditions promote disease clustering and, in turn, enhance disease transmission, progression, and negative health outcomes that disproportionately affect marginalized populations.[12] For example, in a course on public health nutrition, students could explore how food insecurity, malnutrition, and obesity are interrelated and leading causes of poor health (including increased risk of serious illness from COVID-19) among marginalized groups that face related structural challenges associated with education, income, and employment (especially in frontline at-risk jobs).[13] The accumulation of adverse social and environmental conditions can lead to the development of food insecurity, which may contribute to downstream shifts in food environment and personal diet, which may further contribute to the development of malnutrition and obesity.[13]

Engage in Critical Self-Reflexivity

Consistent with CRT, engaging in critical self-reflexivity can enhance understanding and critique of inequities in health knowledge and practice.[1] Reflexivity is

> an intentional intellectual activity in which individuals explore or examine a situation, an issue, or a particular object on the basis of their past experiences to develop new understandings that will ultimately influence their actions.[14(p539)]

Providing safe and supportive spaces for students to reflect on course material as it relates to their unique perspectives and experiences (e.g., via private journal entries or group discussions) can help to make learning more relevant and impactful.

In the field of health promotion, reflexivity provides a means of developing alternative modes of thinking related to social inequities, power dynamics, social justice, and contextually situated health issues.[15] Reflexivity in action occurs when individuals engage in reflection while doing an action and adjust their practices accordingly (e.g., What am I learning about this population, and how might this learning affect the next steps of my action?); reflexivity on action occurs after an action has taken place and involves stepping back and reflecting on one's own actions (e.g., What could I have done differently?); and reflexivity underlying action involves questioning power dynamics or assumptions that underlie a field, such as public health (e.g., What power structures might this kind of practice be creating, supporting, or modifying?).[15] As public health educators, we would benefit from institutional training on how to integrate this typology into our curricula to help students and ourselves become more skilled in contextualizing health decision-making and more attuned to potential biases and power imbalances.[15]

We can use CRT to train a legion of change agents to advance antiracism- and health equity–centered programs, policies, and practices. We must broaden the way that we teach public health by moving beyond reductionist and deficit-focused models toward embracing multilevel pedagogic approaches that teach students actionable knowledge and skills.[1] COVID-19 and long-standing injustices against people of color have brought both public health and racism to the fore, underscoring the need for grounding public health education in CRT. This approach involves infusing an authentic commitment to advancing antiracism and health equity in course materials; explicitly examining intersecting oppressions; and engaging in practices that heighten awareness of our privileges, identities, motivations, and assumptions.[11] These strategies will aid us in training our students and ourselves in how to recognize and eliminate structural racism as a barrier to public health.

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Regulating the Food Industry: An Aspirational Agenda

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See also Manzar, p. 859.

The coronavirus pandemic reveals an urgent need: the marketing of ultra-processed "junk" food must be stopped. Until now, the food industry has gotten away with pushing consumption of high-calorie, highly processed products—as often and in as many places as possible, and in increasingly large amounts—all in the name of profit.[1] In this business-first food environment, obesity and its associated type 2 diabetes, coronary heart disease, and, these days, severe outcomes from COVID-19, are collateral damage.[2] Because poor health more strongly affects the most vulnerable members of society,[3] public health advocates ought to be demanding immediate, forceful government action to discourage food industry production and marketing of unhealthful products.

Ultra-processed foods are those constructed from industrially produced ingredients unavailable in home kitchens and formulated to be "addictively" delicious ("you can't eat just one").[4,5] Box 1 gives my working definition. Familiar examples are carbonated soft drinks, flavored chips, children's cereals, chicken and fish "nuggets," and products with long lists of additives.

We have the evidence: ultra-processed products promote excessive calorie intake and poor health. Many recent studies associate frequent consumption of ultra-processed foods with elevated risks of chronic disease and overall mortality.[4] And, in what I consider to be the most important nutrition study done in decades, a clinical trial conducted in a controlled metabolic ward at the National Institutes of Health compared the effects of consuming two nutritionally similar diets differing only in their degree of processing.[6] The result: when study participants were offered ultra-processed diets, as opposed to diets constructed of minimally processed foods, they consumed an astonishing average of 500 more calories a day and gained commensurate amounts of weight. Participants judged the diets equally palatable and were unaware of overeating when presented with ultra-processed foods. These findings make a strong case for regulation.

HISTORY SINCE 1980

Centers for Disease Control and Prevention data demonstrate an increase in the prevalence of combined overweight and obesity among adults, from 47% in 1980 to 74% in 2018,[7] and among children from 15% to 35%,[8] with higher levels among those who are Black, Hispanic, or socioeconomically disadvantaged.[2,3] We can argue about the precise cutpoints for increased health risk, but, by current body mass index standards, overweight is now normal for adults and becoming so for children.

What happened in about 1980 to promote so sharp an increase in weight gain? Genetics did not change; neither did thermodynamics. From the standpoint of thermodynamics, weight gain occurs when energy intake exceeds expenditure. Whether energy expenditure decreased significantly from 1980 on is debatable, but energy intake most definitely increased and by enough calories a day to account for the 10- to 20-pound average weight gain from 1980 to 2000.[9] What did change was the food environment, and in ways that encouraged people to eat more food.

Food companies marketed wider availability of their products, even in places never previously permitted such as libraries, bookstores, and clothing stores, and they promoted frequent snacking (more calories).[10] Because the cost of food is low relative to that of labor, transportation, and rent,[11] restaurants could increase portion sizes, as could companies making ultra-processed products. Larger portions promote greater calorie intake in three ways: they provide more calories, they encourage greater calorie consumption, and they mislead people into underestimating how much they are eating. Obesity prevalence rose in parallel with increasing portion sizes.[12]

The low prices of ultra-processed foods also encourage overconsumption. Since 1980, the prices of all foods have risen with inflation, but those of soft drinks and snacks rose much less than average, whereas fruits and vegetables became relatively more expensive.[13] Low food prices democratize eating in fast-food and other

BOX 1— Ultra-Processsed Foods: A Working Definition

In contrast with foods that are unprocessed or minimally processed, ultra-processed products are

- **Not obviously related to the whole foods from which they were derived**
- **Formulated with industrially produced ingredient additives (e.g., colors, flavors, sweeteners, texturizers) not usually available in supermarkets**
- **Unable to be made in home kitchens**
- **Formulated to be hyperpalatable (“addictive”)**
- **Heavily marketed**
- **Attractively and conveniently packaged**
- **Relatively inexpensive**
- **Highly profitable**

Note. Selected examples: Coca-Cola, Tang, Doritos, Oreos, Froot Loops, Spam, chicken nuggets, most commercial ice creams.
Source. Adapted from Monteiro et al.[4]

restaurants where portions are large and more calories are consumed.

FOOD INDUSTRY GROWTH IMPERATIVES

I attribute the causes of intensified food industry marketing since 1980 to policy shifts in three areas: agriculture, Wall Street, and food regulation. Historically, Farm Bills paid agricultural producers to leave parts of their land unplanted as a means to prevent overproduction and maintain crop prices high enough for farmers to make a living. But when Earl Butz became US Department of Agriculture Secretary in the early 1970s, he shifted policies from supply management to rewarding farmers for producing as much food as possible. Farmers responded. Between the late 1970s and 2000, the calories available in the food supply per capita—amounts produced domestically, plus imports, less exports—rose from about 3200 per day to 4000, an amount roughly twice what the population needs on average.[14] Caloric overabundance forced food companies to compete fiercely for sales.

Changes on Wall Street forced even greater competition. The early 1980s marked the advent of the shareholder value movement, which demanded higher and more immediate returns on investment. Never mind slow-earning blue-chip stocks; companies now had to report growth in profits every 90 days.[15] For food companies, expanding sales in the face of 4000 calories a day per capita was a difficult challenge. To meet it, they developed new products, promoted snacking, expanded fast-food outlets, sold food in new venues, and increased portion sizes.

These efforts were supported by the antiregulatory policies of the Reagan administration, which allowed health claims on food packages and more aggressive marketing to children. Food companies increasingly targeted marketing to children, to people of low socioeconomic status, to racial minorities, and to populations in low-income countries.[16,17]

In creating this “eat more” food environment, the food industry had only one goal: to increase sales. Food companies are not social service or public health agencies; they are businesses required to put stockholder earnings as their first priority.[13] They did not intentionally promote weight gain, and they saw no reason to take responsibility for it. They could blame excessive weight gain on personal choice and externalize the substantial personal and medical costs of its consequences.

US POLICY PROPOSALS

During the 1980s and 1990s, calls for policy approaches to prevent excessive weight gain focused mainly on personal responsibility. But, in 2000, Michael Jacobson and I, recognizing the food industry’s role in weight gain, recommended measures such as taxes and advertising restrictions that would improve the environment of food choice.[18] In 2001, the Surgeon General called for obesity policies to reduce racial, ethnic, gender, and age disparities and stigma; to *encourage* food companies to provide foods and beverages in reasonable portion sizes; and *examine* its marketing practices (my emphasis).[19]

Federal Dietary Guidelines for Americans explicitly target personal choice: they advise individuals to reduce consumption of sugar, salt, and saturated fat. The 2020 guidelines do not mention “ultra-processed” except indirectly: “Food manufacturers and retail establishments *can* support Americans . . . by providing healthy options in all the places where foods and beverages are purchased. . . . Portion sizes also *can be* reduced. . . . Food manufacturers are *encouraged* to consider the entire composition of the food or beverage, and not just individual nutrients or ingredients when developing or reformulating products” (again, my emphasis).[20(p50)]

Since 1980, the Public Health Service Healthy People objectives for nutrition and weight status also mainly focused on personal choice but are now beginning to address the need for environmental improvements. The 2020 objectives include modest goals for increasing the proportion of schools that exclude sugar-sweetened beverages and for increasing the number of states that provide incentives to retail outlets selling foods consistent with dietary guidelines.[21]

Current guidelines and health objectives not only ignore ultra-processed foods but also ignore three valiant but unsuccessful attempts to address the food industry's role in childhood obesity (an easier target than in adults). In 2006, the Institute of Medicine published a remarkably hard-hitting report on food marketing to children. This report thoroughly documented the adverse effects of marketing on children's food preferences, demands for branded products, eating habits, and body weight. It urged use of multiple policy approaches to prevent childhood obesity—agricultural subsidies, taxes, legislation, regulation, and nutrition education and assistance programs. It even warned that if food companies do not voluntarily stop marketing unhealthy foods to children, Congress should enact mandating legislation.[14] But a follow-up workshop in 2013 identified only marginal improvements in food industry responses, noting that regulatory actions would face difficult political and legal barriers.[16]

The second attempt was First Lady Michelle Obama's Let's Move! campaign to end childhood obesity within a generation, based on a 2010 report from the White House Task Force on Childhood Obesity appointed by President Obama. While the Task Force focused most of its policy recommendations on personal choice (dietary guidelines, food labels, calorie labels), it aimed several at the environment of food choice (portion sizes, school meal nutrition standards, farm-to-school programs, subsidies for healthier foods in food assistance programs, and economic incentives for fruit-and-vegetable production). "The food, beverage, and restaurant industries," the report said, "should be encouraged [that word again] to use their creativity and resources to develop or reformulate more healthful foods for children and young people."[22(p60)]

One recommendation addressed food industry marketing. Echoing the Institute of Medicine report, the Task Force warned that if voluntary efforts to limit marketing did not yield substantial results, the Federal Communications Commission "could consider revisiting and modernizing rules." Michelle Obama reinforced this idea in an eloquent speech to the Grocery Manufacturers Association: "We need you not just to tweak around the edges, but to entirely rethink the products that you're offering, the information that you provide about these products, and how you market those products to our children."[23]

Let's Move! did lead to improvements in school food. But its other major achievements—calorie labeling in fast-food outlets and improved food labels—addressed personal choice. The White House had no authority to force food company compliance with marketing or other public health measures that might reduce sales, and its efforts to promote even minimal regulation were consistently and effectively blocked by heavily funded, concerted opposition from the food industry.[24]

The effectiveness of industry opposition was also evident from the third failed attempt, that of the Federal Trade Commission (FTC) to set nutrition standards for foods marketed to children. In 2009, Congress directed the FTC to establish an Interagency Working Group (IWG) to develop such standards. The IWG proposed upper limits for sugars and salt among other measures, but made them voluntary and did not require implementation for six years. Despite this generosity, the food industry viewed these proposals as far too restrictive and forced the FTC to back off from setting marketing standards.[10]

These attempts took place before the COVID-19 pandemic exposed the increased risks posed by obesity and related chronic diseases and the disparities in their prevalence and before ultra-processed foods were recognized as a distinct category of foods and beverages. The categorical distinction is critical; it helps clarify policy needs.

AN (ASPIRATIONAL) ADVOCACY AGENDA

Antismoking advocates succeeded in reducing use of cigarettes through mass-media campaigns but also by creating an environment less conducive to smoking through higher prices, smoke-free policies, warning labels, and tobacco control programs that addressed socioeconomic disparities. Strategies for curbing food industry promotion of overeating could follow this model.[25] Changing the food environment is, of course, more complicated: we must eat to live. But taking action to reduce the wide availability and promotion of ultra-processed foods could help reduce the overall burden of diseases related to dietary practices as well as the socioeconomic disparities in these conditions. Encouraging personal choice of healthier diets is helpful but not sufficient; the food environment needs to encourage healthy choice and to discourage consumption of ultra-processed foods, especially in large portions. Let us advocate the following:

- **Dietary guidelines** to unambiguously state “Avoid ultra-processed foods” or at least follow the lead of the American Heart Association: “Choose minimally processed foods instead of ultra-processed foods.”[26] Note: US dietary guidelines directly influence federal food assistance, school, and child care feeding policies and programs.[20]
- **Mass media campaigns** to help the public recognize ultra-processed foods, reduce (but not necessarily eliminate) their consumption, and understand the food industry’s role as a commercial determinant of poor health.[27]
- **Taxes** on ultra-processed foods. Taxation of sugar-sweetened beverages is associated with reduced consumption and health improvements. Taxes could contribute to the nearly 20% reduction in sugar availability since 1999 and to strategies to reduce the cost of healthier foods.[28]
- **Warning labels** on ultra-processed foods. Warnings about salt, sugar, saturated fat, and calories already affect a large percentage of these products, but recent suggestions for specific warning labels on ultra-processed foods deserve serious consideration (Figure 1).[29,30]
- **Marketing restrictions.** As with cigarettes, legal authority is needed to consider plain packaging, curbs on television and social media advertising, restrictions on retail product placements, sales and service in schools and institutions, and other such measures, especially as directed toward children. The United Kingdom has started doing this,[31] as have several countries in Latin America.[32] We could too.
- **Portion size restrictions.** Before the pandemic, restaurant and fast-food meals accounted for at least half of Americans’ calorie intake. Mandating pre-1980 portions could help renormalize reasonable serving sizes.
- **Farm subsidies.** We should subsidize the production of healthy food for people and stop subsidizing feed for animals and fuel for automobiles.[33]

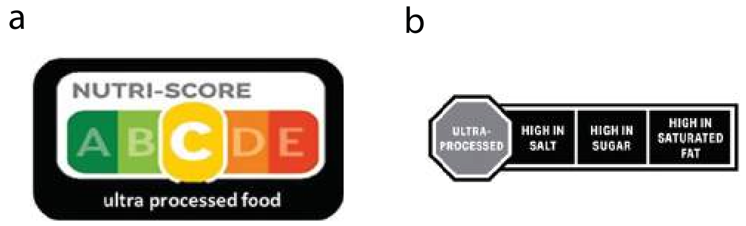

FIGURE 1— Two Suggestions for Front-of-Package Warning Labels for Ultra-Processed Foods

Note. Figure 1a: Ultra-processed added to the Nutri-Score label; this summarizes a food product’s composite balance of nutrients and ingredients. The color-coded scores range from the healthiest—A (dark green—very healthy) to B (light green), C (yellow), D (orange), and E (red—best to avoid).[29]
Figure 1b: Ultra-processed added to warning labels about salt, sugar, and saturated fat used in Latin American and other countries.[30]
Source. Figure 1a courtesy of Serge Hercberg. Figure 1b courtesy of Trish Cotter.

Would policies like these stand a chance in today’s political and social context? They would confront formidable attitudinal, legal, and legislative hurdles. In the United States, lifestyle mandates of any kind are especially fraught (witness opposition to mask wearing). Food companies design and market ultra-processed products to be widely available, appealing, and inexpensive (hence, “addictive”[5]); people love eating them and may not be able to afford healthier foods. The normalization of overweight only expands the proportion of the population likely to resist imposed measures.

Food companies and trade associations take advantage of resistance to “nanny-state” measures. They also invoke First Amendment protections. Just as the tobacco industry used its “playbook” tactics to oppose regulation of cigarettes, the food industry has forced the government to block dietary guidelines from addressing sustainability and weakened nutritional standards for pizza, potatoes, and tomato paste in schools. In such instances, and in soda companies’ willingness to spend fortunes to fight tax initiatives, the food industry has positioned itself as a prime example of how corporations can induce government to act in their—rather than in the public—interest.[34]

These policy suggestions may seem unrealistic, but they are not impossible. Legal scholars have identified laws that could be tweaked to improve the environment of food choice, among them the Farm Bill (Pub L 115-334 [2018]) and regulations governing school nutrition standards.[35] Even seemingly weak advocacy groups can harness their power to effect change when they share a compelling vision, organize community support, and build coalitions.[36] Aspirational goals also have power. Unrealistic public health goals can motivate action, expand expectations, educate, and attract resources; sometimes, they can even be achieved.[37]

While we are thinking in aspirational terms, let us not forget root causes. We must also demand policies that link agriculture to public health, keep corporate money out of politics, reduce corporate concentration, and require Wall Street to evaluate corporations on the basis of social as well as fiscal responsibility. In comparison with those challenges, taking on the food industry should be easy.

Let's get to work.

[**Note**: For additional reading, please see the supplemental references, available as a supplement to the online version of this article at https://ajph.org.] AJPH

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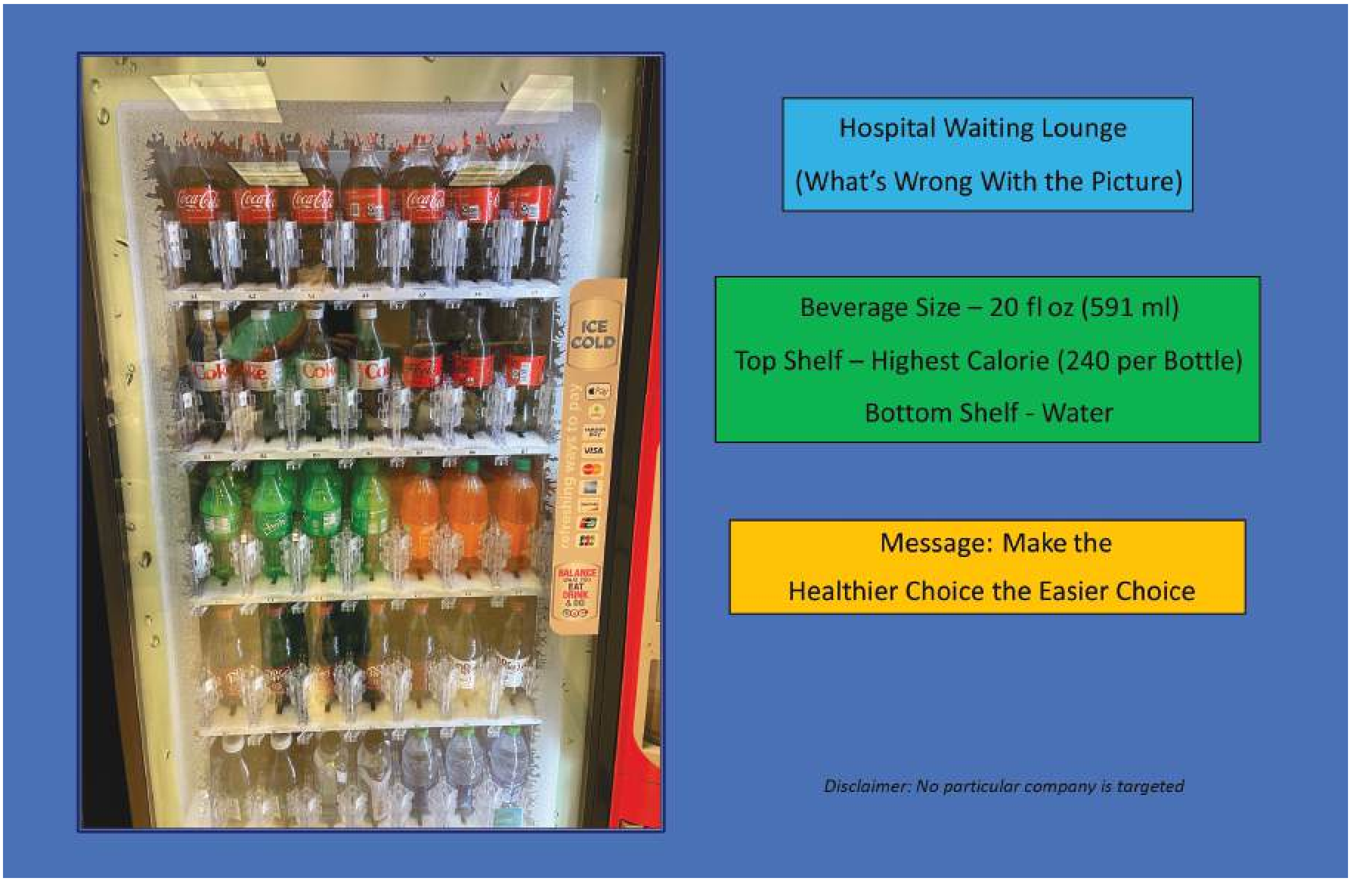

Hospital Waiting Lounge
(What's Wrong With the Picture)

Beverage Size – 20 fl oz (591 ml)
Top Shelf – Highest Calorie (240 per Bottle)
Bottom Shelf - Water

Message: Make the
Healthier Choice the Easier Choice

Disclaimer: No particular company is targeted

Make the Healthier Choice the Easier Choice

Shabih Manzar, MD

See also Nestle, p. 853.

This image was obtained from a waiting area in a hospital. While it is important for visitors and staff to have access to the vending machine as needed to quench their thirst, it is also important for the companies involved in the whole vending process to be cognizant about the health of the public.

As noted in the picture, the accessible items on the top shelf are all high-calorie drinks, while water is placed in the lower row. This is what we call using the sight, top-shelf marketing technique. People will go for the accessible item, resulting in consuming more calories.

The solution could be to place water and low-calorie drinks on the top shelf. We should make the healthier choice the easier choice. AJPH

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Impact of SHIELD Police Training on Knowledge of Syringe Possession Laws and Related Arrests in Tijuana, Mexico

Pieter Baker, PhD, MPH, Leo Beletsky, JD, MPH, Richard Garfein, PhD, MPH, Eileen Pitpitan, PhD, MA, Eyal Oren, PhD, MS, Steffanie A. Strathdee, PhD, MSc, and Javier A. Cepeda, PhD, MPH

See also Kapadia, p. 826.

Between 2015 and 2018, we provided training for 1806 municipal police officers in Tijuana, Mexico, in an effort to improve their knowledge and behaviors related to HIV and injection drug use. Correct knowledge of syringe possession laws improved from 56% before training to 94% after training and was sustained at 24 months (75%). Knowledge improvement was associated with decreases in arrests for syringe possession over time (adjusted odds ratio [AOR] = 0.87; 95% confidence interval [CI] = 0.85, 0.90). Officers with correct knowledge had significantly lower odds of reporting arrests (AOR = 0.63; 95% CI = 0.44, 0.89). Training was associated with sustained improvements in knowledge and practices that advance public health. (*Am J Public Health*. 2022;112(6):860–864. https://doi.org/10.2105/AJPH.2021.306702)

Policies criminalizing drugs or syringes and aggressive enforcement practices frustrate efforts to reduce HIV- and drug-related harms among people who inject drugs (PWID).[1] Police tactics such as syringe confiscation and arrests for syringe possession are associated with riskier syringe sharing practices and reduced help seeking from harm reduction services.[2] Where syringe possession has been decriminalized (e.g., Mexico), arrests for possession may persist despite formal legal changes.[3] Discordance between policies and local enforcement practices may be due in part to inadequate police knowledge of drug and syringe possession laws.[4]

INTERVENTION

We implemented the Tijuana, Mexico, SHIELD (Safety and Health Integration in the Enforcement of Laws on Drugs) training program to address the occupational hazards of drug law enforcement and the impact of harmful policing on the health of PWID. This occupational safety training program for police personnel focused on needlestick injuries while simultaneously addressing police knowledge, attitudes, and behaviors that may affect health and HIV risk among PWID.[5]

The SHIELD program was a binational, interdisciplinary collaboration between the University of California, San Diego; Universidad Xochicalco; and the Tijuana Municipal Police Department. Curricula and instrumentation were adapted from previous training,[6] piloted within the academy, and modified for cultural appropriateness by key stakeholders. Training covered (1) basic epidemiology and prevention of needle stick injuries and infectious disease sequelae, (2) legal provisions under Mexican law related to drug and syringe possession,[3] and (3) addiction science and evidence-based harm reduction strategies.

PLACE AND TIME

As a major border and drug trafficking node, Tijuana is characterized by multiple interacting epidemics of injection drug use, HIV, and harmful policing practices that contravene public health.[7] During routine or coordinated police operations, aggressive tactics such as arrests for syringe possession are a tool frequently deployed against PWID.[8] Between February 2015 and May 2016, 80% of the city's police force (n = 1806) completed the training program in collaboration with the municipal police academy (Instituto de Capacitación y Adiestramiento Profesional de Tijuana). Trained police instructors administered SHIELD on site as a single daylong session, with 20 to 100 trainees per session (n = 38 sessions). Baseline participants were eligible to take part in the longitudinal cohort if they reported having been exposed to syringes in the past six months and were willing to participate in 24 months of follow-up.

PERSONS

Among the baseline sample of 1806 officers, 1594 eligible participants were randomized (n = 212 did not meet the eligibility criteria) and 771 were selected for follow-up (Figure A, available as a supplement to the online version of this article at http://www.ajph.org). Participants were primarily male (84%), the median age was 38 years (interquartile range [IQR] = 33–43), and the median number of years of law enforcement experience was 11 (IQR = 7–18; Table A, available as a supplement to the online version of this article at http://www.ajph.org). Overall, 19% of the participants had less than a high school education, most (88%) had patrol assignments, and 23% were assigned to a high drug use precinct. The majority of participants (64%) reported that they had made syringe possession arrests in the previous 6 months; only 56% knew that syringe possession was legal.

PURPOSE

Training may align policing with public health by closing gaps in legal knowledge.[5,9] However, no study to our knowledge has longitudinally examined the sustained impact of educational interventions on drug law enforcement practices that contravene public health. We evaluated whether training that frames harm reduction as beneficial to occupational safety improves knowledge of syringe laws and reduces arrests for syringe possession. We hypothesized that improved knowledge of syringe possession laws would be associated with sustained reductions in arrests for syringe possession. We assessed the training's impact on arrests for syringe possession after accounting for police characteristics, knowledge of syringe laws, and attitudes toward PWID over time following the SHIELD training intervention.

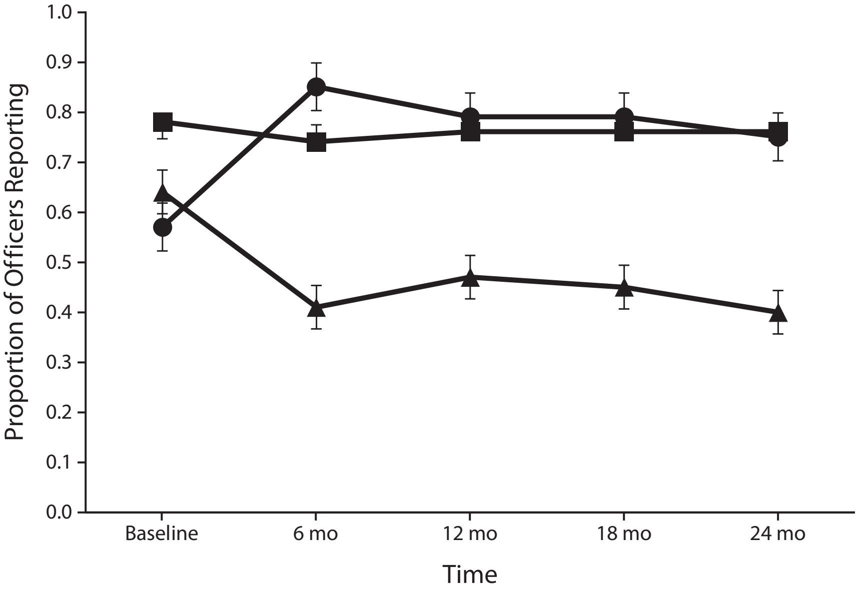
IMPLEMENTATION

Participants completed self-administered pretraining and posttraining surveys (in Spanish) measuring sociodemographic characteristics, knowledge, attitudes, and policing behaviors related to drug policy and substance use. The outcome (knowledge of syringe laws) was measured via a single question ("Under current Mexican law, how many syringes may a citizen legally possess?") and coded, in the form of a dichotomous measure, as the correct response (as many as they want) versus all other responses (e.g., none, 1, 7, 10). In addition, we created a dichotomous measure focusing on attitudes toward PWID that was based on three possible responses to the following statement: "Drug users do not deserve to be treated as people" ("strongly agree"/"agree" vs "disagree"; the first 2 responses were combined). The dependent variable (arrests for syringe possession) was measured via a single question ("How often did you arrest someone for syringe possession in the previous 6 months?") and codified as always/sometimes/rarely versus never. All participants were remunerated $20. Data were deidentified prior to the analysis.

EVALUATION

After exclusion of participants with missing data (n = 14) and those who were lost to follow-up (n = 64), our sample consisted of 693 officers (3523 total observations). Correct knowledge of syringe laws among officers increased from 56% before training to 94% after training (Figure B, available as a supplement to the online version of this article at http://www.ajph.org), with significant sustained improvements at six months (85%) and 24 months (75%; Figure 1). The percentage of officers reporting syringe possession arrests decreased from 64% at baseline to 41% at 6 months ($P < .001$), with no significant decrease during the subsequent follow-up visits. Officers reporting possession arrests were consistently more likely to have incorrect knowledge of syringe laws, to have negative attitudes toward PWID, to be male, and to work in areas with high drug use.

For each 6-month interval subsequent to the baseline visit, there was a 13% reduction in the odds of reporting arrests for syringe possession (adjusted odds ratio [AOR] = 0.87; 95% confidence interval [CI] = 0.85, 0.90; Table 1). Officers with correct knowledge of syringe laws had 37% lower odds of reporting arrests for syringe possession (AOR = 0.63; 95% CI = 0.44, 0.89) after control for follow-up visit, sex, patrol assignment, and precinct location. Female officers had 35% lower odds of reporting arrests for syringe possession (AOR = 0.65; 95% CI = 0.35, 0.87), whereas officers in high drug use



	Baseline	6 Months	12 Months	18 Months	24 Months
▲ Arrest for syringe possession (previous 6 months)	0.64	0.41	0.47	0.45	0.40
● Correct knowledge of syringe law	0.57	0.85	0.79	0.79	0.75
■ Positive attitude towards PWID	0.78	0.74	0.76	0.76	0.76

FIGURE 1— Trends in Arrests for Syringe Possession, Knowledge of Syringe Laws, and Attitudes Toward People Who Inject Drugs (PWID) Among Municipal Police Officers (n = 693) in Tijuana, Mexico, 2015–2018

TABLE 1— Logistic Regression Model of Self-Reported Arrests for Syringe Possession Among Municipal Police After SHIELD Training: Tijuana, Mexico, 2015–2018

	OR (95% CI)	
Variable	**Unadjusted Model**	**Adjusted Model**
Time (visit)	0.86 (0.83, 0.88)	0.87 (0.85, 0.90)
Female sex (vs male)	0.49 (0.32, 0.75)	0.56 (0.35, 0.87)
Age, y	1.02 (0.99, 1.03)	
Less than high school education (vs more)	1.11 (0.97, 1.26)	
Work experience (years)	0.89 (0.82, 0.97)	
Correct knowledge of syringe laws (vs incorrect)	0.51 (0.44, 0.59)	0.63 (0.44, 0.89)
Positive attitudes toward PWID (vs negative)	1.33 (1.14, 1.55)	
Patrol assignment (vs administrative duty)	3.01 (2.02, 4.48)	6.71 (3.83, 11.76)
High drug use precinct (vs low)	1.90 (1.57, 2.31)	2.42 (1.56, 3.77)

Note. CI = confidence interval; OR = odds ratio; PWID = people who inject drugs; SHIELD = Safety and Health Integration in the Enforcement of Laws on Drugs program. Generalized estimating equations with an exchangeable correlation structure were used to conduct logistic regression modeling. Arrests for syringe possession refer to the previous 6 months. The sample size was 693 (3523 observations).

precincts had greater than double the odds of reporting arrests (AOR = 2.42; 95% CI = 1.56, 3.77) than officers assigned elsewhere.

ADVERSE EFFECTS

We are not aware of any adverse effects from this intervention other than the discomfort of responding to sensitive topics on the self-administered surveys.

SUSTAINABILITY

Through leveraging of existing infrastructure within the Tijuana police academy and a train the trainers strategy for implementing the curriculum, 80% of the police force received training within 15 months in concert with routine training activities. Furthermore, most officers were willing to participate longitudinally, and the retention rate was 91.6% through 24 months. We credit this success to locally trained and experienced field staff in Tijuana who used a rigorous yet flexible data collection strategy with regular contact and follow-up visits at convenient locations for officers, including in the field and in private settings.

The SHIELD model provides a sustainable research and practice infrastructure given the ability to collect various types of data with flexibility. For example, numerous in-depth interviews were conducted, and a supplemental quantitative survey on referral preferences was appended to the 24-month follow-up questionnaire. With evolving safety concerns among police personnel, the SHIELD training is sustainable in that the occupational safety component can be easily adapted to address emerging concerns. For example, the needlestick injury module can be supplemented with relevant instruction on fentanyl exposure.[10] However, SHIELD's adoption and sustainability depend on political will and the policing priorities of local administrations.

PUBLIC HEALTH SIGNIFICANCE

Our results highlight the link between officers' knowledge of syringe possession laws and related behaviors. SHIELD training was associated with sustained improvements in knowledge of syringe laws and corresponding reductions in the proportion of officers reporting arrests of PWID for syringe possession. Precinct location, patrol assignment, and female sex likely also shape policing in this context and should be accounted for in public health research and practice. Police training that bundles harm reduction and occupational safety content should be considered among core public health interventions to improve the health of PWID in prohibitionist contexts. AJPH

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CONTRIBUTORS

P. Baker led all aspects of the data analysis, scientific writing, and article preparation. L. Beletsky and S. A. Strathdee conceptualized the parent study and provided support in analytical interpretation and conceptual framing. R. Garfein, E. Pitpitan, E. Oren, and J. A. Cepeda contributed to analytical interpretation and the editing of the article. All of the authors contributed to the development of the article.

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CONFLICTS OF INTEREST

The authors declare no competing interests.

HUMAN PARTICIPANT PROTECTION

All participants provided informed consent with approved documentation. The study protocol was approved by the institutional review boards of the University of California, San Diego, and Universidad Xochicalco (Tijuana).

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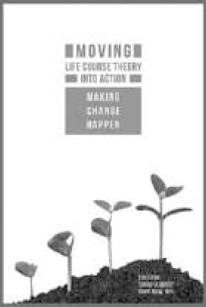

Safe and Stable Housing for Intimate Partner Violence Survivors, Maryland, 2019–2020

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House of Ruth Maryland is a comprehensive intimate partner violence (IPV) service provider. Our academic–practitioner partnership conducted a prospective, quasi-experimental evaluation (n = 70) of on-site transitional housing and community-based rapid rehousing to meet the safety and stability needs of individuals made homeless because of IPV. By 6-month follow-up, both IPV revictimization and housing instability significantly improved ($P < .001$). Housing supports through an IPV service provider advanced the dual goals of safety and housing stability for IPV survivors. Safe, affordable housing is an IPV prevention strategy. (*Am J Public Health*. 2022;112(6):865–870. https://doi.org/10.2105/AJPH.2022.306728)

Individuals made homeless because of intimate partner violence (IPV) have unique needs for safe, affordable housing.

INTERVENTION

Leading programmatic approaches for housing IPV survivors include transitional housing (TH)[1] and, more recently, rapid rehousing (RRH).[1,2] House of Ruth Maryland (HRM) embeds TH and RRH within comprehensive IPV supports including hotline; advocacy, including legal advocacy; health services; counseling; abusive partner intervention; and crisis emergency housing.

Transitional Housing

On-site TH apartments provide 9 to 15 months of safety and security near core services, enabling skill building and self-sufficiency. Participants have access to on-site services and advocacy, including workforce development, safety planning, trauma therapy, health care, childcare, and legal support. TH participants enter following crisis shelter stays (~30–90 days), based on service coordinator referral. Selection is based on long-term safety (IPV severity) and health needs (including mental health and children's health) that impede economic and housing stability. The TH location is concealed for safety.

Rapid Rehousing

RRH follows "housing first" principles[2]; participants receive graduated rental assistance for community-based housing, after which they assume full rent payments. HRM's Safe Homes Strong Communities program provides an average of 6 months of rental assistance, adjusted to client needs. Rent checks are intentionally provided directly to the client, who pays the landlord, to build relationships, skill, and confidence in being the primary leaseholder. Move-in assistance is available for security deposits, rental applications, and other expenses. Clients can receive household supplies, furniture referrals, and transportation assistance. Safe Homes Strong Communities participants enter the program through crisis shelter, TH, or external referral. A housing specialist assists in housing identification, rent reasonableness (relative to comparable housing), housing preinspection, and confirmation of property registration and lead certificate; the housing unit must pass city inspection. Service coordinators provide ongoing support and advocacy in clients' new homes to build stability and support for long-term safety.

PLACE AND TIME

This academic–practitioner partnership is based in Baltimore, Maryland. Study enrollment ran from June 2019 to December 2020.

PERSONS

During the study enrollment period, female RRH and TH participants were recruited for and consented to evaluation; eligibility was limited to ages 18 years and older, with physical or sexual IPV or IPV fear in the year before programming, and ability to complete study activities in English. Receipt of RRH services was defined as being actively housed and receiving rental assistance. We enrolled 70 participants (59 RRH, 11 TH), of whom 81.4% were retained at 6-month follow-up; attrition analyses found no significant differences between women who were retained and those lost to follow-up at 6 months. Qualitative interviews (n = 20) contextualized quantitative results (not reported).

PURPOSE

Comprehensive IPV programs have long provided safe housing spanning the spectrum of emergency crisis to short- and medium-term supports in response to survivors' needs for safe housing. Yet, the efficacy of TH and RRH specifically in preventing IPV revictimization and reducing housing instability among individuals made homeless because of IPV is underdeveloped[3] relative to the public health burden of IPV[4,5] and its mutually reinforcing, escalating dynamics with homelessness.[6] Lack of safe, affordable housing is a barrier to leaving an abusive relationship, and IPV is a leading risk factor for homelessness and housing instability among women.[6] Housing instability can prompt a hazardous cycle of revictimization and increasing IPV severity, creating opportunities for abusive partners to re-engage. Homicide risk peaks at the time of separation.[7] Women overall and women of color disproportionately experience IPV and IPV-related homicide,[4] the gender and gender–race wage gaps[8] undercut their economic leverage to secure housing, and intersectional racial–gender discrimination exacerbates housing disparities.[9,10]

In 2009, the Homeless Emergency Assistance and Rapid Transition to Housing Act expanded the homelessness definition to include individuals fleeing or attempting to flee domestic violence. This change prompted an expansion of housing supports to homeless IPV survivors by the US Department of Housing and Urban Development and a critical need for high-quality evidence on effective intervention approaches to support the unique safety and housing needs of this population.

IMPLEMENTATION

Our quasi-experimental, community-based participatory evaluation examined the impact of TH and RRH supports on safety and housing stability outcomes over 6 months among IPV survivors.

EVALUATION

Survey data were collected at baseline and 3-month intervals through 6-month follow-up via a secure, Web-based application. Participant demographics at baseline are presented in Table 1. Participants received gift card stipends, modest household items, and resource information at each data collection point.

Linear and logistic mixed effects models estimated changes over time; indicator variables for time since baseline at 3-month and 6-month intervals served as the primary independent variables. Analyses were stratified by type of housing program (RRH vs TH) to explore heterogeneity of effects.

Recent IPV decreased significantly by 6-month follow-up both in any experience of IPV (12.3% from 56.1% baseline; adjusted odds ratio [AOR]$_{6m}$ = 0.06; 95% confidence interval [CI] = 0.02, 0.21; $P < .001$; Table 2), and average Revised Conflict Tactics Scale (CTS) score (0.47 from 3.35 baseline; adjusted mean difference$_{6m}$ = −2.88; 95% CI = −3.91, −1.84; $P < .001$). Average Women's Experience with Battering scale score decreased from 36.63 at baseline to 22.61 (adjusted mean difference$_{6m}$ = −14.06; 95% CI = −18.14, −9.98; $P < .001$). These reductions were evident and statistically significant by 3-month follow-up, specifically any IPV (AOR$_{3m}$ = 0.06; 95% CI = 0.02, 0.22; $P < .001$), CTS score (mean difference$_{3m}$ = −2.57; 95% CI = −3.61, −1.52; $P < .001$), and Women's Experience with Battering score (mean difference$_{3m}$ = −14.37; 95% CI = −18.47, −10.28; $P < .001$).

Average housing instability score[11] decreased significantly to 2.31 at 6-month follow-up, from 3.23 baseline (adjusted mean difference$_{6m}$ = −0.87; 95% CI = −1.41, −0.34; $P = .001$).

During this time, economic dependence on partners decreased significantly (AOR$_{6m}$ = 0.32; 95% CI = 0.12, 0.86; $P = .024$). Related economic indicators specific to both housing and food stress significantly improved ($P < .05$). IPV-related self-blame decreased (adjusted mean difference$_{6m}$ = −1.88; 95% CI = −3.14, −0.62; $P = .004$).

In stratified models, the reductions in IPV and housing instability at 6-month follow-up were evident among both RRH and TH participants (not shown).

ADVERSE EFFECTS

No unintended consequences were reported among evaluation participants.

TABLE 1— Sample Demographics of Recent Intimate Partner Violence Survivors in Rapid Rehousing or Transitional Housing: Baltimore, MD, Enrolled June 2019–December 2020

	Total, No. (%), Mean ±SD, or %	Rapid Rehousing, No. (%), Mean ±SD, or %	Transitional Housing, No. (%), Mean ±SD, or %	*P*
Total enrolled	70 (100.0)	59 (84.3)	11 (15.7)	
Age, y	33.11 ±7.25	32.95 ±7.38	34.00 ±6.80	.66
Race/ethnicity				.84
White	2.9	3.4	0	
Black, African American, African	77.1	76.3	81.8	
Hispanic or Latino	5.7	6.8	0	
Asian	1.4	1.7	0	
Multiracial/more than 1 race	8.6	8.5	9.1	
Other	4.3	3.4	9.1	
Family size (adults and children)	4.52 ±2.00	4.60 ±2.05	4.09 ±1.70	.44
Has children with abusive partner				.05
No	24.6	28.8	0	
Yes	75.4	71.2	100.0	
Education				.02
High school or less	47.1	45.8	54.5	
Some college	44.3	49.1	18.2	
College graduate or more	8.6	5.1	27.3	
Household income from all sources in 2018 before taxes, $				.50
0–20 000	63.9	62.0	72.7	
≥ 20 001	36.1	38.0	27.3	
Any employment in past 30 d				.03
No	39.1	33.9	70.0	
Yes	60.9	66.1	30.0	
Total monthly income in past 30 d from all sources, $	1517.67 ±924.88	1649.93 ±926.41	816.70 ±534.00	.008
Baseline homicide risk				.78
Variable	11.9	11.8	12.5	
Increased	23.8	26.5	12.5	
Severe	16.7	17.7	12.5	
Extreme	47.6	44.1	62.5	
Enrollment timing relative to COVID-19 pandemic				.87
Before	65.7	66.1	63.6	
After	34.3	33.9	36.4	

Note. The sample size was n = 70. *P* values were based on *t* test for continuous variables and χ^2 test for categorical variables. Floating sample size accommodates modest amounts of missing data.

SUSTAINABILITY

The promising evidence of reductions in IPV revictimization and housing instability following RRH and TH supports continued investments in these programs as embedded within comprehensive IPV programs. With immediate needs met for safe, affordable housing, survivors could achieve medium-term goals of continued safety and economic stability, which, in turn, support longer-term, mutually reinforcing goals of housing and economic stability, resilience, health, and safety. IPV revictimization was reduced on average though it was not fully eliminated; abuse severity, intensity, and chronicity

TABLE 2— Changes in Safety and Housing Instability Over 6-Month Follow-Up for Intimate Partner Violence (IPV) Survivors in Either Rapid Rehousing or Transitional Housing: Baltimore, MD, Enrolled June 2019–December 2020

	Baseline (n = 70), % or Mean ±SD	3-Mo Follow-Up		6-Mo Follow-Up	
		(n = 57), % or Mean ±SD	AOR or b (95% CI)[a]	(n = 57). % or Mean ±SD	AOR or b (95% CI)[a]
Safety/IPV revictimization					
Any IPV, past 3 mo					
No	43.9	87.5	1 (Ref)	87.7	1 (Ref)
Yes	56.1	12.5	0.06 (0.02, 0.22)	12.3	0.06 (0.02, 0.21)
IPV score per CTS, past 3 mo	3.35 ±3.99	0.77 ±2.61	−2.57 (−3.61, −1.52)	0.47 ±1.82	−2.88 (−3.91, −1.84)
Women's Experience with Battering Score	36.63 ±16.69	22.33 ±14.64	−14.37 (−18.47, −10.28)	22.61 ±15.72	−14.06 (−18.14, −9.98)
Perceived risk of IPV in the next 3 mo					
Not at all likely	50.0	71.4	1 (Ref)	68.4	1 (Ref)
Somewhat unlikely, unsure, or somewhat/very likely	50.0	28.6	0.14 (0.04, 0.52)	31.6	0.18 (0.05, 0.63)
Housing instability					
Housing Instability Score	3.23 ±2.05	1.76 ±1.67	−1.41 (−1.95, −0.88)	2.31 ±2.09	−0.87 (−1.41, −0.34)
Moved in past 3 mo[b]					
No	44.1	75.4	1 (Ref)	92.9	1 (Ref)
Yes	55.9	24.6	0.25 (0.12, 0.55)	7.1	0.06 (0.02, 0.18)
Economic factors					
Economic dependence on partner, past 3 mo					
No	42.0	56.1	1 (Ref)	57.9	1 (Ref)
Yes	58.0	43.9	0.35 (0.13, 0.94)	42.1	0.32 (0.12, 0.86)
Worry or stress about affording housing, past 3 mo					
Always or usually	60.3	40.4	1 (Ref)	38.2	1 (Ref)
Sometimes, rarely, or never	39.7	59.6	3.25 (1.28, 8.23)	61.8	3.52 (1.38, 9.01)
Worry or stress about affording food, past 3 mo					
Always or usually	47.1	24.6	1 (Ref)	23.2	1 (Ref)
Sometimes, rarely, or never	52.9	75.4	5.30 (1.74, 16.19)	76.8	5.33 (1.77, 16.05)
Ability to meet needs for self or children					
Can meet on own or with current assistance	47.1	38.6	1 (Ref)	49.1	1 (Ref)
Can meet a part of, or none, with current assistance	52.9	61.4	2.03 (0.77, 5.36)	50.9	0.93 (0.36, 2.39)
Psychosocial factors					
Depression score	2.68 ±1.94	1.86 ±1.85	−0.72 (−1.17, −0.27)	2.26 ±1.92	−0.42 (−0.87, 0.03)
Internalized IPV stigma score/self-blame	18.60 ±6.53	16.74 ±7.44	−1.65 (−2.92, −0.39)	16.45 ±6.33	−1.88 (−3.14, −0.62)
Resilience score	25.70 ±8.68	27.62 ±8.11	1.41 (−0.49, 3.31)	27.35 ±8.71	1.36 (−0.54, 3.26)
Dyad factor					
Had contact with abusive partner in previous 3 mo					
No	44.9	49.1	1 (Ref)	45.6	1 (Ref)
Yes	55.1	50.9	0.46 (0.15, 1.46)	54.4	0.66 (0.22, 2.02)

Note. AOR = adjusted odds ratio; CI = confidence interval; CTS = Revised Conflict Tactics Scale.

[a] Adjusted for 2018 income, children with abusive partner, baseline CTS (except for CTS outcome). Relative to baseline, based on mixed-effects linear or logistic regression.

[b] Baseline assessment can include program-related moves.

may influence safety timelines and necessary supports. Further research must examine the sustainability of results beyond 6-month follow-up, clarify the pathways to change, consider additional factors involved in shifting IPV and housing stability dynamics, and examine the roles of children as well as abusive partner interventions in influencing safety and stability outcomes.

PUBLIC HEALTH SIGNIFICANCE

Safe housing interrupts the mutually reinforcing dynamics of IPV revictimization and housing instability, thus reducing the burdens of IPV and homelessness. Notably, women's contact with their partners was unchanged through the study period, yet the nature of contact changed profoundly as evidenced by reductions in IPV, perceived risk of abuse, and economic dependence on abusive partners. Evidence that housing interventions can advance women's safety and economic stability without fully severing ties with partners who use violence prompts important questions about how safety can be achieved and counters long-held assumptions that complete separation is the only or best path to safety. Advocates often articulate that separation does not sufficiently recognize women's realities nor preferences, including shared children, that may require contact with abusive partners. Housing aligns with a survivor-centered approach that supports women as they advance their own needs.

Reducing IPV revictimization is a shared goal of public health and public safety. The criminal legal response to IPV is limited by chronic IPV underreporting and overincarceration; comprehensive social support services are needed to prevent IPV revictimization and meet survivors' needs. Safe, affordable housing is one such IPV reduction strategy that can increase public safety. By reducing IPV victimization and responding directly to survivors' stated needs, housing aligns with restorative justice principles that emphasize repairing the harm. RRH and TH are accessible independent of the criminal legal system, allowing women an option for achieving safety without the risks and social consequences that can result from contacting police.[12] Results advance the national priority of evidence-based interventions that meet the dual goals of safety and housing stability for IPV survivors.

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CONTRIBUTORS

M. R. Decker and C. N. Holliday designed the study. M. R. Decker, J. Miller, and C. N. Holliday acquired funding and interpreted results. K. T. Grace, K. G. Bevilacqua, and A. Kaur analyzed the data. All authors contributed to the writing.

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Note. The opinions, findings, and conclusions or recommendations expressed are solely the responsibility of the authors and do not necessarily represent the official view(s) of the Johns Hopkins ICTR, NCATS, HRSA, HHS, NIH, or DOJ.

CONFLICTS OF INTEREST

J. Miller oversees the HRM housing programs described herein; she was not directly involved in study-related recruitment, data collection, or analysis.

HUMAN PARTICIPANT PROTECTION

All procedures were approved by the institutional review board of Johns Hopkins Bloomberg School of Public Health (protocol IRB00009497) and aligned with ethical best practices for violence-related research (Ethical and safety recommendations for intervention research on violence against women. Building on lessons from the WHO publication: Putting women first: ethical and safety recommendations for research on domestic violence against women. Geneva, Switzerland: World Health Organization; 2016).

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District-Level Universal Masking Policies and COVID-19 Incidence During the First 8 Weeks of School in Texas

Amy E. Hughes, PhD, Richard J. Medford, MD, Trish M. Perl, MD, MSc, Mujeeb A. Basit, MD, and Kandice A. Kapinos, PhD

Texas discontinued state-sponsored business restrictions and mask mandates on March 10, 2021, and mandated that no government officials, including public school officials, may implement mask requirements even in areas where COVID-19 hospitalizations comprised more than 15% of hospitalizations. Nonetheless, some public school districts began the 2021–2022 school year with mask mandates in place. We used quasi-experimental methods to analyze the impact of school mask mandates, which appear to have resulted in approximately 40 fewer student cases per week in the first eight weeks of school. (*Am J Public Health*. 2022;112(6):871–875. https://doi.org/10.2105/AJPH.2022.306769)

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Strategies to limit COVID-19 transmission have evolved as scientific knowledge increased, vaccines were developed, and new variants emerged. Prior to the 2021–2022 school year, COVID-19 vaccines were not approved by the Food and Drug Administration for children younger than 12 years and the incidence of SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2, the virus that causes COVID-19) was increasing, in part because of the circulation of the Delta variant. As a result, the Centers for Disease Control and Prevention[1] and the American Academy of Pediatrics recommended that schools return to in-person instruction with universal indoor masking policies in place.

The governor of Texas clarified a "mask mandate ban" via executive order on July 29, 2021, stating that "No governmental entity including a . . . school district . . . may require . . . or mandate that [a] person wear a face covering [but] that does not prevent individuals from wearing one if they choose" (https://bit.ly/36Vi1f0). Despite this, several Texas school districts implemented mask mandates at the start of the school year.

INTERVENTION

School district response to the governor's order varied, creating two groups of districts: those starting school with no required masking per the order, and those starting with masking required despite the order.

PLACE AND TIME

We used publicly available weekly SARS-CoV-2 case counts for students and staff of Texas public schools from August through October 2, 2021, from the Texas Department of State Health Services.[2]

PERSON

Our study comprised students and staff of Texas public schools during the first eight weeks of the 2021–2022 school year.

PURPOSE

We aimed to estimate the effects of district-level masking policies on case incidence using rigorous quasi-experimental methods.

IMPLEMENTATION

We collected information about district-level masking policy from news reports. We incorporated zip code–level weekly vaccination data from the Texas Department of State Health Services, county-level seven-day rolling average case counts from *The New York Times*, financial data from the Texas Education Agency, and enrollment data from American Community Survey's five-year estimates.

Using propensity score matching, we matched 61 Texas public or charter school "treatment" districts that began the school year with district-level mask mandates to 61 statistically similar "control" districts. We excluded from our analysis four treatment districts with missing data and 16 districts with policy mandates that started after the first school day (Appendix, Figure A, available as a supplement to the online version of this article at http://www.ajph.org).

Propensity score matching can mitigate challenges associated with policy endogeneity (e.g., systematic differences among mandate and nonmandate districts). We used machine-learning penalized regression variable selection (i.e., LASSO) to parsimoniously identify district characteristics (describing enrollment, funding, race, ethnicity, nativity, and household crowding) for propensity score estimation from a larger set of district-level socioeconomic and demographic characteristics. We selected the nearest-neighbor comparison district for each treatment district without replacement within the strata of school start date. We conducted balancing tests and chose comparison districts on the common support. After matching, treatment districts spent more per pupil than control districts; we therefore adjusted for this in subsequent analyses. To underscore the importance of our quasi-experimental approach, we also estimated models using the full set of control districts.

We used an event study design[3] centered on school start date as time zero to compare our key outcomes: weekly student and staff cases per 1000 enrolled students (hereafter, "cases per 1000"). For weeks with suppressed rates, we imputed values using total district-level cumulative counts from prior and subsequent weeks' totals. We estimated a two-part model[4] to address nonnormality and zero inflation; we used logistic regression to predict the likelihood of any cases and a generalized linear model with log link and γ-distributed errors. We adjusted for weekly case and vaccination rates, and annual per-student funding. Standard errors were clustered at the district level. See the Appendix for further implementation details.

EVALUATION

The 61 school districts starting with a mask mandate had higher student enrollment compared with all districts starting without a mandate. Residents of areas zoned for treatment districts had higher proportions of the fully vaccinated eligible population prior to school start, higher median home and rent values, more racial diversity, and higher educational attainment (Appendix, Table A). However, treatment districts were not statistically different from matched control districts (n = 61) across most of these dimensions (Appendix, Table B), suggesting that propensity score matching created a balanced sample.

Districts without mandates reported two additional adjusted student cases per 1000 from approximately two to six weeks following school start (Figure 1). This translates to a weekly mean of 37 additional student SARS-CoV-2 cases (range = 28–42) and 183 total excess student cases over the study period. However, cases per 1000 were not significantly different seven to eight weeks after school start.

We observed statistically significant differences in weekly staff cases for a single week during the study period (Figure 2). In week 4, control districts reported 0.5 staff cases per 1000 ($P = .044$), which translates to nine excess cases for the week.

ADVERSE EFFECTS

We are unaware of adverse events arising from this analysis; however, school district mask mandates could have negative effects. We were unable to examine this.

Our intervention evaluation has important limitations. First, reported case counts likely suffer from nonrandom measurement error. If comparison districts reported fewer cases (because, for example, of lower community case rates, limited access to testing, or inability to accommodate unfunded reporting), then our estimates may be biased toward zero. Conversely, if treatment districts were more likely to report cases (e.g., meticulous tracking or random surveillance testing), then our estimates may be biased upwards. We controlled for this with propensity score matching and local vaccination rate adjustments. Second, we used an intent-to-treat analysis, which can attenuate estimated effects if "treatment" districts weakly enforced (or control districts strongly encouraged) masking. Third, pandemic response policy changed during our study period. We account for this by matching districts within start week. Including calendar week fixed effects does not change our findings. Finally, we could not account for community masking rates, compliance, or differential access to testing.

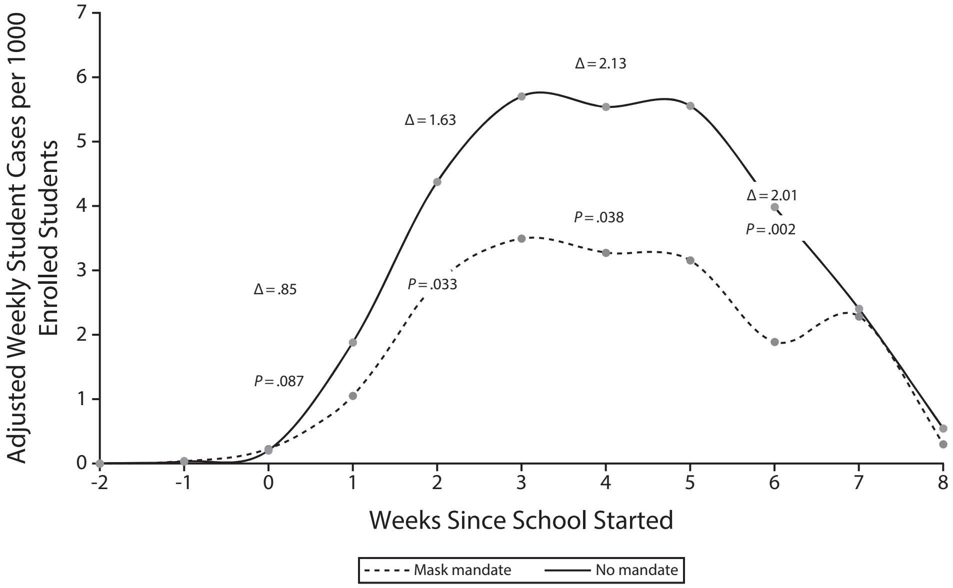

FIGURE 1— Average Number of Student COVID-19 Cases Reported to School Districts, by Mask Requirement: Texas, August 1–October 2, 2021

Note. Deltas (differences) represent weeks (with asterisks) where the case counts between districts with and without mask mandates were statistically significant at $P < .05$ (difference and P value shown on graph). Predicted mean cases per 1000 enrolled students were derived postestimation from a two-part model (logit in the first stage to predict nonzero cases, and then generalized linear model with log link), adjusting for the weekly case and vaccination rates in the district's area, the vaccination rate in the week prior to school start, and per-student annual spending. Standard errors were clustered at the district level.

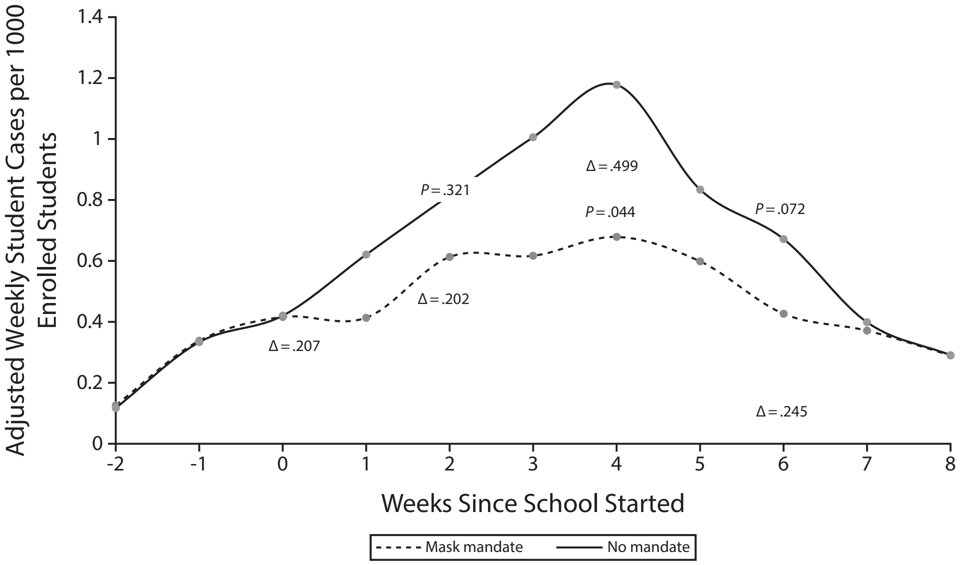

FIGURE 2— Average Number of Staff COVID-19 Cases Reported to School Districts, by Mask Requirement: Texas, August 1–October 2, 2021

Note. Deltas (differences) represent weeks (with asterisks) where the case counts between districts with and without mask mandates were statistically significant at $P < .05$ (difference and P value shown on graph). Predicted mean cases per 1000 enrolled students were derived postestimation from a two-part model (logit in the first stage to predict nonzero cases, and then generalized linear model with log link), adjusting for the weekly case and vaccination rates in the district's area, the vaccination rate in the week prior to school start, and per-student annual spending. Standard errors were clustered at the district level.

SUSTAINABILITY

Mask policy efficacy is driven by vaccine efficacy and coverage, infection-induced immunity, and incidence. As masking and vaccinations increase and incidence decreases, estimated effect sizes of universal indoor masking may wane. All three occurred during our study: Texas COVID-19 prevalence began to decrease in mid-July, 4.9 million Texans were vaccinated in August and September (18% increase),[5] and statewide test positivity rates decreased from 17% (early August) to 11% (late September). Our results, relying on rigorous methods to better isolate causality, are consistent with other observational studies[6–8]; in particular, effect sizes are similar to those found for children in 520 US counties with masked versus unmasked schools (1.3 cases per 1000 in the first week).[9] During our study, the Delta variant dominated case mix; we anticipate higher estimated effect sizes when the Omicron variant dominates because of immune escape and increased contagiousness.

PUBLIC HEALTH SIGNIFICANCE

At the start of the school year, behaviors representing key components of pandemic mitigation responses (vaccination, masking, reporting, contact tracing, distancing) were not uniformly implemented across school districts. Many districts did not collect vaccination or masking adherence metrics from staff and students.[10] After school started in most districts, the Texas Education Agency encouraged case notification to local health departments and parents of children with close contact to cases, and Texas approved remote learning funds for qualified districts and students.[11,12] Lack of information and policy delay might have influenced the efficacy of Texas' personal responsibility approach to mitigating COVID-19 spread in schools.

Our findings suggest that school masking policies could protect students and teachers from COVID-19, and prevent further community spread.

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CONTRIBUTORS

A. E. Hughes contributed to the conceptualization, design, analysis, interpretation of data, drafting, and revision of the manuscript. K. A. Kapinos contributed to the design, analysis, interpretation of data, drafting, and revision of the manuscript. R. J. Medford, T. M. Perl, and M. A. Basit aided in the study design and interpretation, and in drafting and revising the manuscript. All authors approved the final version of the article.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to report.

HUMAN PARTICIPANT PROTECTION

The University of Texas Southwestern Medical Center institutional review board certified that no institutional review board review was necessary because this study used only publicly available, anonymous, and aggregated data.

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Implementation of Baltimore City's COVID-19 Isolation Hotel

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In May 2020, Baltimore City, Maryland, implemented the Lord Baltimore Triage, Respite, and Isolation Center (LBTC), a multiagency COVID-19 isolation and quarantine site tailored for people experiencing homelessness. In the first year, 2020 individuals were served, 78% completed isolation at LBTC, and 6% were transferred to a hospital. Successful isolation can mitigate outbreaks in shelters and residential recovery programs, and planning for sustainable isolation services integrated within these settings is critical as the COVID-19 pandemic continues. (*Am J Public Health*. 2022;112(6):876–880. https://doi.org/10.2105/AJPH.2022.306778)

As the COVID-19 pandemic unfolded, susceptibility of populations made vulnerable because of structural inequities related to race, income, and other circumstances became apparent.[1–3] Prior to COVID-19, housing instability and homelessness were recognized as being associated with increased morbidity and mortality.[4,5] Living in congregate settings such as shelters placed an already medically vulnerable population at high risk of COVID-19 infection[3] with the potential for poor outcomes. In response, jurisdictions across the United States quickly established isolation and quarantine (I&Q) sites for individuals experiencing homelessness to prevent COVID-19 outbreaks in shelter settings, reduce community spread, and provide clinical monitoring for marginalized populations.[6–9] Here we describe implementation activities and data from the first year (May 12, 2020, to May 11, 2021) of the COVID-19 isolation hotel in Baltimore City, Maryland.

INTERVENTION

The Baltimore City Health Department and the Mayor's Office of Homeless Services created a public–private partnership with the University of Maryland Medical System and the Lord Baltimore Hotel to open the 300-room Lord Baltimore Triage, Respite, and Isolation Center (LBTC) for COVID-19 I&Q support.

PLACE AND TIME

LBTC, located at the historic Lord Baltimore Hotel, opened on May 12, 2020, and services are ongoing; here we present one year of data through May 11, 2021.

PERSON

Services are designed to meet the needs of people experiencing homelessness or in recovery programs, but accommodations are open to any individual or family in the community requiring COVID-19 I&Q and are not restricted to Baltimore City residents.

PURPOSE

LBTC's mission is to (1) limit the spread of COVID-19 in high-risk settings and among medically vulnerable populations, (2) ensure the safety and well-being of individuals and families during their I&Q, (3) provide additional support to residents in I&Q to ensure a successful transition after their stay, and (4) provide a dynamic service that can adapt to community needs as the COVID-19 pandemic evolves.

IMPLEMENTATION

LBTC offers clinical support and monitoring for individuals and families who have confirmed COVID-19, who have COVID-19 symptoms and are awaiting test results, or who require quarantine after COVID-19 exposure. Referrals are accepted seven days a week from hospitals and emergency departments, shelters, residential recovery programs (inpatient substance use treatment programs and recovery housing), clinics, other community sites, and individuals who self-refer. The Baltimore City Health Department COVID-19 outbreak team also conducts contact tracing and testing and makes referrals to LBTC for individuals in shelters and recovery programs. Clinical staff complete a telephone intake with a clinical safety checklist for all referrals before acceptance to LBTC. Medical transportation is provided to limit community exposure. Residents undergo a security check to remove weapons and illicit substances.

Several floors of the hotel are considered the "hot zone," which is designated by physical barriers and includes a separate entrance and elevator bank. Staff wear full personal protective equipment while in the hot zone. Residents are asked to stay in their rooms except when visiting the smoking room, and nonclinical staff are stationed on each floor to ensure resident safety. Meals prepared by the Lord Baltimore Hotel are delivered to residents three times a day.

Clinical staff perform daily resident wellness checks, including symptom screening and checking of vital signs, and provide over-the-counter medications and supplies for a comfortable stay. Staff work with pharmacies and treatment programs to ensure that medications are delivered, including methadone. Clinical staff are on site 24 hours per day for evaluation of medical needs and triage to the hospital. Harm reduction strategies include an alcohol withdrawal protocol with monitored distribution of alcohol and opioid overdose prevention strategies such as same-day buprenorphine

TABLE 1— Characteristics of Individuals Served in COVID-19 Isolation and Quarantine at the Lord Baltimore Triage, Respite, and Isolation Center: Baltimore, MD, May 12, 2020–May 11, 2021

Characteristic	Individuals Served (n = 2020), No. (%)
Age, y	
0–18	116 (5.7)
19–30	438 (21.7)
31–50	818 (40.5)
51–59	443 (21.9)
≥ 60	205 (10.1)
Gender	
Male	1371 (67.9)
Female	627 (31.0)
Transgender	16 (0.8)
Missing	6 (0.3)
Race/ethnicity	
Black or African American	1296 (64.2)
White	419 (20.7)
Latinx, Latin–Black, or Latin–White	105 (5.2)
Other	69 (3.4)
Missing	131 (6.5)
COVID-19 status	
Positive	1478 (73.2)
Negative	507 (25.1)
Results missing	35 (1.7)
Housing status on intake	
Shelter or residential recovery program	1008 (49.9)
Homeless or unstably housed	329 (16.3)
Housed but unable to isolate	617 (30.5)
Missing	66 (3.3)
Referral source	
Residential recovery program	601 (29.8)
Hospital or emergency department	387 (19.2)
Self-referred	373 (18.5)
Shelter	243 (12.0)
Health Care for the Homeless	117 (5.8)
Other community clinic or partner	237 (11.7)
Missing	62 (3.1)
Medical and behavioral health status	
At least 1 major medical comorbidity[a]	919 (45.5)
At least 1 mental health diagnosis[b]	866 (42.9)
Substance use disorder[c]	860 (42.6)
Major medical, mental health, and substance use disorder	297 (14.7)
Discharge reason	
Completed isolation or quarantine	1580 (78.2)
Chose to leave	265 (13.1)

Continued

TABLE 1— Continued

Characteristic	Individuals Served (n = 2020), No. (%)
Hospital transfer	124 (6.1)
Administrative discharge	15 (0.7)
Deceased	1 (0.1)
Other	22 (1.1)
Missing	13 (0.6)

[a] Includes diabetes, hypertension, hyperlipidemia, HIV, hepatitis C, chronic obstructive pulmonary disease, asthma, or history of cancer, blood clots, stroke, or myocardial infarction.
[b] Includes depression, anxiety, bipolar disorder, schizophrenia, and dementia.
[c] Includes reported active illicit use, use of medication for opioid use disorder, and currently in a recovery house or substance use disorder treatment program.

initiation, clinical monitoring after suspected drug use, and naloxone training for staff.

National guidelines are followed to determine release from I&Q. A discharge planner ensures a safe discharge location, including arranging placement at a shelter or recovery program if needed. In September 2020, LBTC opened a co-located shelter to provide an additional safe discharge location for homeless residents completing I&Q. Residents in the shelter receive ongoing housing case management and clinical case management services with the goal of securing housing.

EVALUATION

Clinical information and outcome data were prospectively tracked in a secure REDCap database administered by the Baltimore City Health Department for the purposes of clinical monitoring during I&Q. Descriptive statistics are presented for residents served in I&Q in LBTC's first year of operations.

From May 12, 2020, to May 11, 2021, a total of 2020 residents were served in I&Q (Table 1). Of these individuals, 1337 (66.1%) were experiencing homelessness, were unstably housed, or were living in a shelter or residential recovery program setting. The main sources of referrals were residential recovery programs (n = 601; 29.8%), hospitals or emergency departments (n = 387; 19.2%), self-referrals (n = 373; 18.5%), and shelters or Health Care for the Homeless (n = 360; 17.8%). Figure 1 shows the number of residents admitted per month by referral source. During the study period, the peak number of residents was 93 (data not shown), and LBTC never reached full capacity.

A total of 1478 individuals (73.2%) had a positive COVID-19 test result, and the remainder were either symptomatic but tested negative or quarantined after an exposure and remained COVID-19 negative. Medical and behavioral health comorbidities were common; 919 residents (45.5%) had at least one major medical condition, 866 (42.9%) had a major mental health diagnosis, 860 (42.6%) had a substance use disorder, and 297 (14.7%) had all three. The majority of individuals completed I&Q at LBTC (n = 1580; 78.2%). Only 6.1% of residents (n = 124) were transferred to a hospital; 265 (13.1%) chose to leave early, and 15 (0.7%) were discharged for unsafe behavior. Fifty residents (2.5%) transitioned to living in our on-site shelter after completion of I&Q.

ADVERSE EFFECTS

There was one death that was not related to COVID-19.

SUSTAINABILITY

LBTC was designed and implemented within weeks of the COVID-19 pandemic's initial impact on Baltimore, when the length and scope of the pandemic were unpredictable. Federal COVID-19 emergency funds have been used for this project, and these funding mechanisms will dissipate as the country transitions to recovery planning. LBTC emergency-level operations are not sustainable at the current scale. Strong partnerships between agencies serving people experiencing homelessness, health departments, and clinical partners are needed to develop smaller-scale, long-term isolation services modeled on successful LBTC components.

PUBLIC HEALTH SIGNIFICANCE

LBTC has provided safe and effective I&Q services for Baltimore City and beyond. Clinical support and hospitality services tailored to meet the needs of individuals who are experiencing homelessness and have a substance use disorder led to 78% of people completing I&Q and only 6% being transferred to a higher level of care, rates that are comparable with those of other isolation sites.[7] On the basis of prevalence estimates of secondary household infections, LBTC has likely

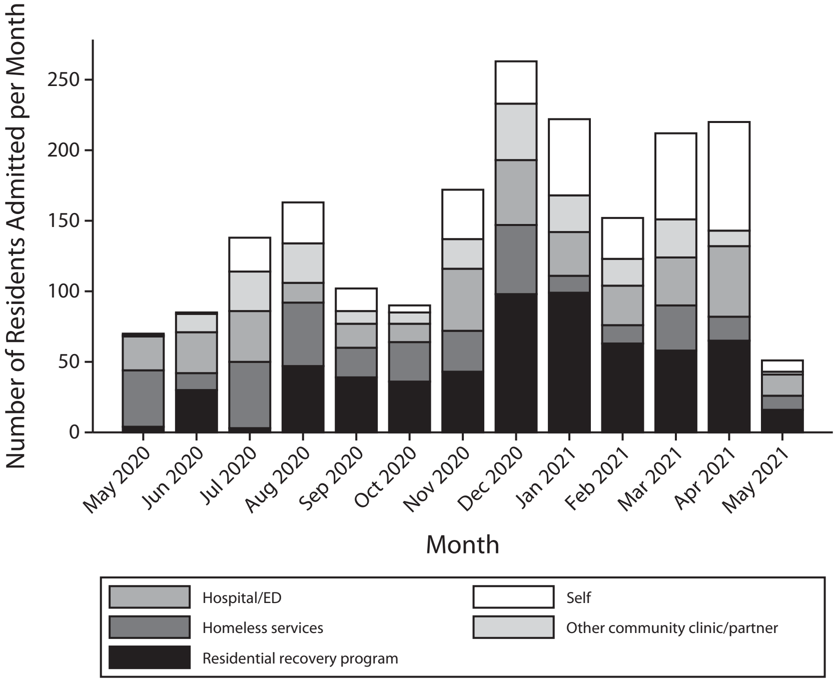

FIGURE 1— **Number of Residents Admitted per Month at the Lord Baltimore Triage, Respite, and Isolation Center, by Referral Source: Baltimore, MD, May 12, 2020–May 11, 2021**

Note. ED = emergency department.

prevented thousands of COVID-19 infections within shelters and recovery programs.[10] Isolation services that remove infectious individuals from shelter settings are effective in preventing disease transmission and reducing costs,[11] ultimately improving health outcomes and preventing deaths.

Key elements of the LBTC model such as clinical monitoring, infection prevention measures, and harm reduction strategies could be modified and implemented in existing shelter or residential recovery program settings where individual room occupancy is available. Models for integrated clinical and shelter services exist[12] and should be expanded as many jurisdictions move toward noncongregate hotel-based shelter care. Integrated on-site clinical services, including infectious disease isolation, medical respite, primary care, and behavioral health services, could prove effective in providing person-centered care to people experiencing homelessness. AJPH

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The authors have no conflicts of interest to declare.

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Homeless Shelters: HIV Testing During the Atlanta Tuberculosis Outbreak (2008–2018)

Udodirim N. Onwubiko, MBBS, MPH, Jane C. Yoon, MD, Sophia Ajoku, PhD, MPH, Anum N. Khan, MPH, and David P. Holland, MD, MHS

See also Kapadia, p. 826.

People experiencing homelessness are at increased risk of tuberculosis (TB) and HIV. We examined the impact of integrating HIV testing and mandatory TB screening on HIV test uptake (HTU) during a multishelter TB outbreak in Atlanta, Georgia (2008–2018). Overall HTU was low; however, the intervention led to a reversal of declining HTU trend (rate ratio = 1.11; 95% confidence interval = 1.04, 1.19). Concerted efforts to increase HIV testing access and uptake alongside robust TB control efforts may increase progress toward the goals of End TB and Ending the HIV Epidemic. (*Am J Public Health*. 2022;112(6):881–885. https://doi.org/10.2105/AJPH.2022.306801)

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Because of their infrequent contact with and poor access to adequate health care, people experiencing homelessness (PEH) are disproportionately affected by infectious diseases, including tuberculosis (TB) and HIV.[1,2] Not only is homelessness, as a social determinant, an independent risk factor for both infections, but diagnosis of HIV in PEH also increases risk of TB coinfection, worsening outcomes.[2,3] For HIV, improved outcomes begin with testing, and although HIV tests are generally available through medical clinics, HIV test uptake (HTU) among PEH remains suboptimal.[4] Opt-out HIV testing strategies that aim to increase access and decrease testing stigma have been shown to increase HTU in various settings.[5] We report on the impact of integrating HIV testing with TB control measures during a TB outbreak among PEH in Atlanta, Georgia.[6,7]

INTERVENTION

The Fulton County Board of Health began screening sheltered PEH for TB in response to an outbreak of isoniazid-resistant TB in 2008.[6,7] Until May 2015, screening for individuals not identified as known contacts to active TB was voluntary or opt-in and provided primarily at the health department (HD). Mandatory TB screening of sheltered PEH (irrespective of contact status) was implemented in May 2015 to combat a resurgence of the outbreak, and access to testing was expanded by provision of regular TB testing opportunities at most shelter locations.[6,7] HIV testing using an opt-out strategy was also recommended as an additional measure to identify at-risk PEH during these TB-screening encounters.[8]

PLACE AND TIME

TB and HIV screening for PEH was provided at the HD and homeless shelters in Atlanta, Georgia, between 2008 and 2018.

PERSON

PEH residing at Atlanta homeless shelters were the targets of this intervention.

PURPOSE

Our goal was to describe HTU correlates and evaluate how integrating HIV testing with TB screening affected HTU.

IMPLEMENTATION

In addition to in-house testing by clinic staff (HD clinic team), testing capacity was boosted after May 2015 by the addition of regular, offsite testing opportunities using mobile or field teams. Two mobile teams—an HD mobile team and a community-based partner (CP) mobile team—staffed by different providers (HD-mobile: specially recruited and trained disease intervention specialists; CP-mobile: nurse and laboratory technicians) were constituted. Each team's operations were independently supervised by its parent organization.

PEH presenting for mandatory TB screening were informed that they would be tested for HIV (HD teams) or asked if they would like to be tested for HIV (CP-mobile team). Those who did not decline to have an HIV test either received an additional needlestick to collect a blood sample for HIV testing (if they were screened for TB using the intradermal tuberculin skin test [TST]) or had an additional blood sample collected at the same draw as the blood sample for their QuantiFERON Gold-in-tube test (QIAGEN Inc, Germantown, MD), or QFT (if they were screened for TB using QFT; (QIAGEN Inc, Germantown, MD)). HIV tests were performed using the INSTI rapid test (BioLytical, Richmond, BC, Canada) followed by the Abbott Architect fourth generation Antigen/Antibody test (Abbott Industries, Wiesbaden, Germany) for confirmation.

EVALUATION

PEH were included in the analytic sample if they were screened for TB using a TST or QFT between 2008 and 2018. Only initial (baseline) TB screening encounters were used. Participants were identified as HIV tested if a test (HIV) was done the same day as the baseline TB screening, and HTU was calculated as the proportion of TB-screened PEH with HIV tests. Given the testing structure, correlations in HTU within shelter-provider clusters (i.e., PEH residing at the same shelter and tested by same provider or team) were accounted for by using generalized estimating equations with logit link function to model correlates of HTU. Testing trends were assessed using quarterly aggregated data. Median quarterly HTU with 95% bootstrapped confidence intervals (CIs) was calculated for pre- and postimplementation periods, and differences were tested using Wilcoxon rank sum tests. Using interrupted time series design and segmented negative binomial regression models, we examined the intervention impact on HTU trend.[9] SAS version 9.4 (SAS Institute, Cary, NC) and R version 4.0.2 (RStudio Inc, Vienna, Austria) were used for analyses.

Of 17 939 PEH screened, the majority were men (76.9%) and African American (86.3%; Table A, available as a supplement to the online version of this article at http://www.ajph.org). Median age was 44 years (interquartile range = 33–53 years), and 4.6% were known contacts to TB cases. Nine percent had positive TB screening results (unread TSTs and indeterminate tests excluded), and 2.1% of those tested were HIV positive.

Overall, HTU was 13.5% (Table 1). There were small but significant differences in uptake by gender (transgender, 19.4%; females, 16.9%; males, 12.4%; $P < .001$), race (Hispanic, 36%; other non-Hispanic, 21.7%; non-Hispanic Black, 13.6%; non-Hispanic White, 11.5%; $P < .001$), age ($P < .001$), and TB test type used (QFT, 18.8%; TST, 10.8%; $P < .001$). There were also variations by shelter-provider clusters; HTU varied from 8.8% to 55.7% in clusters screened by an HD-mobile team, 8.7% to 21.4% in HD-clinic–screened clusters, and 0.6% to 7.2% in CP-mobile–screened clusters (Table B, available as a supplement to the online version of this article at http://www.ajph.org). Statistically significant correlates of increased HTU in adjusted analysis were Hispanic ethnicity, age younger than 45 years, and using the QFT for TB screening.

Over two thirds of the cohort (68.2%) were first screened after May 2015. Median quarterly HTU increased from 9.2% (95% CI = 7.3%, 12.6%) prior to May 2015 to 15.6% (95% CI = 13.6%, 19.6%) after ($P = .028$; Figure 1a). Interrupted time series analysis (Figure 1b and Table C [available as a supplement to the online version of this article at http://www.ajph.org]) showed that the intervention was associated with reversal of the modestly declining HTU trend (rate ratio [RR] = 0.99; 95% CI = 0.96, 1.01) observed prior to May 2015 to a significantly increasing trend after the intervention (RR = 1.10; 95% CI = 1.03, 1.16).

ADVERSE EFFECTS

We are not aware of any adverse effects following intervention implementation. However, our study is not without limitations. Having collected data over an 11-year period, evolving attitudes toward HIV may have affected HTU, and these were unaccounted for during analysis. Also, reasons for uptake or nonopaque of HIV testing were not collected; such insight could help improve future attempts at improving HIV screening among PEH.

SUSTAINABILITY

Providing free, regular community-based HIV testing to PEH in large metropolitan areas is costly. The Fulton County Board of Health leveraged an existing structure addressing another prevalent condition to reduce costs associated with scaling up HIV testing access among PEH. Our evaluation demonstrates that an integrated approach like this one is a practical and realistic avenue for addressing HIV in PEH.

PUBLIC HEALTH SIGNIFICANCE

African Americans have historically been overrepresented in US homeless populations, and the demographic captured in our study demonstrates that this finding, shown to be driven by

TABLE 1— Predictors of HIV Test Uptake Among Persons Experiencing Homelessness (PEH) Screened During the Isoniazid-Resistant Tuberculosis (TB) Outbreak in Atlanta, GA: 2008–2018

	No. of PEH Screened for TB (n = 17 939)	HIV Test Uptake (n = 2 414)		OR[c] (95% CI)	
		No. (%)[a]	P[b]	Unadjusted	Adjusted
Gender					
Female	4 110	696 (16.9)	< .001	1 (Ref)	
Male	13 798	1 712 (12.4)		0.90 (0.67, 1.22)	
Transgender[d]	31	6 (19.4)		0.87 (0.72, 1.04)	
Race/ethnicity					
NH White	2 289	263 (11.5)	< .001	1 (Ref)	1 (Ref)
NH Black	15 327	2 082 (13.6)		1.01 (0.86, 1.19)	1.02 (0.88, 1.18)
NH other[e]	184	40 (21.7)		1.43 (0.83, 2.48)	1.33 (0.81, 2.16)
Hispanic	75	27 (36.0)		2.59 (1.54, 4.35)	2.55 (1.36, 4.79)
Age, y					
18–24	1 407	218 (15.5)	< .001	1.28 (0.99, 1.64)	1.38 (1.06, 1.79)
25–34	3 748	588 (15.7)		1.38 (1.16, 1.65)	1.40 (1.14, 1.71)
35–44	4 074	560 (13.7)		1.17 (1.01, 1.34)	1.27 (1.08, 1.49)
45–54	5 281	639 (12.1)		1.01 (0.84, 1.22)	1.09 (0.91, 1.30)
≥ 55	3 424	409 (11.9)		1 (Ref)	1 (Ref)
Known contact to a TB case					
No	17 118	2 294 (13.4)	.32	1 (Ref)	
Yes	821	120 (14.6)		0.99 (0.61, 1.62)	
TB test type used					
TST	11 955	1 289 (10.8)	< .001	1 (Ref)	1 (Ref)
QFT	5 984	1 125 (18.8)		9.58 (3.30, 27.85)	9.08 (3.17, 26.04)
TB test result					
Negative	13 197	1 890 (14.3)	< .001	1 (Ref)	1 (Ref)
Positive	1 363	197 (14.5)		0.96 (0.80, 1.17)	1.01 (0.85, 1.21)
Unread TST[f]	3 261	318 (9.8)		0.45 (0.21, 0.96)	0.85 (0.69, 1.05)
Indeterminate	118	9 (7.6)		1.09 (0.73, 1.62)	0.83 (0.61, 1.12)

Note. CI = confidence interval; NH = non-Hispanic; OR = odds ratio; QFT = QuantiFERON Gold-in-tube test (an interferon γ release assay test; QIAGEN Inc, Germantown, MD); TST = tuberculin skin test.

[a] Row percentages (i.e., proportion of population subset tested for HIV at baseline TB screening encounter).

[b] Chi square test (or Fisher exact test if small cell).

[c] Generalized estimating equations with logit link function used to account for correlations in HIV test uptake within shelter-provider clusters. Only correlates significant in bivariate analysis were included in multivariable regression model.

[d] Includes male-to-female transgender, female-to-male transgender, and all nonbinary PEH.

[e] Includes Native American, Pacific Islander, Asian, Arab, etc.

[f] PEH did not return for skin test reading.

racial differences in predisposing risks and pathways to homelessness, remains true in the US South even now.[10]

Expansion of testing after May 2015 led to a doubling of the number of PEH screened prior to the intervention. More importantly, there was a reversal of the declining HTU trend, indicating that the integration of TB and HIV testing had a significant positive effect on the study cohort's HTU. Notably, HTU was higher among PEH screened by HD teams (HD-clinic and HD-mobile) than non-HD-screened PEH, potentially reflecting nonuniform implementation of testing protocols across teams. Although strong public–private partnerships are essential for healthy communities, concerted efforts to ensure that key partners executing a public health initiative are equipped with clear

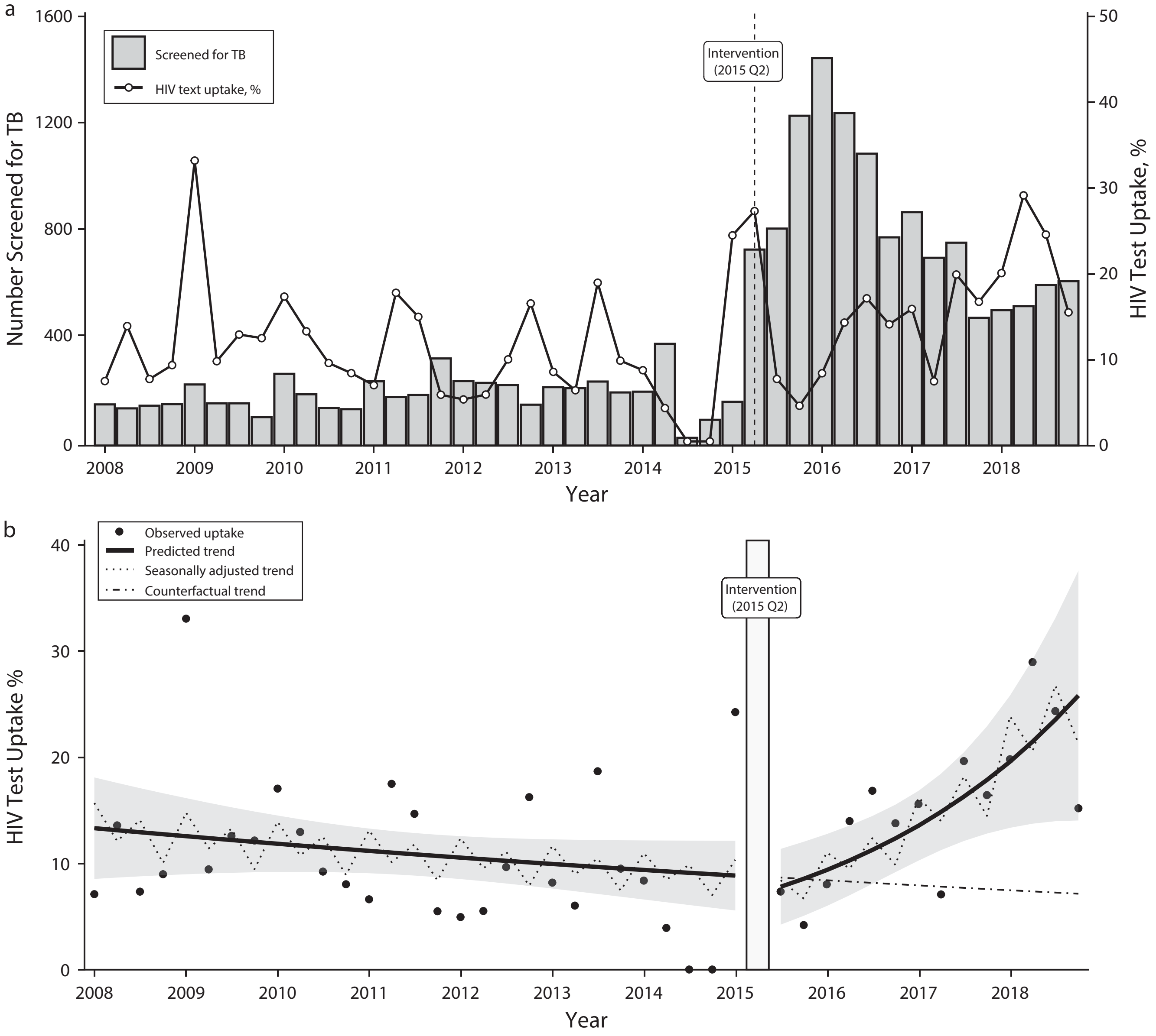

FIGURE 1— **Trends in (a) Tuberculosis (TB) Screening and HIV Test Uptake Among People Experiencing Homelessness (PEH), and (b) HIV Test Uptake Over Time: Atlanta, GA, 2008–2018**

Note. Panel a shows observed trends in response to the isoniazid-resistant TB outbreak in Atlanta homeless shelters (2008–2018). Panel b shows fitted trends in HIV test uptake using interrupted time series analysis. Gray dots show observed quarterly HIV test uptake (per 100 PEH screened for TB or %). Thick black line represents the fitted trend in quarterly HIV test uptake from segmented regression analysis (gray bands represent 95% confidence intervals around fitted trend). Dotted line represents the seasonally adjusted fitted trends in quarterly HIV test uptake. Dot-dash line represents the counterfactual trend in quarterly HIV test uptake expected if the intervention was not implemented in May 2015. Note that because the intervention was implemented midway through the second quarter (Q2) of 2015. 2015 Q2 data were censored to avoid misclassification in pre- and postimplementation periods.

interpretations of recommended protocols will help guarantee consistent policy implementation.

The observed racial and gender differences in HTU suggest that there may be important nuances in HIV testing behaviors in PEH subpopulations that should be considered when planning HIV testing interventions for this population. Among the significant HTU correlates identified, TB test type had the highest point estimate, a finding potentially explained by the additional needlestick needed for HIV testing in TST-screened PEH. If, indeed, a second needlestick is a major barrier to concomitant HIV testing, this obstacle could be eliminated by exclusively using the QFT for TB screening among PEH. By integrating HIV testing with existing TB screening efforts, the burden of both diseases can be reduced, leading to improved health outcomes in PEH. AJPH

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U. N. Onwubiko and D. P. Holland conceptualized and designed the study. U. N. Onwubiko, S. Ajoku, and A. N. Khan performed data collection and statistical analysis. U. N. Onwubiko and J. C. Yoon interpreted data and drafted the manuscript. D. P. Holland, U. N. Onwubiko, and S. Ajoku performed administrative and technical support. D. P. Holland supervised the study. All authors critically reviewed the manuscript.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

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This study was conducted in accordance with the statutory duties of the Fulton County Board of Health and was deemed research of an exempt type by the Georgia Department of Public Health institutional review board.

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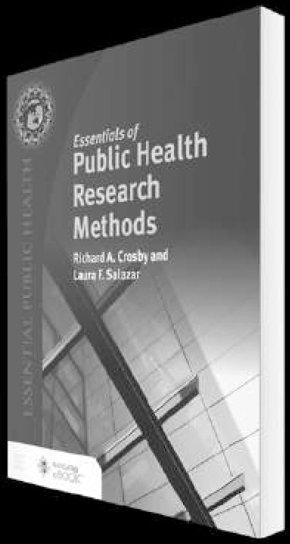

The Future of the Public Health Data Dashboard

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See also Public Health Dashboards, p. 886–904.

The display of surveillance data is an inherent exercise of power. Through the creation of a dashboard, a central authority, sometimes in conjunction with a predetermined group of stakeholders, will make determinations on what data ought to be included in a dashboard. That authority, often external to the community, becomes the arbiter of what data matter for priority setting within and across communities. Through reading dashboards, the central authority also has the power to make sense of what is happening across communities of which they are outsiders.

In public health, this exercise of dual powers is considered altruistic and accepted as it is intended to prevent or alleviate disease whereby a dashboard may serve as a guide for determining where and among whom resources should be prioritized. In this issue, Thorpe and Gourevitch (p. 889), Gleesonet al. (p. 896), and Dixon et al. (p. 900) advocate the use of health dashboards, drawing from early as well as current pandemic experience. We generally concur with their assessment but also share key considerations that temper our enthusiasm for the universal utility of dashboards.

Public health agencies have long used dashboards internally to conduct syndromic surveillance and notifiable disease reporting, and for monitoring and evaluation activities. Before 2020, the public was most frequently exposed to dashboards from consumer goods like fitness apps, car displays, financial portfolios, sports scores, video games, and home security, indoor climate, and weather monitors. However, over the past two years, publicly available dashboards chronicling the COVID-19 pandemic have become ubiquitous, a staple of news outlets and health department communications. And their growth has been fueled by availability of software platforms that can easily and rapidly visualize COVID-19 surveillance data on cases, hospitalizations, deaths, location of cases and deaths, vaccinations, and, to some extent, demographics for these metrics. To date, public-facing COVID-19 dashboards have been more widely available than for any other health condition.

There are many aspects of dashboard design that are underappreciated. While some of these are stylistic choices that are primarily meant to enhance visualization and, to some extent, data comprehension, there are other fundamental assumptions, as raised by other authors in this special section, that bear consideration: asking the right questions, blending quantitative and text-based information, audience segmentation, implications of defining geographical units, and data dispossession.

RIGHT QUESTIONS? RIGHT ANSWERS?

Understanding whether dashboards are asking the right questions and delivering necessary answers requires stepping back and considering two critical components of dashboards: the dashboard creators and the data made available. First, dashboard creators are data analytics or informatics experts who are highly skilled in manipulating, summarizing, and presenting trends in big data from different sources and at different levels. Often, these professionals are disconnected from those who observe, monitor, and use the information presented in dashboards—most particularly users in the public domain who often lack a comparable level of data skills and analytic capabilities. For example, a dashboard analyst can easily provide visualizations of epidemiological models that predict disease transmission dynamics based on some set of preidentified metrics—information that is useful to a policymaker or public health official but has less utility to a private citizen trying to determine their individual risk level based on contact with their social networks.

Second, we are in an era in which vast amounts of surveillance data are being rapidly collected and quickly integrated in dashboards. However, not all data are necessary for all users at all times, and often the information that citizens need to make informed decisions is absent. For example, information on COVID-19 hotspots within a geographical area can alert public health officials on where resources need to be allocated. But, for this to be useful to a person in that community, they would need to check the dashboard regularly and then decide whether and what behaviors to modify to reduce disease risk. Instead, we believe that greater emphasis on providing links to relevant resources that inform and empower individuals on how to modify risk behavior (e.g., masking, social distancing) and health care access (e.g., testing sites, vaccination sites) in their communities is likely to provide information necessary for reducing disease risk.

NARRATIVE INFORMATION

In an accompanying essay, Crisan (p. 893) points out the importance of integrating text-based narratives alongside dashboard displays. In practice, this happens most frequently in news media outlets that blend local anecdotes with time trends or maps. This tested formula is a communication convention in good part because it is effective: quantitatively minded audiences will pay attention to different data display aspects than those whose worldview is more oriented to stories.

Yet, in most public health dashboards, there is a singular emphasis on quantitative information display. This deficit is driven in part by cumbersome or nonexistent methods for including text-based narrative in most data visualization software. It is easy to hide behind institutional concerns about confidentiality to dismiss the inclusion of case studies outright. Yet, by ignoring narrative as an ancient and powerful mode of communication, we privilege transmission of knowledge to those of higher numerical literacy. Hypothetical patient profiles, made of composite cases, are routinely used in clinical education, and similar efforts can and should be envisioned in the next generation of dashboards.

AUDIENCE SEGMENTATION

With these considerations in mind, audience segmentation is an underutilized concept in dashboard design. A nurse in a public health department monitoring benchmarks for his or her hospital has distinctly different needs than a school principal making decisions on masking. Yet, early stages of dashboard creation too often emphasize quantitative data structures, without a foundational understanding of the needs, numerical literacy, and available time and ability of the intended audience.

One example of audience segmentation in practice comes from North Carolina, where three separate dashboards were created for different audiences involved in distributing opioid litigation settlement funds for overdose prevention: one on standard opioid use indicators, including overdose and dispensing rates for biomedical and news media audiences; one on social determinants of health for a public health practitioners advocating structural change; and another for policymakers on government-set overdose reduction targets (https://bit.ly/3v05j6Z).

GEOGRAPHICAL UNITS

Even the fundamental choice of reporting unit has underappreciated consequences. Criticizing the use of geopolitical borders (states, counties, nations) for public health reporting, Everts points out "most dashboards have a built-in spatial imaginary of territorially confined spaces and societies whose integrity must be defended or regained" (https://bit.ly/3r73nbQ). Yet, spatial smoothing to create continuous distributions is readily doable. Even if data are aggregated at county or state levels, people move fluidly across borders, including international ones. For calculating population denominator rates, most dashboards use residential population, but during mass social disturbances, migration is a common feature.

Besides rate calculation, there could be closer attention paid to what is the unit of intervention or action. Dashboards that present national boundaries as definitive and immutable disenfranchise those traveling between nations, including refugees and migrant laborers. Data aggregated at the state level may make large assumptions of homogeneity (e.g., between urban and rural areas) that are untenable. Would John Snow's famous cholera map have been as effective if it had plotted London city limits instead of water source jurisdictions? While geopolitical boundaries are convenient data structures, a greater range of creativity is needed to ensure geographies presented in dashboards correspond to the public health needs being studied.

DATA DISPOSSESION

Data dispossession has become a passively accepted aspect of dashboard construction. Sadly, reporting of methodological details are universally deemphasized in dashboard design. Often "Source:" is all that is listed in a chart, and yet the source may be an entire university or organization that has aggregated the data. The identity of the originating data providers is erased, and in that erasure also disappears accountability. In favor of simplicity, temporal reporting artifacts or gaps in underlying data are rarely described, and often in tiny footnotes.

The pandemic has led to a wave of creativity in conveying complicated concepts (e.g., "flatten the curve"), and we encourage more experiments that bring innovation to presenting critical methodological detail. Sometimes these changes can be small. For example, in early pandemic dashboards, weekly data reporting dips during weekends were presented raw, but visualizations eventually settled on smoothing with multiday moving averages.

RECOMMENDATIONS

In public health, the dashboard paradigm is here to stay. Top-level summary standardization may be worth considering. Weather and sports box scores instantly convey a story with a few numbers; this system works in part because the audience has become attuned to it and knows what to expect. Nobody asks if a weather app should look different in Alaska versus Florida. Similarly, top-level metrics could be further standardized in public health, allowing people traveling across jurisdictions to obtain similar data. We should also acknowledge when it is time to sunset a dashboard, when it has outlived its communication reason for existence. From our experience, dashboards are often decommissioned when personnel resources to keep data flowing and upkeep of data platforms reach a breaking point.

Finally, short, mobile-friendly videos and storytelling are powerful paradigms that reach large audiences and can help people retain knowledge longer. Can we reimagine data display so that it conveys one metric and one story in seconds? This pairing is how we naturally talk and make sense of the world. While dashboards will continue their central place in public health planning, we owe it to those beyond our profession to communicate better: telling true stories about health, with numbers.

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Data Dashboards for Advancing Health and Equity: Proving Their Promise?

Lorna E. Thorpe, PhD, and Marc N. Gourevitch, MD, MPH

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See also Dasgupta and Kapadia, p. 886.

As the COVID-19 pandemic has clearly demonstrated, the role of local data in guiding public health action cannot be overstated. Government agencies, frontline community organizations, health care institutions, policymakers, researchers, and advocates all depend on data to guide their work and, especially during COVID-19, take swift action. Much has been written about gaps in the nation's surveillance capacity and the need to improve reporting timeliness.[1] Less has been written about an ever-growing array of health-related data aggregation dashboards that have stepped in to address some of these gaps. These resources build on surveillance tenets (to provide data to assess burden and distribution of adverse health events and prioritize public health actions) and share the premise that data draw power and value from being placed in context and compared across jurisdictions and geographies, over time, between population groups, and by community characteristics. Indeed, one of the driving forces behind data dashboards has been an effort to reframe how we think about health and its many determinants. Another driving force has been the goal of making data available to wider and more diverse audiences, often with visualizations intended to catalyze change. But are these data dashboards meeting their intended promise? Are they useful to public health stakeholders? We believe the answer is rapidly trending toward "yes."

The introduction of data dashboards by nongovernmental entities is relatively recent. One of the first, the County Health Rankings & Roadmaps (CHRR), was released in 2010 by the University of Wisconsin in partnership with the Robert Wood Johnson Foundation.[2] By parsing data from multiple data sources, CHRR provided the public with ready access to county-level data on a host of metrics. Since then, foundations and federal agencies have supported the development of other dashboards to expand access to data on health and its drivers.[1] The purposes of dashboards can vary. Some analyze health and health equity data to distinct geographic boundaries.[3] Others present and disseminate a new metric.[4] Still others aggregate local policies and laws that affect population health to guide research and advocacy.[5] During the rapidly unfolding COVID-19 pandemic, many state and local health departments struggled to make data publicly available, and the Johns Hopkins University COVID Tracker quickly became the "go-to" data source for by-the-day counts of COVID-19 cases, deaths, tests, and vaccinations.[6] Other COVID-19 dashboards have since drawn explicit attention to COVID-19 inequities[7-9] (see Table 1 for examples).

MONITORING UTILITY

Given the diversity of purposes, how do we assess whether these data dashboards are meeting their intended promise and providing utility to stakeholders? Some dashboards explicitly showcase impact stories of how local communities use their data, which also suggests to other site visitors how these data can be applied across different communities. But quantitative indicators of a dashboard's usefulness must also be measured, including visit and revisit frequency data from Web site analytics, as well as media, social media, and scientific article citations.[10] Dashboards generally seek to "liberate" access to data. Local media reports quoting the use of dashboard data by different stakeholders—whether local and state health officials, journalists, or advocates—offer direct evidence of this goal. Although there are no thresholds for the number of new or returning users a site should have, and although target audience sizes vary, many sites sustain hundreds of thousands or even millions of users. Others see a spike in use and then a loss of interest. If usership is low or drops consistently, the

TABLE 1— Examples of Health Data Dashboards: United States, 2022

Dashboard Name	Creator	Geographic Focus	Size	No. of Metrics (as Accessed on January 28, 2022)	Domains
General					
America's Health Rankings https://www.americashealthrankings.org	United Health Foundation	State	50 states	50	Social and economic factors, physical environment, clinical care behaviors, health outcomes
County Health Rankings & Roadmaps https://www.countyhealthrankings.org	University of Wisconsin Population Health Institute	County	All counties (n = 3006)	Ranked: 35 Additional: 32	Social and economic factors, physical environment, clinical care behaviors, health outcomes
City Health Dashboard https://www.cityhealthdashboard.com	New York University Langone Health Department of Population Health	City, census tract	766 cities; 34 424 census tracts	City and tract level: 27 Citywide only: 13	Social and economic factors, physical environment, clinical care behaviors, health outcomes
National Equity Atlas https://nationalequityatlas.org	PolicyLink	City, region, state, nation	100 cities; 150 regions; 50 states	30	Demographics, economic vitality, readiness, connectedness, economic benefits
PolicyMap https://www.policymap.com	PolicyMap, Reinvestment Fund	State, county, metropolitan area, zip code, block group, congressional district, etc.	Nationwide	Tiered subscriptions for >50 000 metrics, available at different geographic units	Demographics, incomes and spending, housing lending, quality of life, economy, education, health, federal guidelines, analytics
US News Healthiest Communities https://www.usnews.com/news/healthiest-communities/rankings	*US News and World Report*	County	2875 counties	84	Population health, equity, education, economy, housing, food and nutrition, environment, public safety, community vitality, infrastructure
COVID-19 specific					
Coronavirus Resource Center US Map https://coronavirus.jhu.edu/us-map	Johns Hopkins University Department of Medicine	State, county	All states and counties	. . .	COVID cases, deaths by demographics
US COVID Atlas https://theuscovidatlas.org	University of Chicago	County	All counties	. . .	COVID cases, deaths, testing, vaccination, community health information, mobility
Geographic Insights COVID Metrics for US Congressional Districts https://geographicinsights.iq.harvard.edu/coviduscongress	Harvard University Geographic Insights Lab	State, county, congressional district	All states, counties, congressional districts	. . .	COVID cases and deaths
COVID-19 Health Inequities in Cities https://www.covid-inequities.info	Drexel University, Big Cities Health Coalition	City	29 cities (Big Cities Health Coalition)	. . .	COVID cases, percent positivity, hospitalizations, deaths by neighborhood characteristics

(*continued*)

TABLE 1— Continued

Dashboard Name	Creator	Geographic Focus	Size	No. of Metrics (as Accessed on January 28, 2022)	Domains
Novel metric/index based					
AARP Livability Index https://livabilityindex.aarp.org	AARP Public Policy Institute	Zip code, city, county	All counties and zip codes, some cities	40	Housing, neighborhood, transportation, environment, health, engagement, opportunity
Measure of America's Mapping America https://measureofamerica.org/maps	Measure of America, Social Science Research Council	State, metropolitan area, county, congressional district	All states, counties, congressional districts; 25 most populous metropolitan areas	Varies by geographic unit	Human development index, sustainable development goals, demographics, education, environment, health, housing, inclusion and engagement, safety and security, work, wealth and poverty
The Opportunity Atlas https://www.opportunityatlas.org	Harvard University Opportunity Insights	County, census tract	All counties and census tracts	37	Children's outcomes in adulthood, neighborhood characteristics
Child Opportunity Index https://www.diversitydatakids.org/child-opportunity-index	diversitydatakids.org	County, census tract	All counties and census tracts	Varies by index Child Opportunity Index contains 29 indicators	Child opportunity, education, health and environment, social and economic
Opportunity Index https://opportunityindex.org	Opportunity Nation (Forum for Youth Investment and Child Trends)	State, county	All states + DC, 2065 counties	20	Economy, education, health, community

site's operators should either adopt new strategies to reengage users or consider that the site's utility may have run its course.

From a technical perspective, hosting data on a public Web site platform is increasingly easy, but developing a dashboard that successfully reaches and meets users' needs involves extensive effort and diverse skill sets. Key elements include (1) actively reaching and engaging stakeholders; (2) performing quality assurance and updating data, technical documentation, and underlying geographic boundaries; (3) evolving site functionality to meet users' needs; and (4) researching and developing new measures. Dashboard Web sites are efficient dissemination tools when coupled with portfolios of engagement and communication strategies (blogs, newsletters, impact stories, updates)[11] and also when users are involved in its initial design and ongoing promotion.[3]

Beyond assessing reach, there are other important dimensions of impact to consider. Dashboards can change narratives and mindsets. The coordinated release and compelling conceptual framework of CHRR is widely credited with having contributed to a greater appreciation of underlying drivers (beyond health care) of heath and equity.[2] Another impact can be the contribution of new knowledge, achieved by introducing novel metrics into the research, policy, and advocacy spheres. The Child Opportunity Index, increasingly used by policymakers and researchers, measures neighborhood-level resources and conditions that matter for children's healthy development using an index based on 29 indicators.[4] As the COVID-19 pandemic hit, some dashboards rapidly adapted to include new COVID-19–related measures. For example, in early 2020, the Opportunity Atlas team at Harvard University used data from private companies to add granular measures of local shifts in economic activity resulting from pandemic shutdowns.[12] The City Health Dashboard added a census tract–level measure of COVID-19 local risk to guide local testing and vaccination efforts.[3]

Rigorous methods to measure a dashboard's actual impact on health and health equity are more elusive. Yet, perhaps that is acceptable. Just as we do not question the value of birth and death data generated by the National Vital Statistics System—widely recognized as an essential public good—the value of health data dashboards lies in evidence of uptake of the data they present and its use in advancing health and health equity goals, programs, and policies. Similar to public health surveillance systems, the main intended output of data dashboards is information to drive action. Clear articulation of the objectives of specific dashboards supports assessment of their reach and effectiveness in contributing to health and health equity improvement.

MULTISECTOR ROLES

How should public agencies contribute? Dashboards hosted by federal, state, and local health agencies—the institutions that generate much of the data currently being shared—have been part of this landscape for several years, and dashboards will undoubtedly become more visible components of public health surveillance systems going forward. But not all government agencies have the resources required to build and sustain dashboards that integrate data from multiple sources and domains. The more complex a Web site is in terms of data and functionality (e.g., number of metrics, number of underlying data sources, range of geographies, comparison functions, multiyear data), the more staff time is required to ensure that all facets are updated regularly. Because of this, and because there will always be salient new and creative ways to combine data, we anticipate that health data dashboards will continue to be developed by both public and nonpublic actors, with financial support from foundation and federal agency grants. Indeed, the future of "activated" public health surveillance will involve partnerships between government public health and other sectors, as is already the reality. The appetite for integrating and presenting locally actionable data on health and equity outcomes in the context of their socioeconomic and environmental determinants has been whetted and is here to stay. AJPH

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The Importance of Data Visualization in Combating a Pandemic

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See also Dasgupta and Kapadia, p. 886.

An unprecedented volume and variety of data have been produced to analyze and monitor the changing dynamics of the COVID-19 pandemic. Within the backdrop of this data deluge, the use of data visualization, and especially dashboards, served as a core component of the public health response to disseminate and distill key indicators of community spread and to contextualize mitigating actions. Individuals also began to create dashboards of their own on personal websites or public platforms, such as PowerBI or Tableau Public, adding a personal interpretation to the broader public health narrative. At no other point in history has there been such an extensive collection of data, visualizations, and dashboards of a singular virus and the disease it causes. As the pandemic continues into its third year, it is important to reflect on the effectiveness of these dashboard creation strategies and what we can learn from them.

WHY DASHBOARDS?

The importance of data visualizations for informed decision-making has long been examined and demonstrated in use cases as divergent as therapeutic decision aids, infectious disease management, and policymaking.[1,2] These studies of data visualization focus primarily on simplistic ways of communicating individual risk metrics.[3] However, the pandemic has underscored the utility of more complex visual displays to engage and inform the public, including embedding visualizations within text narratives (i.e., news articles), infographics, and dashboards. Among these different approaches, dashboards stand apart in their specific goal of displaying data in a way that is glanceable but also creates channels to engage in further exploration or analysis; in contrast, narratives and infographics are intended for deeper exposition, although they can limit opportunities for exploration and alternative analysis.[4] The glanceable views of dashboards are constructed from multiple visualizations that are combined, ideally, to provide an effective overview of the data. I argue that it is these characteristics of dashboards that made them a key tool that many public health organizations used to communicate and contextualize the changing dynamics of the pandemic.

EXAMINING DASHBOARD CREATION STRATEGIES

The ways that dashboards are constructed is an important factor in their efficacy. Different dashboard configurations can vary from the types of data and visualizations they show to even nuanced choices of individual design elements such as color, text, and degrees of interaction.[5,6] The efficacy of individual visualizations is as important as their combination into a dashboard.[7] Yet, despite research exploring different visualization and dashboard creation strategies,[5–8] a clear consensus on an effective approach has failed to emerge.

From the perspective of business analytics, where dashboards first gained widespread use, the purpose of dashboards is to relay high-level metrics.[4] Many public health dashboards did conform to this constraint and emphasized key indicators of the pandemic's changing dynamics, including case counts, hospitalizations, and deaths. However, data underlying the pandemic and public health responses are also more complex and include changes over time, geography, viral genomics, and networks of transmission.[9] Forecasting models showing the possible trajectories of the pandemic, including the response to interventions (i.e., vaccines, therapeutics, and nonpharmaceutical interventions), were also influential in shaping public perceptions. These statistical and machine learning models also add uncertainty that influences how information is visualized, interpreted, and acted on.[8]

These complex types of data push the boundaries of dashboard creation, but they are essential for telling a complete and informed story about the pandemic. An example is Nextstrain,[10] which provides a real-time visual snapshot of viral evolution and spread. Nextstrain integrates multiple visualizations, including a phylogenetic tree, a map, and a Muller plot, to convey the extent of viral variation over space and time. Nextstrain had been developed over the better part of

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a decade, initially to monitor seasonal influenza, but it also was tested and refined in the Ebola and Zika outbreaks. Over time, the creators arrived at a set of visualizations that provided an effective overview. Early into the pandemic, researchers with the Seattle Flu Study shared a Nextstrain visualization with a concerning conclusion: the then unknown novel coronavirus had already been circulating in Washington State for approximately 6 weeks. Within 1 week of this finding, many employers in the Seattle area shifted to remote work, with others across the United States and beyond soon adopting a similar strategy. This scenario underscores the important synergistic relationship between data analysis and visualizations; it demonstrates the capabilities of visualization to contextualize the public health implications of analytic results.

THE POTENTIAL FOR DIS- AND MISINFORMATION

Despite the demonstrated benefits of visualizations and dashboards, there is also evidence that they can misinform, either intentionally or not. Intents to mislead with data and visualization are active efforts of disinformation; examples of disinformation using data visualization have been actively observed throughout the pandemic and shared widely on social media.[11] More poorly understood is misinformation that does not result from malice but is unintentional, such as by failing to update dashboard data, accidentally displaying an incorrect metric, or failing to include appropriate contextual information.[12] Poorly crafted visualizations that exaggerate data trends, such as via truncated axes or filtering out or obscuring relevant contextual information, also affect how people read and interpret dashboard information. As the pandemic continues, the presence of “stale dashboards”—those whose data has not been updated in some time—may also serve as concerning sources of misinformation; at first glance, the reader may not understand that the information is out of date and may come away with an incorrect interpretation. The reader’s own data and graphical literacy baselines will also factor into their interpretation of dashboards. Without knowing how these baselines are distributed among the general population, we are not able to assess the efficacy of dashboards to inform or the susceptibility of the public to visual dis- and misinformation. We also lack insight into how dashboards can build or (intentionally or not) erode trust in data and public health organizations.

Unfortunately, the pervasiveness of dashboards that misinform, and their impact on public understanding of the pandemic, has not received much attention. In retrospective analyses of the pandemic, the role that data visualizations and dashboards play in the public’s perception, including their contributions to dis- and misinformation, needs additional scrutiny.

THE CASE FOR A DATA VISUALIZATION RESEARCH AGENDA

Data visualization has long been viewed as an afterthought in data analysis. Yet, the current pandemic makes a compelling case that uses of data visualization and the creation of dashboards are key instruments in the public health toolbox, alongside methodologies from statistics, epidemiology, and qualitative research. Dashboards are also tools that can be misused, both intentionally and not, to mislead rather than to inform. Although research exists that demonstrates the importance and impact of data visualization, there is also a lack of studies that examine visualizations in more complex presentations, such as a dashboard, and that are robustly tested with a broad audience. This knowledge gap means that data visualizations and dashboards are relatively untested and poorly understood even as they are being widely deployed to inform and persuade the public during a pandemic. We should do better. A public health research agenda needs to include data visualization not as an afterthought but as a core component. This agenda should consider the role of visualizations and dashboards not only as a communication tool but also as an intervention that both informs and can modify behavior, from individual choices to larger public health policy. It is critical to understand both the scope and the limitations of such an intervention and discern its effect on how people think critically with data.

Beyond the present pandemic, public health interventions will be deployed to address other pressing challenges, from the opioid epidemic to the climate crisis. Then, as now, data visualization will serve as an important tool to inform and persuade. A research-informed and evidence-based approach needs to guide our data visualization strategies and evaluate their impact on the public. AJPH

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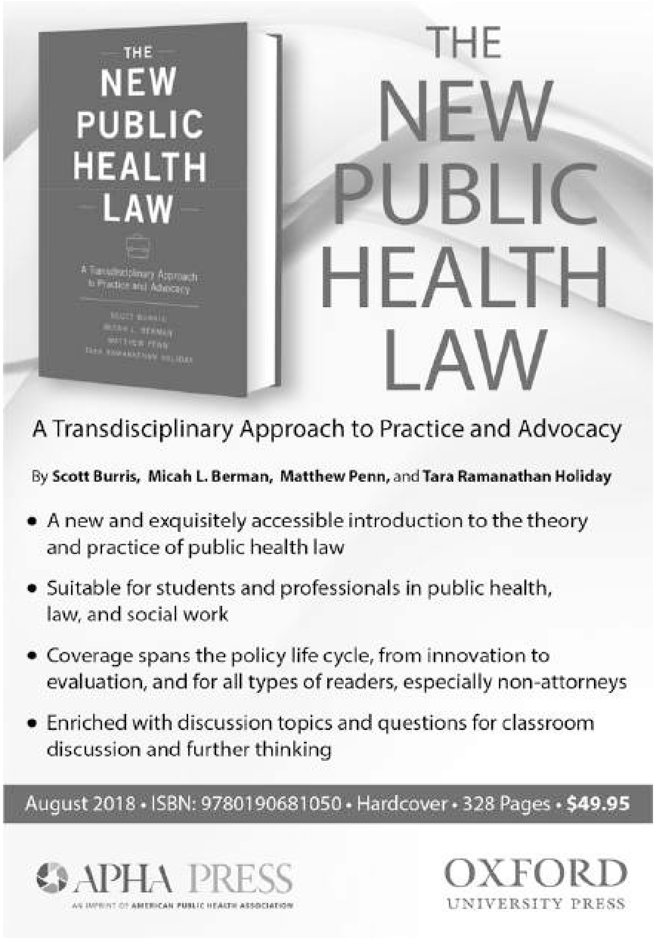

Dashboards and Public Health: The Development, Impacts, and Lessons From the Irish Government COVID-19 Dashboards

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See also Dasgupta and Kapadia, p. 886.

Dashboards use a suite of visual analytics, such as various forms of graphs (e.g., line graphs, histograms, bar charts, pie charts), maps, and infographics (e.g., gauges, traffic lights, meters, arrows) to display and communicate time series and spatial data.[1] Most contemporary dashboards are dynamic (i.e., being updated as data, including real-time data, are released) and interactive (e.g., allowing selecting, filtering, and querying data; zooming in or out, panning, and overlaying; changing type of visualization).[2] The power and utility of dashboards is that they act as effective cognitive tools for making sense of and tracking voluminous, varied, and quickly transitioning data, enabling users to examine emerging patterns and trends and make evidence-informed decisions and policy responses.[3,4] Consequently, dashboards have become common across sectors as a means to communicate, monitor, track, analyze, and act on large volumes of dynamic data.

In the case of health, dashboards have been developed for a variety of purposes, ranging from monitoring individual patient diagnostics (e.g., the dashboard of an intensive care unit monitor) or wellness (e.g., the dashboard of a fitness app), to the management of a hospital (e.g., the performance of staff teams and services benchmarked against targets and other hospitals), to the tracking of disease outbreaks within and across jurisdictions.[4–6] As the COVID-19 pandemic started to become a global phenomenon, a number of COVID-19 dashboards were developed that displayed time series, key performance indicators at different spatial scales (e.g., countries, regions, local areas, hospitals).[7–9]

Academics, journalists, citizen scientists, and health professionals created a number of these dashboards using open data sets as a means of publicly communicating the unfolding situation. Governments and health agencies developed other COVID-19 dashboards to monitor and direct public health operations and formulate policy, as well as to communicate with populations. We discuss the development of the official Irish government COVID-19 dashboards (one designed for the public, the other for internal use only), tracing their development and impact as well as lessons to be learned from their development. Our analysis is based on being actively involved with the dashboards in their proposal, design, implementation, and ongoing maintenance.

DEVELOPMENT

The first case of COVID-19 was detected in Ireland on February 29, 2020. The government quickly put in place the National Public Health Emergency Team (NPHET) to be responsible for monitoring and tackling COVID-19, including formulating and implementing policy related to health system responses (e.g., hospital practices, testing regime, and contact tracing) and citizen and society behavior (hygiene, social distancing, mask wearing, lockdowns, etc.). Data related to the disease quickly became an issue for the government, the media, and the public.

On March 12, the All-Island Research Observatory, in collaboration with colleagues at Ordnance Survey Ireland (OSI) and Central Statistics Office (CSO), proposed the creation of a public-facing Irish COVID-19 dashboard to the Department of Health, using the Johns Hopkins Coronavirus Resource Center dashboard, which was launched on January 22, 2020,[9,10] as a case example. Following a short demonstration and sharing of a basic prototype, the proposal was favorably received, in large part because the All-Island Research Observatory already had a long-established strategic partnership with OSI to develop and manage government-related dashboards and mapping toolkits using the GeoHive platform. In addition, OSI and CSO had an ongoing collaborative relationship, with governance and technical agreements in place for the recently developed UN Sustainable Development Goals Hub for Ireland. Shared experience from this collaboration provided critical direction in the initial development of the COVID-19 dashboard and future iterations.

On March 17, 2020, the OSI and CSO established the COVID-19 Response Coordination Group, and the Department of Health agreed to commission a COVID-19 dashboard using the GeoHive platform. Crucially, the work was to be underpinned by a formal memorandum of understanding between the All-Island Research Observatory, the CSO, and OSI; a service-level agreement between OSI and the Department of Housing, Planning and Local Government; a framework agreement between OSI and Esri Ireland (which provided the Operations Dashboard for ArcGIS software [Esri, Redlands, CA] and technical support); and collaborative arrangements with the Department of Health, the Health Protection Surveillance Centre at the Health Service Executive, and the Office of the Government Chief Information Officer.

The purpose of the Response Coordination Group was to coordinate the technical, data, policy, and financial activities associated with producing a geospatial data hub and dashboard to inform Ireland's response to the COVID-19 outbreak. The underpinning logic of the data strategy was to "collect once, use many times," with the data not only feeding into the dashboard but also available for other activities such as modeling, planning, policy, and operational work. Key aspects of the initial work were to create a workflow and governance model for sourcing and managing data, building and maintaining the data infrastructure, and designing and creating the dashboard. The assistance of the Central Statistics Office Administrative Data Centre was central to this process, as it provided a secure data infrastructure and researcher data portal to support this work.

Work proceeded rapidly, with the COVID-19 Health Surveillance Monitor dashboard publicly launched on March 24, 2020. The dashboard provided information on confirmed cases, deaths, and modes of transmission; segmentation by age, gender, and county; and international benchmarking. This public dashboard was migrated to an ArcGIS Hub platform in June 2020, and new data and tools continued to be added for the next 18 months, along with a Frequently Asked Questions section. This ongoing development was informed and steered through weekly COVID-19 data coordination group meetings chaired by the Department of Health. The development included those involved in COVID-19 data collection and dissemination as well as technical experts from the Health Service Executive, the CSO, the National Office of Clinical Audit, OSI, the All-Island Research Observatory, and the Departments of Health and Public Expenditure and Reform. The original dashboards and hubs, as well as all open-data services, proved very popular, with more than 250 million views in 2020 and 2021 (the Irish population is 5 million).

After the launch of the public dashboard, attention turned to developing an internal, centralized, and secure National Public Health Emergency Team COVID-19 data hub to provide far more in-depth analysis for key stakeholders and to include case data, computerized infectious disease records, acute and intensive care unit hospital data, laboratory testing, movement data from telecoms, and, later, vaccination data. New partnerships were formed with the National Office of Clinical Audit, Health Atlas Ireland, and the University College Dublin National Virus Reference Laboratory. The tools developed provided highly detailed time series and spatial views of COVID-19, its impact on society at the electoral division area (typically ∼5000 households), and the health services response with information on individual units in specific hospitals. The Statistics Act (1993) provided the legal framework for sharing such microdata. The secure data hub also had a sandbox section for exploring new dashboard tools and exploring pressing research questions. Access to the dashboard was strictly restricted to 140 registered users from key bodies. Some of the new data and tools were added to the public dashboard in an aggregated and de-identified form to protect privacy and confidentiality and to comply with General Data Protection Regulation.

The final element of the dashboard work was to make the data used in the public dashboard available on the Irish government open-data site, data.gov.ie, enabling other interested parties to examine the data, build their own data tools, and offer their own analyses. Much of these self-produced data analytics were circulated on social media and traditional media, but, importantly, they used the same official data, reducing confusion concerning data sources and veracity. The COVID-19 Daily Statistics for Ireland by County data set is now the most downloaded data set on the site.

IMPACT AND LESSONS

The public and internal Response Coordination Group–produced COVID-19 dashboards had important impacts with respect to how the pandemic was handled in Ireland. The dashboards provided vital, timely, fine-grained intelligence on a rapidly unfolding situation that directly shaped operational decision making and policy formulation, locally and nationally, and informed public opinion about and attitudes toward the disease and public health measures. The data became a key means of justifying to the public difficult and unpopular decisions concerning lockdowns and public health responses, such as mask wearing. Indeed, the public dashboard and its key indicator data were a daily feature of traditional media reporting and public debate on radio, television, and social media. Internally, the dashboard was a key resource for modeling and near and midterm operational planning of resources and responses. An important impact was to rapidly transform elements of the health data ecosystem in Ireland; long-standing data silos and institutional inertia were dismantled and rebuilt in a handful of weeks, with new data infrastructures, data practices, data protocols, data sharing, and publishing arrangements put in place.

The pandemic and its quickly unfolding nature were clearly the impetus for the rapid changes in the health data ecosystem, but these changes could not have occurred as effectively as they did without a number of conditions. The initiative used existing, successful working relationships between key stakeholders and a body of expertise for building geospatial dashboards. This relationship had already established the legal basis for cooperation and data governance and had a demonstrated and trusted record of delivering high-quality, secure, and trusted data infrastructures and tools. In other words, building on existing relationships and platforms, where trust, systems, roles, and leadership are already in place, enabled a more effective and timely response than starting from scratch. These preexisting relationships—along with the political backing and prioritization by the leading figures in the National Public Health Emergency Team—short-circuited early debate, data protectionism, and potential division between, or resistance by, stakeholders and provided a somewhat ready-made path toward the constitution of a data hub and dashboards.

"Can-do" leadership, where the priority was to make things happen and quickly, was vital. The data governance arrangements were especially important in instilling confidence among all participating parties regarding data security, legal compliance with General Data Protection Regulation, and the appropriate use of the data. Another important decision was to make the data openly available, where legally possible, enabling others to verify, replicate, reproduce, and contribute ideas. This helped to facilitate an evidence-informed public narrative on COVID-19 and established a culture of having to back up claims with data, rather than a political–ideological narrative dominating.

The COVID-19 data hub and dashboards produced in Ireland are significant elements that have informed the public health response to the disease. Importantly, how they were implemented seems set to produce three longer-term impacts. First, it has set in motion a transformation of Ireland's health data ecosystem. Second, it has helped to cement an evidence-informed approach to dealing with an unfolding crisis and to monitoring public health in Ireland. Third, it has established the use of dashboard tools for public and media reporting and an expectation for evidence-informed public debate and the availability of open data. Therefore, we anticipate that public dashboards will become increasingly common for guiding internal operations and for public communication.

DASHBOARD AND ASSOCIATED DATA

The Irish COVID-19 dashboard is available at https://covid19ireland-geohive.hub.arcgis.com. All of the publicly available COVID-19 data related to Ireland, plus associated information and links to international data, are available at https://data.gov.ie/blog/coronavirus-covid-19. AJPH

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CONTRIBUTORS

J. Gleeson coproposed the dashboards and worked on their development, governance, and ongoing maintenance. R. Kitchin was the principal writer of this editorial. E. McCarthy worked on the initial development of the dashboards and related projects.

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The authors have no conflicts of interest to disclose.

HUMAN PARTICIPANT PROTECTION

The dashboards were a direct government intervention in tackling COVID-19, not a research project that would require institutional review board approval. The work was directly overseen by several government departments and complied with General Data Protection Regulation requirements.

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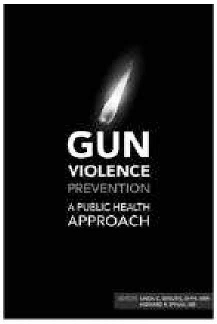

Dashboards Are Trendy, Visible Components of Data Management in Public Health: Sustaining Their Use After the Pandemic Requires a Broader View

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See also Dasgupta and Kapadia, p. 886.

The COVID-19 pandemic highlighted significant deficiencies in the US public health system,[1] especially data-management challenges faced by public health agencies. Many data elements that are now routinely reported and available publicly, such as intensive care unit bed availability, were not measured by public health before the pandemic. It took months before public health could consistently receive critical data from hospitals, emergency departments, and clinics on facility resource utilization and case details for individuals infected with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).

At the beginning of the pandemic, fax machines and human data entry powered the information pipelines to public health officers. Limited capacity to collect, store, and manage data resulted in delays with respect to case identification and contact tracing, delaying mitigation efforts through isolation and quarantine of individuals. Equally important, inefficiencies in data management delayed public health agencies from reporting information to decision-makers and the public, delaying community-level response efforts and limiting transparency. And when there is a vacuum of information, rumors and misinformation spread like wildfire, further complicating the vital work of public health.

DASHBOARDS DURING THE COVID-19 PANDEMIC

Going forward, public health agencies can employ robust information technology (IT) to address their data management and reporting challenges in conjunction with a supportive scientific discipline. Dashboards, which provide a graphical summary or at-a-glance view of essential data and information, are the breakthrough star of the pandemic. Before COVID-19, few health departments used dashboards for anything. By the end of 2020, nearly all states and most large cities had deployed COVID-19 dashboards. In 2021, states and cities updated their dashboards to include vaccination information or created separate dashboards to track COVID-19 vaccine distribution. The Centers for Disease Control and Prevention (CDC) hosts multiple dashboards to track data on COVID-19 testing, hospitalization, vaccinations, variants, and wastewater surveillance. Now part of the public health lexicon, dashboards are here to stay.

Although epidemiologists have long used figures and graphs to communicate information, dashboards go beyond graphical data representation. Consider, for example, the COVID-19 dashboard created by the Regenstrief Institute, which features information on hospitalizations, intensive care unit utilization, and inpatient mortality for Indiana and its 92 counties.[2] Users can interact with the data, filtering by specific counties or narrowing the time window to customize their views. A nonpublic version of the Regenstrief Dashboard, designed for county health officers, allows users to narrow in on census tracts and school districts to provide detailed, hyperlocal situational awareness.[2] The Marion County Public Health Department found it helpful to guide decisions about where to send mobile testing units as well as establish vaccination clinics, enabling the agency to identify and respond to disparities in COVID-19 burden.[3]

SUSTAINING DASHBOARDS BEYOND THE PANDEMIC

Dashboards are a form of information visualization and an applied method used in public health informatics, a discipline with roots in the computer and information sciences that is concerned with not only automating routine tasks (e.g., electronic laboratory reporting, electronic case reporting) but also the nature and use of data and information in public health processes and decision-making.[4,5] Informatics spends as much time, if not more, on process flow and workflow redesign as it does on algorithms and enterprise architecture. For example, the Public Health Informatics Institute[6] assists health departments in improving their management and application of information through collaborative design approaches for information systems and the work processes surrounding those systems.

To routinely leverage dashboards for infectious and chronic diseases as well as injury prevention beyond COVID-19, health departments must become informatics-savvy organizations.[7] Information visualization tools are only the tip of the iceberg when it comes to effectively leveraging data to spur action in addressing population health and well-being. As depicted in Figure 1, public health organizations require significant infrastructure, including people and processes, before developing and publishing dashboards on their Web sites. The technology to host the dashboard online is the easy part. All the other aspects of designing and managing a dashboard are challenges for most health departments.

To effectively visualize data such that decision-makers can act upon the information, public health must clearly define indicators or metrics that can be uniformly interpreted. Significant discussions during the pandemic sought to determine which indicators were most important to know when it would be safe to relax mitigation efforts. Dashboards around the country differ in which metrics they publish. Most present data on laboratory-confirmed infections and deaths, but only some provide details on race/ethnicity or hospitalizations. Some states provide information on breakthrough cases, and many do not. The process of defining informative indicators must ensure metrics are grounded in health literacy and numeracy principles. It must incorporate multiple stakeholders, including epidemiologists, clinicians, informaticians, and health communications specialists. As a consequence, the process is necessarily complex.

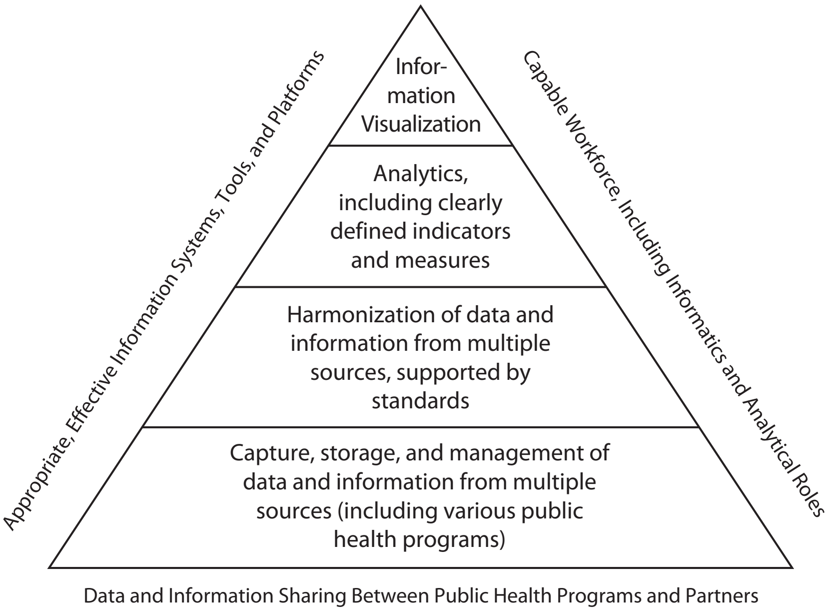

FIGURE 1— The Components Necessary to Support and Facilitate Information Visualization (Dashboards) in Public Health Organizations

For dashboards to contain useful metrics, public health must harmonize data and information from multiple sources. Harmonizing means that all permutations of laboratory tests for COVID-19 (e.g., antigen test, nucleic acid amplification test, polymerase chain reaction [PCR]) from hospital, clinic, commercial, and home sources must be reconciled and standardized so that the agency can define metrics using PCR-only versus any positive result based on the analysis desired by decision-makers. Semantic interoperability is a core competency in informatics, which can help public health unlock the value in the various data captured and stored in the organization's multiple information systems.

EFFECTIVE INFORMATION SYSTEMS, TOOLS, AND PLATFORMS

Supporting the information and work processes that undergird dashboards are three critical aspects of informatic-savvy health departments. First, public health needs ready access to modern IT software and hardware. Effective systems are necessary to collect, store, and manage ever-growing volumes of data. Additional tools are needed to extract, harmonize, and transform data into useful metrics. Then agencies need visualization tools to create and deploy their dashboards.

In our experience, getting approval from the IT department to have a single license for AcrGIS, Tableau, or Microsoft Power BI can be a daunting experience. Provisioning a high-performance computing environment to facilitate data analysis and responsive user interaction is next to impossible in local health departments. We must architect computing environments that provide access to tools yet enable cost-effective sharing and repurposing in public health. For example, states should share infrastructure with local health departments, and CDC should host repositories of reusable algorithms or R packages that can be downloaded and modified to meet local needs.

DATA SHARING BETWEEN PROGRAMS AND PARTNERS

Second, public health requires ongoing, reliable data sharing between internal programs and external partners, including health systems and community-based organizations. For too long, we have hoarded data within program-specific databases. Furthermore, overly zealous concerns about data privacy have sometimes hindered data sharing, even when the collaborations are in the best interest of advancing the public's health. Agencies need collaborative data sharing processes to create cross-functional, linked data sets so that, for example, individuals with HIV who receive nutrition assistance, get vaccinations in public health clinics, and participate in diabetes-prevention programs can be identified and the synergistic benefits of these multiple public health programs measured. Otherwise, public health cannot assess the multiple determinants of health or the true impact of its programs on population health and well-being.

A CAPABLE INFORMATICS WORKFORCE FOR PUBLIC HEALTH

Finally, public health requires a capable workforce to support the myriad activities involved in creating and maintaining dashboards. This requires employing individuals with informatics and analytical skills. Unfortunately, this is challenging when many health departments do not understand what informatics is or how informatics professionals could support agencies in achieving their mission. When the Association of Schools and Programs in Public Health revised the foundational competencies for the masters in public health (MPH) degree in 2014, there was active lobbying to remove the term informatics. Yet, informatics skills are critical for all public health workers, and informatics career paths need to exist at all levels as evidenced in reports based on the Public Health Workforce Interests and Needs Survey.[8,9] This sentiment is shared by the US Department of Health and Human Services, which recently invested $73 million in programs at minority-serving institutions to train future public health informatics and technology workers.[10]

While new training efforts will help, they will not completely fill the gap. The 2021 Epidemiology Capacity Assessment Report reported a 107% increase between 2017 and 2021 in the number of epidemiologists working in informatics, yet much of this increase was attributable to federal funding for COVID-19 response.[11] Some of these employees were students and alumni from our MPH in Public Health Informatics program,[12] many of whom have now returned to school or moved into other areas. We need to find a way to sustain and expand informatics positions beyond the pandemic.

CONCLUSION

The COVID-19 pandemic let dashboards out of the bag, and there is no going back. Now that we understand their potential, we need to invest in public health such that local, state, and federal agencies are equipped to develop, deploy, and maintain dashboards for emerging health threats and many other critical activities they do to advance population health. This means investing not just in software tools for dashboards but also in the systems, processes, and people that support dashboarding activities. Only then can dashboards achieve their goal of visualizing information so that decision-makers can effectively guide public health action and the public can understand health trends and why they should support recommended actions. AJPH

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Tracking COVID-19 Inequities Across Jurisdictions Represented in the Big Cities Health Coalition (BCHC): The COVID-19 Health Inequities in BCHC Cities Dashboard

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See also Dasgupta and Kapadia, p. 886.

Objectives. To describe the creation of an interactive dashboard to advance the understanding of the COVID-19 pandemic from an equity and urban health perspective across 30 large US cities that are members of the Big Cities Health Coalition (BCHC).

Methods. We leveraged the Drexel–BCHC partnership to define the objectives and audience for the dashboard and developed an equity framework to conceptualize COVID-19 inequities across social groups, neighborhoods, and cities. We compiled data on COVID-19 trends and inequities by race/ethnicity, neighborhood, and city, along with neighborhood- and city-level demographic and socioeconomic characteristics, and built an interactive dashboard and Web platform to allow interactive comparisons of these inequities across cities.

Results. We launched the dashboard on January 21, 2021, and conducted several dissemination activities. As of September 2021, the dashboard included data on COVID-19 trends for the 30 cities, on inequities by race/ethnicity in 21 cities, and on inequities by neighborhood in 15 cities.

Conclusions. This dashboard allows public health practitioners to contextualize racial/ethnic and spatial inequities in COVID-19 across large US cities, providing valuable insights for policymakers. (*Am J Public Health*. 2022;112(6):904–912. https://doi.org/10.2105/AJPH.2021.306708)

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Growing urbanization creates unique challenges for population health, challenges that are exacerbated by the ongoing COVID-19 pandemic. COVID-19 has created a large mortality crisis throughout the world and in the United States,[1–4] where 83% of the population lives in cities. While the pandemic is now widespread in the United States,[5] cities were hardest hit initially, with New York City seeing increases in mortality similar to those observed in the 1918 influenza pandemic.[6] Cities are especially vulnerable to pandemics, as they are home to wide social inequalities[7] and are connected to the rest of the world.[8] The COVID-19 pandemic has illustrated the various ways that structural factors such as racism, segregation, and economic inequalities drive health inequities in urban areas.[9,10] Cities can differ substantially in population characteristics, including levels of inequality, segregation, physical environments,[11] and health and health inequities.[7,12,13] Characterizing how health varies across cities and how social groups or neighborhood inequities vary from city to city may provide cities with important insights on the drivers of, and potential strategies to reduce, health inequities.

Yet, COVID-19 data on city-to-city comparisons remain rare, and granular COVID-19 data on neighborhoods or social groups are often unavailable, difficult to access, or presented in ways that make comparisons across cities challenging, resulting in limited exploration of inequities within and between cities.[5] This lack of an equity focus obscures the role of structural factors in shaping equity-oriented COVID-19 responses in cities more broadly, suggesting the need for longer-term actions to address the social determinants of health via urban policies.[14] While other repositories have focused on timely updates by local geographies (e.g., Johns Hopkins University Coronavirus Resource Center or the Centers for Disease Control and Prevention [CDC] COVID Data Tracker), or on health equity at the national or state levels (e.g., Kaiser Family Foundation Racial Equity and Health Data Dashboard or Emory University's COVID-19 Health Equity Dashboard), there is a lack of comparable data on COVID-19 inequities across cities.

As part of the Tracking Outcomes and Inequalities of the COVID-19 Pandemic Across Big Cities Health Coalition (BCHC) members project, we (1) developed an equity framework to inform the characterization and comparison of inequities in COVID-19 within and across cities, (2) compiled data on COVID-19 inequities across cities, and (3) developed an interactive public access dashboard that allows descriptions, visualization, and comparisons of key COVID-19–related outcomes. This article describes this process and outlines challenges we faced in this project to inform future similar efforts to create interactive real-time visualization tools.

METHODS

We developed this dashboard in 4 phases, by (1) defining objectives and intended audience, (2) developing an equity framework, (3) compiling data on social indicators and COVID-19 outcomes, and (4) building the interactive dashboard.

Defining Objectives and Audience

Drexel's Urban Health Collaborative partnered with the BCHC, a forum for the lead health officials of 30 of the United States' largest metropolitan health departments. BCHC aims to exchange strategies and jointly address issues to promote the health and safety of the nearly 62-million people they serve (see Table 1 for a list of cities whose health departments are represented in the BCHC). We defined the objectives of the dashboard as (1) to characterize inequities in various COVID-19–related outcomes including testing, incidence, hospitalizations, and mortality, in BCHC cities; (2) to facilitate city-to-city comparisons of these inequities; (3) to promote further research on the drivers of heterogeneities in these inequities across cities and over time; and (4) to facilitate the use of inequities data to evaluate and inform policy and strategy impacts.

We defined the audience broadly to include public health practitioners (especially BCHC health departments) and public health researchers. After discussions with staff at BCHC and the Robert Wood Johnson Foundation, which funded this project, BCHC member health departments were asked to contribute to the extent possible in creating the dashboard, including sharing the plan for the dashboard with health directors or commissioners and other key health department staff. We met individually with 16 of the 30 local health departments (LHDs) to present the project idea and request available data on COVID-19 inequities. The remaining 14 LHDs did not respond to our outreach.

Equity Framework

COVID-19 inequities in cities are driven by a complex set of interconnected and reinforcing structures and systems linked to social inequality and racism that modify risk of exposure, of infection, or of severity[15] at the individual, neighborhood, or city level.

At the individual level, longstanding racial, social, and economic inequities have caused a disproportionate impact of COVID-19 on people from marginalized racial groups, individuals with limited socioeconomic resources, and immigrants. Socioeconomic position (often proxied by income, education, or occupational class) and measures of wealth capture a range of life-course exposures that may affect COVID-19 outcomes. Low-wage and essential workers are at increased risk for exposure; often experience barriers to accessing health care for testing, treatment, and vaccinations; and have limited income protections such as paid sick leave and hazard pay, increasing the adverse consequences of illness or mitigation measures.[16,17] As a result of structural racism, marginalized racial and ethnic groups including Black, Latino, and Native American persons as well as immigrants experience multiple types of factors that place them at high risk,[5,9,18] including an overrepresentation in high-risk occupations and a higher likelihood

TABLE 1— Cities Included in the Big Cities Health Coalition Dashboard and Selected Basic Demographic Characteristics: United States, September 14, 2021

City	Type	Population (Millions)	% Poverty	% Non-White
Austin, TX	CDP	0.95	13	52
Baltimore, MD	IC	0.60	21	73
Boston, MA	CDP	0.68	19	56
Charlotte, NC	CDP	0.85	13	59
Chicago, IL	CDP	2.70	18	67
Cleveland, OH	CDP	0.38	33	66
Columbus, OH	CDP	0.87	20	45
Dallas, TX	CDP	1.33	19	71
Denver, CO	CCC	0.70	13	46
Detroit, MI	CDP	0.67	35	89
Fort Worth, TX	CDP	0.87	14	61
Houston, TX	CDP	2.31	20	76
Indianapolis, IN	CCC[a]	0.86	18	46
Kansas City, MO	CDP	0.48	16	45
Las Vegas (Metro), NV	CCC[b]	2.18	14	57
Long Beach, CA	CDP	0.46	17	72
Los Angeles, CA	CDP	3.97	18	72
Miami, FL	CDP	0.45	23	89
Minneapolis, MN	CDP	0.42	19	40
New York, NY	CCC	8.42	18	68
Oakland, CA	CDP	0.42	17	72
Philadelphia, PA	CCC	1.58	24	66
Phoenix, AZ	CDP	1.63	18	57
Portland, OR	CDP	0.64	14	29
San Antonio, TX	CDP	1.50	18	75
San Diego, CA	CDP	1.40	13	57
San Francisco, CA	CCC	0.87	10	59
San Jose, CA	CDP	1.03	9	74
Seattle, WA	CDP	0.72	11	36
Washington, DC	CCC	0.69	16	63

Note. CCC = consolidated city–county; CDP = census designated place; IC = independent city. % non-White refers to the proportion of the population that is not non-Hispanic White.

[a] For Indianapolis, we used data for the census-designated place Indianapolis (balance), which is the portion of the consolidated city–county excluding a handful of small towns.

[b] For Las Vegas, we use the "Las Vegas (Metro)" definition (conterminous with Clark County), as suggested by the local health department.

of living in crowded housing and in underserved neighborhoods.

Neighborhood factors also affect COVID-19 risk. Racist federal, state, and local policies (e.g., redlining) and discriminatory mortgage practices have made residential segregation a persistent hallmark of major cities across the United States.[19] Differences in neighborhood composition resulting from segregation are linked to inequities in power and investment, which, in turn, lead to inequities in many social and environmental features that may affect COVID-19 outcomes.[9,20] Examples of neighborhood features that may affect COVID-19 outcomes include crowded housing, exposure to environmental pollutants, and features related to the development of chronic diseases such as inadequate access to healthy foods or recreational opportunities and chronic stressors.[21] These factors are further compounded by limited access to health care.

Last, cities' differences in pre-existing economic and social factors as well as public health and health care infrastructure may lead to differences in COVID-19 outcomes between cities.[22] Other examples of city features that may relate to differences across cities in COVID-19 outcomes include residential segregation, crowding, poverty, occupational structure, and income inequality.

Data Collection

Geographic definitions. We developed a precise geographic definition of cities to allow comparisons across geographies. The jurisdictions covered by members of the BCHC are heterogeneous, and include consolidated city–counties (e.g., Philadelphia, PA), collections of counties (e.g., New York City, NY), independent cities (e.g., Baltimore, MD), or census-designated places (e.g., Chicago, IL). Of the 30 BCHC cities, 6 (7, if including Las Vegas, NV, as described subsequently) are exactly defined by a county or set of counties (i.e., they are a consolidated city–county, a collection of counties, or an independent city, which is functionally equivalent to a county in terms of data acquisition), and 24 (23, if excluding Las Vegas as described subsequently) are census-designated places (cities, generally smaller in size than their respective counties). Table 1 shows a list of members, administrative definitions, and basic sociodemographic characteristics. We use the term "cities" through this article to refer to the jurisdiction of member health departments, although, in some cases, counties are used to proxy jurisdictions that do not exactly overlap with cities.

In deciding what data to collect, we prioritized the specific geographic definition of each health department's jurisdiction (e.g., City of Chicago over Cook County), but, for the 24 cities that are census-defined places, we sometimes used available county data as an approximation. We used county proxies because most publicly available data are available at the county level, and several BCHC members are county health departments that mostly provide data at the county level. In addition, the LHD of 1 city (Las Vegas) indicated a preference for county-level (Clark County) data as opposed to city-level data, while several other LHDs strongly expressed a preference for county-level data over no data at all. For this reason, while we prioritized city-level data collection, in some cases we show county-level data for each city's corresponding county proxy. Table A (available as a supplement to the online version of this article at http://www.ajph.org) shows a complete list of county proxies, including the proportion population overlap between cities and their respective counties. We also had to decide on a definition for neighborhood. Given limited access to census tract identifiers for cases, tests, hospitalizations, and deaths, we used zip code tabulation areas to proxy neighborhoods and collected both outcome and social indicators at this level.

Outcomes. We identified 5 COVID-19–related outcomes to include in the dashboard: number of tests, proportion of tests that are positive (positivity), number of confirmed cases (incidence), number of hospitalizations, and number of deaths (mortality). These outcomes all represent different policy-relevant aspects of the pandemic, and each has strengths and weaknesses in terms of data availability and measurement validity and reliability. Population denominators for all outcomes (at the county, city, or zip code tabulation areas level) were obtained from the 2015–2019 5-year American Community Survey.[23] As available, we obtained both crude and age-adjusted estimates, using the 2000 US standard million as the standard population.

Social indicators. Based on the equity framework, we selected a set of social indicators at the individual, neighborhood, and city level, all collected from the 2015–2019 5-year American Community Survey[23] or other sources (Table 2).

Operationalization of inequities. To ensure accessibility and improve interpretability of inequities, we selected 2 simple metrics that could be easily explained.[24] For individual-level inequities, we calculated rate ratios and rate differences comparing each racial/ethnic group to non-Hispanic Whites, as they usually represented the group with the most favorable outcomes. For neighborhood-level and city-level inequities, we calculated both relative and absolute inequity metrics, comparing the top to the bottom quartile of each measure based on the distribution within each city (for neighborhood measures) or across cities (for city measures).

Data sources and strategy for obtaining and updating outcome data. We aimed to obtain COVID-19 outcome data by race/ethnicity, neighborhood of residence, and date. Ideally, data would

TABLE 2— Social Indicators in the Big Cities Health Coalition Dashboard by Level (Individual, Neighborhood, or City)

Levels	Indicators in Dashboard
Individuals across social groups	Because of limited individual-level data, generally only race/ethnicity is available, if at all
	In some cases, neighborhood-level proxies are available (see next row)
Neighborhoods	Compositional measures (may capture both context and proxy unavailable individual-level constructs): poverty, income, education, occupation, health insurance
	Housing and transportation: overcrowding, public transit use
	Neighborhood segregation: index of concentration at the extremes for race/ethnicity, income, occupation, and combinations
	Summary indices: Social Vulnerability Index and City Health Dashboard COVID Risk Index
Cities	Region and size: census region, total population, density
	Compositional measures: race/ethnicity, poverty, income, education, occupation, health insurance
	Income inequality: Gini coefficient
	Residential segregation: dissimilarity and isolation indices

Note. Data for indicators were obtained from the American Community Survey (2015–2019), the Centers for Disease Control and Prevention, and the City Health Dashboard.

be provided directly by the LHDs to ensure maximum disaggregation, comparability, and flexibility. However, this approach was considered infeasible because of LHD workload and data privacy issues. The pandemic itself has put an enormous burden on LHDs that were already operating under large personnel and budgetary constraints. By August 25, 2021, we were able to obtain non–publicly available data from 1 LHD (corresponding to Las Vegas).

We therefore developed 3 alternative strategies to obtain data from public sources. First, we explored publicly available dashboards and data repositories of all LHDs in the BCHC and their respective state health departments. We tracked the availability of each type of outcome and whether they were age-adjusted and available over time, by race/ethnicity, and by neighborhood. We accessed this publicly available data using 3 approaches depending on format and access: (1) automatically updated data (e.g., an API or a csv file that is updated continuously), (2) automatically updated files that require a user action for download (e.g., clicking on a download button), and (3) manually copying values from dashboards or other files (e.g., a pdf report).

Second, to compare rates across cities, we incorporated automatically updated daily data from the Johns Hopkins University COVID-19 tracker (JHU Tracker).[25] Third, we obtained data from the CDC's COVID-19 Case Surveillance Data Access, updated biweekly (from May 2021 onward) or monthly (before May 2021). The restricted version of this file contains line-level data for all cases and deaths reported to CDC, with information on age, race/ethnicity, hospitalization, mortality, and county of residence. Not all states reported to CDC consistently, so we only used data for counties in which the total number of cases or deaths 14 days before the date of last update (as indicated by CDC) matched the total count as provided by the JHU Tracker, allowing for a relative difference of 10% in the number of cases and deaths. We also excluded cities with high levels of missing race/ethnicity data (≥ 30% missingness for cases; ≥ 15% for deaths). For both the JHU and all CDC data, we used data for the county or counties as a proxy for the city.

Dashboard Development

We developed the dashboard through an iterative process, gathering feedback both internally at the Urban Health Collaborative and through presentations and meetings with BCHC and LHD staff. The dashboard was built using the shiny package in R version 4.0.1 (R Foundation, Vienna, Austria). Shiny is an open-source Web application framework that enables those familiar with R to create interactive graphical user interfaces for their analyses or visualization.[26] We also built a landing Web site using the Blogdown R package to allow for a more flexible presentation of methods and considerations about data, metrics, and the equity framework, and to create blog posts to contextualize the data in the dashboard.

RESULTS

The dashboard is organized in 2 broad sections: city reports and comparisons across cities (Figures A and B, respectively, available as supplements to the online version of this article at http://www.ajph.org). We also present a section summarizing variation in availability and timeliness of the data for each section, and we also allow downloads of the compiled publicly available data, along with their available metadata (e.g., sources, geographic definition, dates). Table 3 contains a summary of the available data by September 9, 2021.

We publicly launched the dashboard in January 2021, at https://www.covid-inequities.info, and held a webinar to showcase the dashboard.[27] Figures C and D (available as supplements to the online version of this article at http://www.ajph.org) show a summary of visits and unique visitors to the dashboard and Web site by metropolitan area in the United States. From January 21 to September 19, 2021, a total of 1249 and 3397 unique users visited the dashboard and Web site, respectively. Apart from Atlanta, Georgia, the main source of visits to the dashboard were metropolitan areas where BCHC cities are located. We have also produced a brief,[28] an analysis of health inequities across 3 large cities using dashboard data,[9] and blog posts highlighting diverse methodologic and substantive aspects of the dashboard (available at https://www.covid-inequities.info).

As an example of potential uses of the dashboard, we provide a case study on how the dashboard can be used to study inequities at 3 levels (across social groups, neighborhoods, and cities). Figure 1 shows a description of disparities in COVID-19 mortality rates between (1) non-Hispanic Black and non-Hispanic White persons, by city; (2) neighborhoods at the top versus bottom quartile of percentage non-Hispanic Black, by city; and (3) cities at the top versus bottom quartile of percentage non-Hispanic Black. First, non-Hispanic Black persons had higher age-adjusted mortality compared with non-Hispanic White persons in all cities, ranging from 1.31 times higher in Boston, Massachusetts, to 4.91 times higher in Washington, District of Columbia. These disparities were

TABLE 3— COVID-19 Outcomes Data Availability by Section of the Dashboard: United States, September 9, 2021

	Local or State Health Department Data			Other Data			
Dashboard Section	**Number**	**Geographic Definition**	**Timeliness of Updates**	**Number**	**Geographic Definition**	**Timeliness of Updates**	**Source**
City trends data	11 cities	City: 6 County proxy: 5	Daily	30 cities	City: 7 County proxy: 23	Daily	JHU
Neighborhood data	15 cities	City: 15 County proxy: 0	11 daily 4 monthly	NA	NA	NA	NA
Race/ethnicity data (crude)	13 cities	City: 8 County proxy: 5	5 daily 8 monthly	18 cities	City: 4 County proxy: 14	Biweekly	CDC
Race/ethnicity data (age-adjusted)	2 cities	City: 2 County proxy: 0	1 daily 1 monthly	18 cities	City: 4 County proxy: 14	Biweekly	CDC

Note. CDC = Centers for Disease Control and Prevention; JHU = Johns Hopkins University; NA = not available. City refers to the actual city definition, as shown in Table 1. County proxies refers to cities in which, instead of using the actual definition (census-designated place), we used data for their corresponding county proxy (Table A, available as a supplement to the online version of this article at http://www.ajph.org).

attenuated when we looked at crude mortality but were still higher among non-Hispanic Black persons in 13 of 19 cities. Second, for 8 out of 9 cities with available data by neighborhood, we found that mortality was higher among neighborhoods at the top quartile of percentage non-Hispanic Black compared with the bottom quartile. Last, we found that crude COVID-19 mortality was 1.56 times higher in cities at the top quartile of percentage non-Hispanic Black compared with the bottom quartile.

DISCUSSION

The dashboard and Web platform we developed enable users to compare and visualize key COVID-19 indicators within and between cities over time, with a focus on COVID-19 inequities.

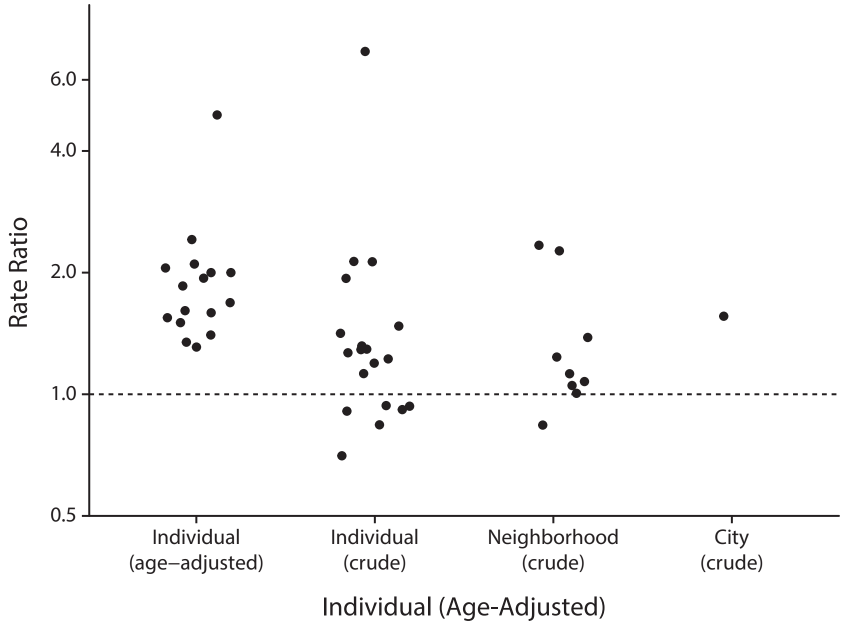

FIGURE 1— Example of Disparities in COVID-19 Mortality by Population Subgroup, Neighborhood, and City: Big Cities Health Coalition, 30 US Cities, September 14, 2021

Note. Age-adjusted rates were calculated using the 2000 US Standard Population as the referent population. Quartiles of % non-Hispanic Black persons by neighborhood were calculated for each city separately. Quartiles of % non-Hispanic Black persons by city were calculated for the whole sample. For individual and neighborhood comparisons, each dot represents the rate ratio in a specific city. For city comparisons, the dot represents the rate ratio comparing the top vs bottom quartile of % non-Hispanic Black persons across the 30 Big Cities Health Coalition cities included in this study.

Data on health inequities at various levels, as well as insights that can be gleaned from comparing cities to each other, is critical for policymaking. The development of this dashboard highlighted the utility but also the challenges inherent in creating information systems to compare health and health inequities across urban areas in real time and in collaboration with LHDs. In developing this dashboard, we faced several challenges around data availability, stakeholder engagement, and their intersection that are relevant for efforts to compare health and health inequities across cities more generally.

First, we found frequent changes in both what data were available and how the data were made available. Understandably, many cities adapted their reporting systems as the pandemic was evolving and changed data reporting, variables, structures, dashboards, location of information, etc. We found that the degree of public data availability varied widely between cities and over time by 2 key domains: (1) level of data disaggregation (e.g., by neighborhood or race/ethnicity) and (2) format of data availability (e.g., automatically downloadable files vs dashboards with no data downloads). This heterogeneity in data availability has been recently highlighted as a barrier to health equity by the National Commission to Transform Public Health Data Systems.[29]

Second, and related to the first point, ensuring timely updates was also challenging. We elected to focus on timeliness for the overall trends, because trends would not be comparable unless all cities were similarly updated, and on breadth (having more cities available) for race/ethnicity–stratified and neighborhood-level outcomes. These changed less over time, and relative disparities may not be as sensitive to having data that are less up to date. However, navigating the access to comparably updated data across 30 LHDs proved to be challenging. In fact, one of the data sources that provided the most information for the largest number of cities was the CDC's COVID-19 Case Surveillance Data Access, made available following a *New York Times* investigation on equity in COVID-19 outcomes.[30] This data source ended up being useful for half of the cities, as this data set barely included cases from some states (e.g., Texas) or had high levels of missing data on race/ethnicity for others (e.g., Pennsylvania).

Third, we started the development of this dashboard focusing on "cities." While there is no universally accepted definition of a "city," the members of the BCHC all have a clear jurisdiction. Initially, we focused on census-designated places (cities) but had to exclude several cities because no data were available at that level. We ended up using county proxies wherever city data were not available, which may induce bias in the cases in which the county differs dramatically from the city,[31] but extends data availability and allows for a wider breadth of comparisons. Differential data availability by city and county has been a longstanding issue in the development of local health indicators. For example, the City Health Dashboard[32] compiles city-level environmental and health data, further extending the CDC's PLACES (formerly 500 cities) project to include environmental data and going beyond the county-level work of other platforms such as the County Health Rankings or the *US News* Healthiest Communities project.

Fourth, budget-constrained and overworked LHDs made an effort to provide publicly available data and had, understandably, limited resources to provide customized data requests. These real-world constraints are often a key issue for stakeholder engagement in research.[33] Concurrently, the iterative process of dashboard development provided invaluable feedback, including acknowledging data issues. For example, in our conversations with LHDs, we found a consistent concern with the percentage missing race/ethnicity in case and testing data, which guided a new data collection effort to visualize percentage missing race/ethnicity by city. In addition, some LHDs indicated that the originally intended definition of cities did not align with local perceptions about the city (e.g., City of Las Vegas vs Las Vegas Metro). Moreover, because the main audience of our dashboard included public health practitioners interested in COVID-19 inequities (from LHDs in the BCHC or elsewhere), we elected to show simpler measures of inequities (e.g., comparisons of outcomes by top vs bottom quartiles of neighborhood-level indicators), which may not represent the full distribution of factors driving COVID-19 outcomes. Because these comparisons were also intended to showcase within-city inequities, we may also be missing how differences in the distribution of factors across cities drive inequities in COVID-19 outcomes. However, we do provide access to the compiled publicly available data to ensure that interested parties can explore the data in more detail.

As the maintenance of the dashboard has become less labor intensive by adding more data sources that are updated automatically, we have started to leverage other opportunities. For example, as of May 2021, we have incorporated data on spatial accessibility to testing sites. For this, we leveraged data on testing site location obtained from Castlight Inc and calculated several spatial accessibility metrics.[34,35] In June 2021, we also started incorporating vaccination rates, both overall and by race/ethnicity and neighborhood, using similar visualizations to others in the dashboard.

Describing and quantifying the magnitude of COVID-19 inequities allows for comparisons across urban areas, which can help public health practitioners understand drivers of health and health inequities, target resources, and identify effective policies. These summaries and comparisons can be instrumental in identifying actionable policy levers to improve health and health equity in urban areas. The COVID-19 Inequities in BCHC Cities Dashboard provides key data on COVID-19 inequities and illustrates how social and economic factors can affect health and health equity in urban areas of the United States, allowing local governments to benchmark inequities in their jurisdiction as compared with peer areas in the nation. More generally, it illustrates the value of comparing cities to each other as we work to identify policies to reduce urban health inequities. However, our experience also highlighted the many challenges inherent in developing useful and valid metrics that can be compared across cities. Addressing these challenges is critical to fully leveraging the power of city comparisons to promote health equity and urban health.

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CONTRIBUTORS

U. Bilal led the data team and co-wrote the first draft of the article. E. McCulley led overall study logistics and co-wrote the first draft of the article. R. Li coordinated the development of the Web site and dashboard. H. Rollins coordinated data harmonization and compilation. A. Schnake-Mahl and P. H. Mullachery contributed to the design of the dashboard and development of social indicators and inequity metrics. V. Vaidya contributed to city engagement. C. Koh, A. Furukawa, K. Dureja, and A. Sharaf supported data acquisition. S. Barber led the development of the equity framework. J. Kolker oversaw the partnership with BCHC and obtained funding. A. V. Diez Roux co-wrote the first draft, supervised the project, and obtained funding. All authors participated in the interpretation of data and critical revision of the article.

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CONFLICTS OF INTEREST

The authors declare no financial conflict of interest.

HUMAN PARTICIPANT PROTECTION

This research was deemed exempt under 45 CF 46.104(d)(4)(i) and (ii).

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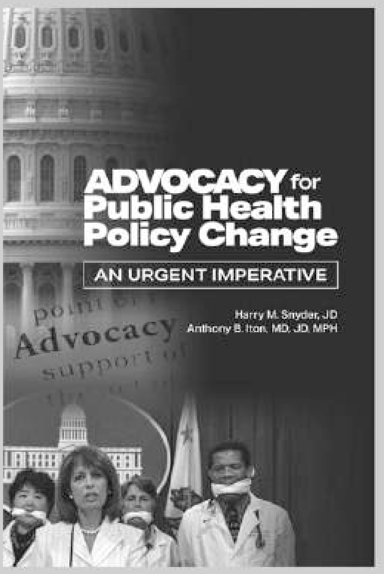

Improving Data Surveillance Resilience Beyond COVID-19: Experiences of Primary heAlth Care quAlity Cohort In ChinA (ACACIA) Using Unannounced Standardized Patients

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See also Kwan, p. 818.

We analyzed COVID-19 influences on the design, implementation, and validity of assessing the quality of primary health care using unannounced standardized patients (USPs) in China. Because of the pandemic, we crowdsourced our funding, removed tuberculosis from the USP case roster, adjusted common cold and asthma cases, used hybrid online–offline training for USPs, shared USPs across provinces, and strengthened ethical considerations.

With those changes, we were able to conduct fieldwork despite frequent COVID-19 interruptions. Furthermore, the USP assessment tool maintained high validity in the quality checklist (criteria), USP role fidelity, checklist completion, and physician detection of USPs. Our experiences suggest that the pandemic created not only barriers but also opportunities to innovate ways to build a resilient data collection system.

To build data system reliance, we recommend harnessing the power of technology for a hybrid model of remote and in-person work, learning from the sharing economy to pool strengths and optimize resources, and dedicating individual and group leadership to problem-solving and results. (*Am J Public Health*. 2022; 112(6):913–922. https://doi.org/10.2105/AJPH.2022.306779)

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As the COVID-19 pandemic swept through the world,[1] it has resulted in severe work disruption in all walks of life. National health and health care surveillance efforts are no exception. A resilient health surveillance system is critical for dealing with the current as well as future pandemics. Primary heAlth Care quAlity Cohort In ChinA (ACACIA) was launched in 2017 to longitudinally track the quality of primary health care (PHC).[2,3] The initial round of ACACIA data collection coincides with the pandemic. The pandemic interrupted every step of ACACIA's work. However, despite the COVID-19 challenges, we have remained agile in adapting to the pandemic environment and maintaining our fieldwork. Our experiences in making and implementing those decisions can be helpful for other complex nationwide data collection efforts. Meanwhile, as we intend to make the ACACIA data publicly available, fully disclosing the COVID-19–related changes and their impact on data validity is critical for future users to interpret the data in context.

After presenting a brief review of the history of ACACIA, we discuss the influences of COVID-19 on a full implementation spectrum of the program and the resultant program adjustments. We then report the preliminary results of the study and discuss the influence of COVID-19 on the validity of our quality assessment tool. Finally, we discuss the lessons learned and our recommendations to build a resilient data collection system during and beyond COVID-19.

HISTORY AND OVERVIEW

ACACIA was conceptualized in 2017 in response to an increasing call for improving the quality of PHC toward the realization of universal health coverage. China has made substantial progress in developing its PHC since the 2009 national health reform, having achieved universal health insurance coverage.[4] However, universal health coverage goes beyond access to care; it also includes quality of care.[5] There has been scanty information about the quality of China's PHC,[6] although the limited studies so far suggest that the overall quality is unsatisfactory.[4,7,8] ACACIA used unannounced standardized patients (USPs) to assess PHC quality with a nationally representative sample of primary care providers across 7 provinces in China.[2,3] ACACIA involves 10 multidisciplinary teams: from Southern Medical University, Guizhou Medical University, Lanzhou University, Sun Yat-sen University, Sichuan University, Central South University, Inner Mongolia Medical University, Xi'an Jiaotong University, China Pharmaceutical University, and Guangzhou University.

Standardized patients (SPs) are healthy people who, after rigorous training, simulate the symptoms and emotions of an actual patient with certain conditions in a consistent fashion.[9] The USP case includes 3 critical components: a decoy plan (methods to conceal the true identity of the USP), a script (standardized lines for the USP–clinician conversation), and a quality checklist (evidence-based guideline-suggested items for consultation, medical exams, diagnosis, and treatment plans). The USP as a quality assessment tool has 3 distinct advantages: it (1) directly assesses quality in actual practice,[9–11] (2) minimizes the Hawthorne effect,[12] and (3) inherently controls patient-level variations.[13] To the best of our knowledge, ACACIA was the first attempt to nationally use USPs for quality assessment, probably because of the complexity of developing USP cases and recruiting, training, and fielding USPs on a national scale.

USPs have been increasingly used in quality assessment for PHC in recent decades.[14] The implementation experiences of ACACIA can help other USP projects to cope with COVID-19 challenges. We here discuss a few unique features of ACACIA to put the lessons learned in context. First, we used 11 USP cases to represent common conditions in PHC in China, whereas prior studies generally used 1 to 5 cases.[9,15] Second, we constructed a nationally representative sample of PHC providers, whereas most studies restricted their samples to a health system or several cities.[9,15] Third, we comprehensively validated each USP case and USP player, whereas many studies assumed the validity of the USP as an assessment tool. Fourth, we voice-recorded each USP–clinician encounter, which enabled us check the implementation quality of each USP visit. Fifth, we used USPs to check multiple quality dimensions, including technical quality (adherence to guidelines for effectiveness and safety), patient-centered care, and efficiency (cost). Finally, we plan to conduct ACACIA every 5 years for the same sample to track the evolution of China's quality of PHC over time.

COVID-19 CHALLENGES AND RESPONSES

As of August 17, 2021, both the number of COVID-19 cases (32 574) and the death toll (959) were relatively low in China.[16] Over the past 12 months, life in China has generally returned to normal. However, because China adopted a zero-COVID policy, a handful of COVID-19 cases would lead to rapid region-wide mass testing for COVID-19 and widespread restrictions on movements.[17] This new normal directly and indirectly affected almost all phases of ACACIA implementation. In the rest of the article, we describe COVID-19 challenges and corresponding program responses.

Funding

The USP tool was perceived to be an expensive data collection method.[18] Government funding in China prioritizes biomedical research rather than health service research. The pandemic has resulted in a substantial cut in funding opportunities globally.[19] Consequently, we took a 2-pronged approach. On the one hand, we tightly controlled cost through process optimization and resource sharing, as discussed in several of the following sections. On the other hand, we turned to crowdsourcing to pool funds. We encouraged and assisted interested researchers in using the ACACIA platform to prepare grant proposals for different research questions; in return, a proportion of their funds help finance the core USP data collection. ACACIA collaborators succeeded in obtaining 7 ACACIA-related competitive grants.

Case Development

We developed and validated a total of 12 USP cases: angina, asthma, child diarrhea, common cold, gastritis, hypertension, lower back pain, migraine, postpartum depression, stress urinary incontinence, tuberculosis (TB), and type 2 diabetes. We selected those conditions based on 2 national surveys of the common conditions at PHC. Because of the pandemic, PHC providers were put on high alert for COVID-19–related symptoms. Patients with a body temperature above 37.3°C were directed to a specialized fever clinic. Testing for COVID-19 nucleic acid was also required. To avoid harming USPs and interrupting the COVID-19 response system, we dropped TB cases (as fever was among the symptoms) and retained 2 other cases with respiratory symptoms (common cold and asthma) after necessary modifications. For the common cold, we updated its quality checklist per the government's COVID-19 guideline to include whether the clinician checked the USP's epidemiological history related to COVID-19. We strengthened the asthma-related features after a clinician, in an asthma USP's validation visit, suspected that the asthma was actually COVID-19. For all cases, we added a script for the USPs to report no exposure to the COVID-19 high-risk population over the past 2 weeks.

Recruitment

We intended to have 132 USPs for the entire project, with the USPs being recruited from their home provinces (which were part of ACACIA). The pandemic created a substantial hurdle for recruiting and retaining USPs. Many people perceived visits to a medical facility as putting them at risk of acquiring COVID-19. Also, China's zero-tolerance policy for COVID-19 subjected residents or passersby in any affected area to various degrees of quarantine, leading to travel concerns. To meet this shortage of USPs, we selected some capable USP players to take on 2 USP roles. In addition, we shared our USPs across the 7 provinces to support other regions after the USPs had completed their home-province visit. To date, through a combined online–offline interview procedure, 357 people have applied for USP positions, 77 candidate USPs have entered training, and 41 people (taking the roles of 77 USPs, with 36 playing 2 roles) have participated in official ACACIA visits (Figure 1). During the visit, each USP player was accompanied by a USP facilitator. The facilitators went through the entire training with the USPs and were tasked with coordinating onsite logistics and data collection, and sometimes played the role of family members or friends of the USPs. Additionally, 58 rigorously trained health sciences students served as quality controllers, who listened to the recording of each USP visit to verify USP role fidelity and double-check the checklists. Furthermore, 11 researchers involved in case development worked as "case tutors" who guided USP role-play in the field, and 12 students working toward a master's degree in health sciences acted as provincial coordinators who organized USP recruitment, training, and site visits.

Training

In response to the pandemic, we adapted our in-person training (originally planned for Jiujiang City) to a competency-based and hybrid online–offline approach. People entering the training at different times experienced slightly different procedures as the methods evolved over time. Our most recent training started with prerecorded online self-learning modules, which were followed by online one-on-one tutoring and offline training visits. Figure 2 provides more training details. The trainees learned at their own pace but had to pass exams to move from one module to another. The candidate USPs became USPs only when they achieved 90% role fidelity in 4 consecutive unannounced visits or a mean 90% over the 6 visits.

Clinician Visits

Both validation visits and official visits were significantly interrupted by the pandemic. We originally planned to complete the official visits within 6 months. Our official visits started on March 30, 2021, and we had completed 817 (37%) of the 2200 visits as of August 14, 2021. The interruptions of the field visits were mainly caused by lockdowns in the targeted destinations due to regional COVID-19 outbreaks, a shortage of USPs (or of both USPs and USP facilitators) due to challenges in recruiting and retaining them, precautionary restrictions imposed on travel outside of the home cities, and precautionary closure of PHC services even in low-risk municipalities. However, disruption of the USP visits had been restricted to individual provinces until July 20, 2021, when the delta variant of COVID-19 swept through several provinces in China.

Ethics

ACACIA received ethical approval from several universities (see "Human Participant Protection" statement). However, the pandemic warranted 2 additional concerns. First, our use of fake patients

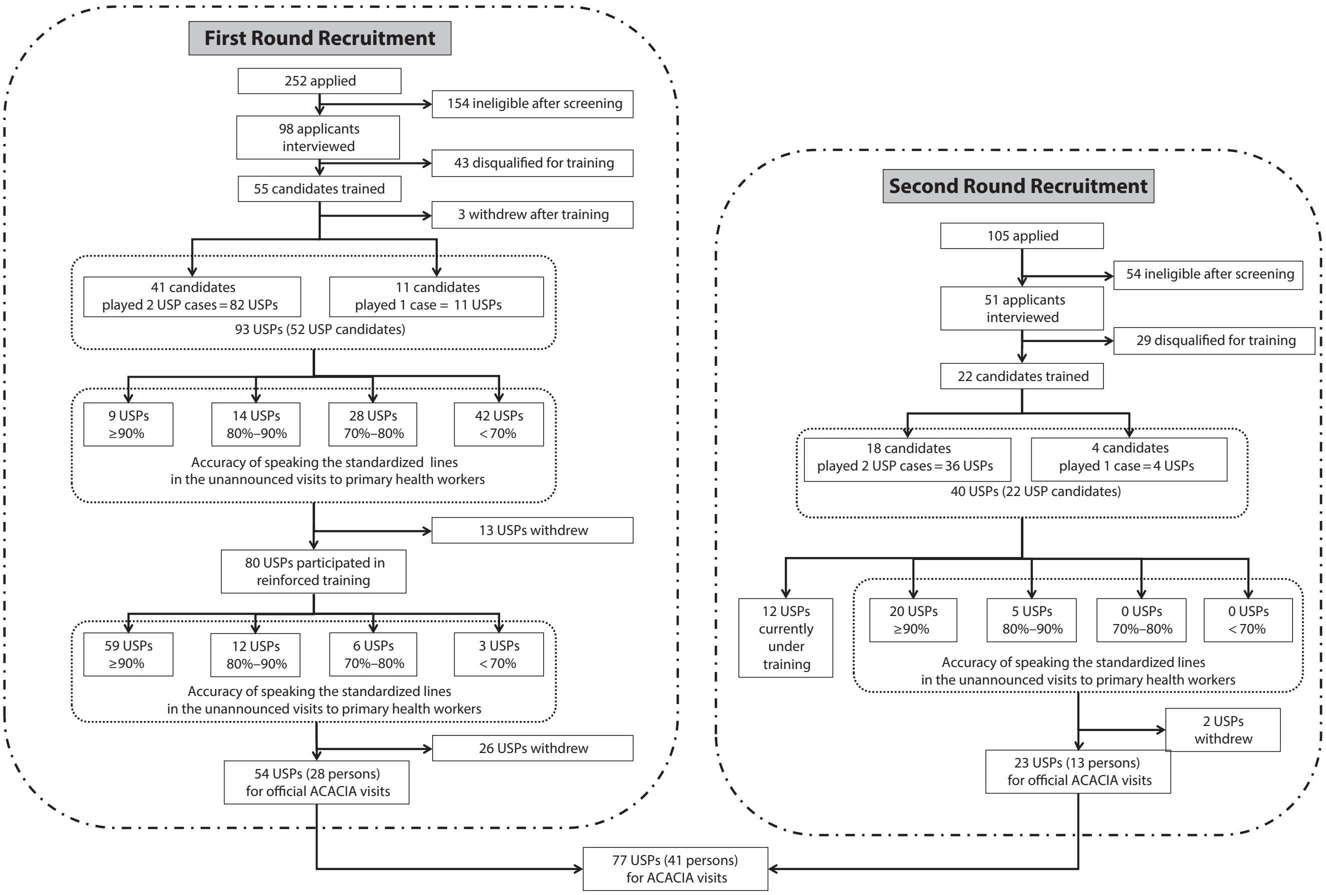
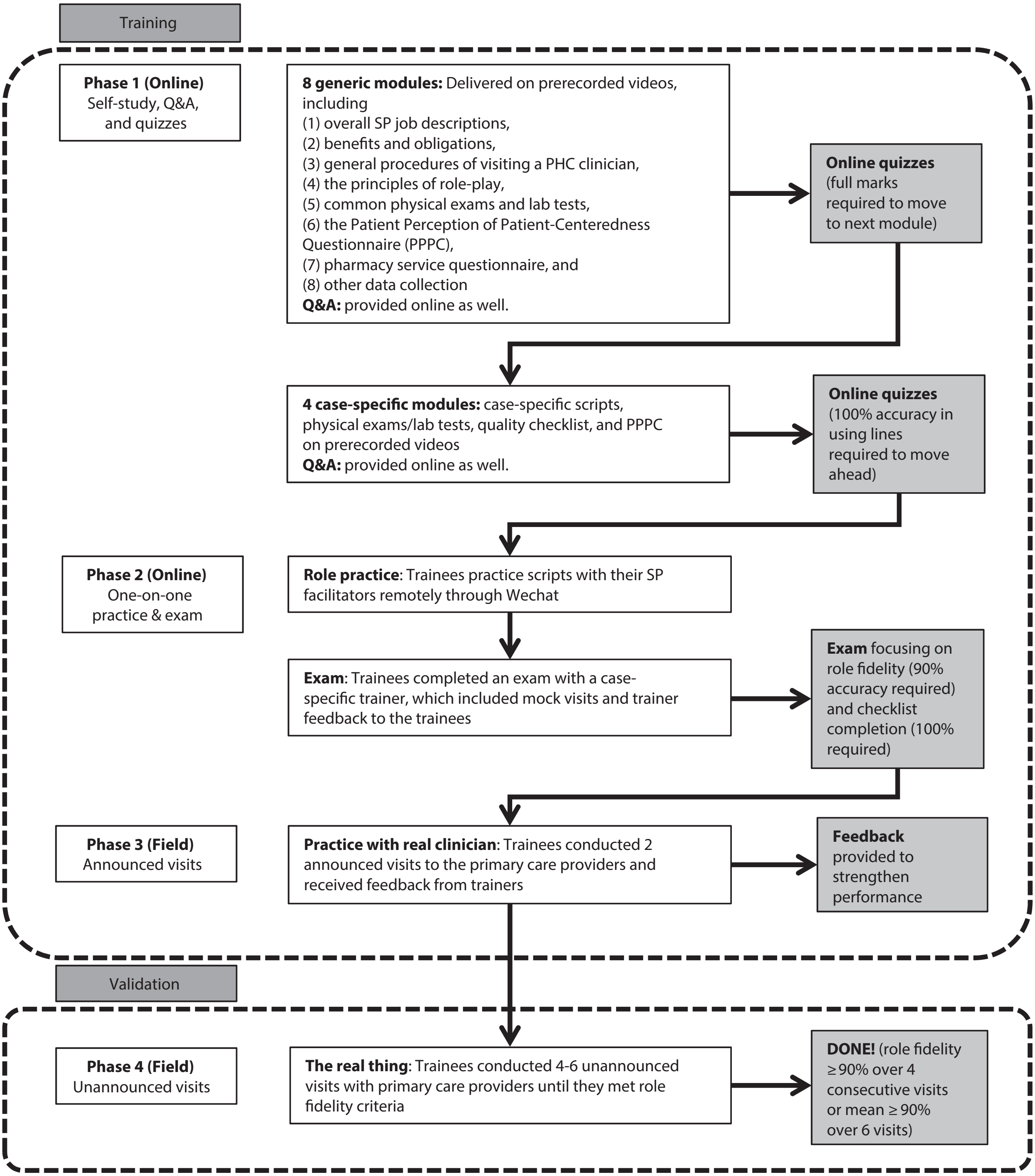


FIGURE 1— Flow of Unannounced Standardized Patient (USPs) Participants: Primary heAlth Care quAlity Cohort In ChinA (ACACIA), March 30, 2021–August 14, 2021

might divert the already constrained medical resources to nonessential work. Second, the USPs and facilitators might be subject to risk of COVID-19 transmission. To address these concerns, we suspended activities in any municipalities and surrounding areas whose government-designated pandemic level was medium or above. For any municipality that had more than 1 locally transmitted COVID-19 case but had not yet received a medium-risk designation, we allowed ongoing USP visits to proceed with caution while suspending new visits. As of August 14, 2021, none of our field-workers had been infected with COVID-19.

PRELIMINARY RESULTS

We have so far conducted 817 visits (45.8% urban vs 54.2% rural), including 235 (28.8%) hospital outpatient visits, 163 (19.9%) community or township health center visits, and 419 (51.3%) heath station or clinic visits. Only 27.3% of the USP visits resulted in a perfect diagnosis, whereas 19.2% were completely wrong. On average, of the guideline-recommended quality checklist items, the PHC clinicians completed only 16.0% (95% confidence interval [CI] = 15.5, 17.1) of those for consultation, 10.0% (95% CI = 9.1, 11.1) of those for physical and laboratory exams and 23.0% (95% CI = 21.0, 24.8) of those for treatment (Table 1). By comparison, the 2007 systematic review of USP studies reported that doctors were performing 40% to 60% of guideline recommendations.[9] The average total expenditure of a PHC visit was renminbi (RMB) 35.45 (95% CI = 30.63, 40.27), or US $4.49 (95% CI = 4.74, 6.23). The median medicine expenditure was RMB 12.00 (interquartile range [IQR] = 41.07 – 0 = 41.07), or US $1.86 (IQR = 6.36 – 0 = 6.36). A surprising finding is that 61 of the 817 visits (7.5%) were not completed because the facilities had closed down, even though they were listed on the government registry.



Training

Phase 1 (Online)
Self-study, Q&A, and quizzes

8 generic modules: Delivered on prerecorded videos, including
(1) overall SP job descriptions,
(2) benefits and obligations,
(3) general procedures of visiting a PHC clinician,
(4) the principles of role-play,
(5) common physical exams and lab tests,
(6) the Patient Perception of Patient-Centeredness Questionnaire (PPPC),
(7) pharmacy service questionnaire, and
(8) other data collection
Q&A: provided online as well.

Online quizzes (full marks required to move to next module)

4 case-specific modules: case-specific scripts, physical exams/lab tests, quality checklist, and PPPC on prerecorded videos
Q&A: provided online as well.

Online quizzes (100% accuracy in using lines required to move ahead)

Phase 2 (Online)
One-on-one practice & exam

Role practice: Trainees practice scripts with their SP facilitators remotely through Wechat

Exam: Trainees completed an exam with a case-specific trainer, which included mock visits and trainer feedback to the trainees

Exam focusing on role fidelity (90% accuracy required) and checklist completion (100% required)

Phase 3 (Field)
Announced visits

Practice with real clinician: Trainees conducted 2 announced visits to the primary care providers and received feedback from trainers

Feedback provided to strengthen performance

Validation

Phase 4 (Field)
Unannounced visits

The real thing: Trainees conducted 4-6 unannounced visits with primary care providers until they met role fidelity criteria

DONE! (role fidelity ≥ 90% over 4 consecutive visits or mean ≥ 90% over 6 visits)

FIGURE 2— **Procedures of Training and Validating Unannounced Standardized Patient Participants: Primary heAlth Care quAlity Cohort In ChinA (ACACIA), March 30, 2021–August 14, 2021**

Note. PHC = primary health care; Q&A = questions and answers; SP = standardized patient.

COVID-19 IMPACT ON ASSESSMENT VALIDITY

A major concern of the implementation's deviation from the original protocol was its potential impact on the validity of the USP assessment tool. We now discuss several negative and positive aspects.

First, we initially selected the TB case to serve as a tracer condition for major infectious diseases and to enable easier international comparisons, as TB was widely used in USP studies in China,[20] India,[21–23] Kenya,[24] and South Africa.[23,25] Dropping TB thus affected the overall representativeness of our case roster. Second, some USPs were sent from their home bases to other provinces with distinct cultures and dialects, possibly increasing the risk of exposing their true identities. Incognito visits are critical for minimizing the Hawthorne effect. However, recruiting "local" USPs was not feasible even in the same province because of the diversity of cultures and dialects. In the cities, speaking Mandarin was common for medical consultations; in rural areas, however, we trained the USPs to use various decoys to minimize suspicions, such as posing as a student who was conducting thesis fieldwork. Third, the in-person training was completely revamped into a hybrid online–offline modality.

We considered this approach superior and preferable to the conventional training. Meanwhile, because of our competency-based training approach, we had higher confidence in those trainees in playing their roles. Finally, the pandemic substantially prolonged the length of the program's fieldwork. As the duration of data collection gets longer, external quality-related policy changes that could introduce bias are more likely to occur. However, so far, we have not observed any major national policy changes related to PHC. ACACIA had an embedded validation study for the USP tool. The full results of the validation will be reported in a separate article. However, the preliminary analysis suggested high validity of the USP assessment even against the background of the pandemic. Table 2

TABLE 1— Clinician Completion of Essential Guideline-Suggested Items: Primary heAlth Care quAlity Cohort In ChinA (ACACIA), March 30, 2021–August 14, 2021

Conditions and Provinces	Visits, No.	Consultations, % (95% CI)	Exams, % (95% CI)	Perfect Diagnosis, %	Treatment, % (95% CI)
Condition					
Postpartum depression	67	16.6 (13.6, 19.7)	0	49.3	26.3 (21.0, 31.5)
Hypertension	91	11.7 (9.9, 13.6)	6.2 (4.9, 7.4)	19.8	10.4 (7.5, 13.4)
Migraine	71	19.1 (16.2, 22.0)	3.6 (2.5, 4.7)	12.7	38.8 (30.5, 47.1)
Common cold	64	17.0 (13.9, 20.0)	17.4 (13.5, 21.3)	37.5	13.8 (9.8, 17.8)
Type 2 diabetes	89	9.6 (7.6, 11.6)	8.0 (5.6, 10.4)	0.0	27.9 (21.8, 34.0)
Gastritis	44	23.4 (20.0, 26.7)	16.5 (11.4, 21.7)	34.1	34.4 (27.8, 41.0)
Asthma	52	17.6 (13.5, 21.8)	9.6 (5.2, 13.9)	25.0	27.5 (14.8, 40.1)
Child diarrhea	47	18.1 (14.0, 22.2)	7.1 (3.5, 10.6)	0.0	25.6 (20.5, 30.8)
Angina	52	16.2 (13.4, 19.0)	22.7 (15.6, 29.8)	51.9	28.8 (20.0, 37.7)
Stress urinary incontinence	118	15.3 (13.3, 17.4)	4.8 (2.6, 6.9)	20.3	32.9 (28.1, 37.8)
Lower back pain	122	19.3 (17.5, 21.1)	18.4 (16.4, 20.5)	49.2	3.2 (1.9, 4.6)
Province					
Gansu	84	19.4 (16.6, 22.3)	10.3 (6.7, 13.9)	31.0	26.0 (19.4, 32.5)
Guangdong	60	17.6 (14.5, 20.6)	11.6 (8.3, 14.9)	28.3	18.8 (12.6, 25.1)
Guizhou	58	14.4 (11.7, 17.2)	11.3 (7.9, 14.6)	17.2	18.1 (13.0, 23.2)
Hunan	38	14.1 (10.0, 18.2)	10.8 (5.8, 15.8)	21.1	15.7 (8.4, 23.0)
Inner Mongolia	7	20.6 (4.9, 36.4)	8.2 (−5.6, 22.0)	28.6	41.8 (1.8, 81.9)
Shaanxi	157	14.1 (12.3, 15.8)	10.5 (8.1, 12.9)	31.2	22.8 (18.0, 27.6)
Sichuan	513	16.7 (15.6, 17.9)	9.5 (8.1, 10.9)	26.9	23.9 (21.2, 26.6)
Total	817	16.0 (15.5, 17.1)	10.0 (9.1, 11.1)	27.3	23.0 (21.0, 24.8)

Note. CI = confidence interval.

summarizes the results of the 4 most important areas of validity.

IMPLICATIONS AND RECOMMENDATIONS

As societies transition from lockdowns to partial or sporadic restrictions, our experience will be especially relevant for other complex national data collection efforts. COVID-19 will not be the last pandemic. We need to learn from the past to build resilient data surveillance actively.

What Went Well

Crisis often creates momentum and conditions for changes. Several approaches that we were forced to take have become preferred ones even under normal conditions. As an example, our hybrid training model had many advantages over the initial in-person training. It allowed trainees to learn repeatedly at their own pace, saved trainers' workload, shared trainers' resources across provinces, enhanced communications between instructors and trainees, and saved substantial travel costs. It also enabled a rolling training process, indispensable to addressing USP attrition. Similarly, sharing our USPs across the provinces has become more efficient and effective than training more USPs. The direct cost of the hybrid training was RMB 1680 (US $260) per USP, less than the cost of moving a USP to a neighboring province. The USP role-playing improved with more visits as well. The pandemic also created new research opportunities. We have now begun to use the same USPs to assess the quality of eHealth in China, which has become increasingly popular during the pandemic.

Our second lesson concerns maintaining team morale and interests during the pandemic. The frequent disruptions from the pandemic could be baffling and disheartening for the project team. There were almost 200 fieldworkers of diverse backgrounds working for ACACIA at any time. Notably, 117 undergraduate and master's degree students of health sciences worked as USP facilitators, quality controllers, and provincial coordinators. We maximally matched the students' interests with the project objectives to stimulate their self-motivation for the project work. For instance, we prospectively discussed a range of ACACIA-based thesis opportunities with the master's degree students. We also specifically targeted undergraduates who intended to gain

TABLE 2— Validity of the Unannounced Standardized Patient (USP) Assessment Tool: Primary heAlth Care quAlity Cohort In ChinA (ACACIA), March 30, 2021–August 14, 2021

Validity	Measures	How	Why It Matters	Results
Content validity of the quality checklist	Scale-level content validity index with averaging calculation method (S-CVI/Ave)	Agreement of a multidisciplinary expert panel on the relevance of the checklist via a Delphi process	Checklist serves as the evidence-based criteria for the evaluation of the quality	12 USP cases ranging from 0.92 to 1, > 0.90 threshold
Fidelity of USP role-playing	Proportion of accurately used lines during an unannounced USP visit	Quality controllers listened to each voice-recording of the USP visit to verify the accuracy of the USP line use[a]	Consistently and accurately using the lines is critical to maintaining the standardization of the USP visit	Average 94%, > 90% criterion
Accuracy of checklist completion by USPs	Agreement of checklist items completed between the USP and the quality controllers	Using the checklist completed by quality controllers listening to the voice-recording of the visits as the gold standard[a]	USPs must accurately recall and identify the details of clinician consultation, exams, diagnosis, and treatment	88% agreement
Detection of USP	Proportion of USPs detected by the clinicians	Clinicians reported on any suspected USP visits over the past 2 weeks	Maintaining the fake identity during the visit is critical to avoid the Hawthorne (observation) effect	0.68%[b]

Note. Scale level content validity index/average (S-CVI/Ave) = 0.96.

[a] We required the field team to upload the voice recording before 7 p.m. of the same day of the visit. The quality controller checked the accuracy of the standardized patient (SP) rendition of the lines (> 90% accuracy required) and the completion of the checklist and provided feedback to the field team. The SPs who did not meet the quality requirement would take an online refresher course on scripts before resuming their visit.

[b] In the development and validation phase, 147 doctors returned survey forms and 25 reported their suspicion of at least 1 USP visit. However, only 1 reported suspicion was actually linked with our USP visits.

research experiences through ACACIA. Likewise, for the 14 ACACIA researchers from the 10 universities, we prospectively and mutually agreed upon one another's benefits and obligations in the project. We successfully aligned the participants' interest with ACACIA to the extent that all researchers volunteered their time in the research. The high self-motivation of the entire team was the core for building project resilience under the pandemic.

The third thing we learned is to use technology and tools well. We leveraged the societal drive for remote work for all phases of ACACIA. As described in the "Recruitment" and "Training" sections, we used remote means for USP interviews and training. Moreover, the cloud-based Research Electronic Data Capture (REDCap) system[26] provided us with a sophisticated, customizable, secured, and efficient tool for remote collaborations.[27] For example, our USPs and facilitators used REDCap to upload all data forms, audio recordings, and images on the same day as their visits, whereas the quality controllers, who were spread over different universities, used the same system to remotely check missing data, assess USP role-play fidelity, and verify the quality of the checklist completion. The remote means improved the efficiency and validity of the data as mistakes were promptly rectified.

Finally, we should emphasize the importance of ethical considerations at the implementation level. The method of USP was ethically controversial because of the use of deception and the absence of consent.[28–30] The pandemic further complicated the issue, as mentioned in the "Ethics" section. However, the currently prevailing opinion is that USP studies are justifiable as long as there is (1) minimum risk to the clinicians (ACACIA analysis will be at the aggregated level and only on de-identified data), (2) the necessity of a waiver of consent to produce scientifically valid data (obtaining clinician consent will lead to self-selected bias), and (3) the potential for substantial social value of the knowledge gained from the research (ACACIA is a rare attempt to monitor the quality of PHC in China).[31,32] We carefully observed those conditions in our preparation of the study protocol[2] and took extra care to deal with the pandemic-related risks as discussed in "Case Development" and "Ethics."

What Could Be Improved

We had great difficulty in recruiting USP players. Recruitment news was distributed mainly through social media and word of mouth. In hindsight, we should have explored other recruitment avenues, such as popular job search Web sites. Identifying and establishing partnerships with hospital medical education departments that have standardized patients might be another recruitment shortcut for recruiting the USPs.

Meanwhile, pandemics such as COVID-19—as well as future public health crises—highlight the importance of PHC. Although we tactically dealt with this issue—for example, we adjusted the quality checklist of the common cold to include a COVID-19–related item—we did not have a strategic and overarching design to examine the preparedness and resilience of PHC systematically. It was a missed opportunity.

Recommendations

We would like to share the 3 most important recommendations to foster resilient data surveillance during and beyond the COVID-19 pandemic. First, the hybrid remote and in-person work is highly recommended. One of the lasting legacies of the pandemic is probably the realization of how much can be achieved remotely without compromising quality. Data collection teams need to pursue technological tools to actively facilitate this hybrid model, which can be implemented across all phases of the project, not only the fieldwork.

Second, we should learn from the sharing economy to pool strengths and optimize resources. An individual is powerless against the pandemic, but collectively we are strong. In ACACIA, we shared ideas, funds, expertise, resources, and intellectual properties. Sharing entails more than the passive availability of resources for the group; it also involves dynamically optimizing individual resources for group needs. Sharing makes the group not only stronger but also more efficient.

Third, individual and group leadership is critical for a resilient system. It was a bold vision, not the availability of a grant, that initially led to the ACACIA group's launch. Several core members of ACACIA, from students to researchers, exercised exceptional leadership in harnessing the group strengths for a shared goal. Without the intrinsic call of the team members to take initiatives, ACACIA would not have been maintained during the pandemic.

CONCLUSIONS

COVID-19 brought crisis but also opportunities. With leadership and innovation, we adopted hybrid work and dynamically shared resources to fund, design, validate, and implement this complex national data effort with unannounced standardized patients. Our experiences may encourage like-minded researchers to build resilient data systems during and beyond the pandemic. AJPH

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CONTRIBUTORS

D. Xu conceptualized the study. Y. Y. Cai and X. H. Wang coordinated the daily implementation of this study in the 7 provinces. Y. Y. Cai conducted the data analysis. Y. Y. Cai, X. H. Wang, Y. L. Chen, W. J. Gong, J. Liao, J. F. Zhou, Z. L. Zhou, N. Zhang, C. X. Tang, and J. Pan were the project leaders in each province and were responsible for the implementation of the project in each province. B. B. Mi was the chief data manager of the project. Y. Lu took charge of online training. R. X. Wang, Q. Zhao, W. J. He, and H. J. Liang were project assistants. D. Xu prepared the first draft of the manuscript and Y. Y. Cai and X. H. Wang developed the second draft. All authors substantially contributed to the implementation of the project and the iterative revisions of this manuscript.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to report.

HUMAN PARTICIPANT PROTECTION

Ethical approval for this project was issued by the institutional review boards of Sun Yat-sen University (2017-011 and 2019-024), Xi'an Jiaotong University (2020-1288), Guizhou Medical University (2020-201), and Lanzhou University (2020-0901).

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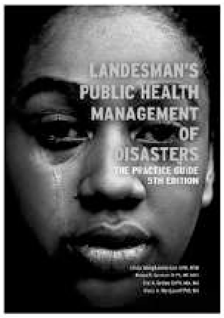

Linking Electronic Health Records to the American Community Survey: Feasibility and Process

Victoria Udalova, PhD, Timothy S. Carey, MD, MPH, Paul Roman Chelminski, MD, MPH, Lucinda Dalzell, MA, Patricia Knoepp, MPH, Joanna Motro, PhD, and Barbara Entwisle, PhD

See also Cantor, p. 821.

Objectives. To assess linkages of patient data from a health care system in the southeastern United States to microdata from the American Community Survey (ACS) with the goal of better understanding health disparities and social determinants of health in the population.

Methods. Once a data use agreement was in place, a stratified random sample of approximately 200 000 was drawn of patients aged 25 to 74 years with at least 2 visits between January 1, 2016, and December 31, 2019. Information from the sampled electronic health records (EHRs) was transferred securely to the Census Bureau, put through the Census Person Identification Validation System to assign Protected Identification Keys (PIKs) as unique identifiers wherever possible. EHRs with PIKs assigned were then linked to 2001–2017 ACS records with a PIK.

Results. PIKs were assigned to 94% of the sampled patients. Of patients with PIKs, 15.5% matched to persons sampled in the ACS.

Conclusions. Linking data from EHRs to ACS records is feasible and, with adjustments for differential coverage, will advance understanding of social determinants and enhance the ability of integrated delivery systems to reflect and affect the health of the populations served. (*Am J Public Health*. 2022; 112(6):923–930. https://doi.org/10.2105/AJPH.2022.306783)

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Patterns of population health and the persistence of health disparities demonstrate the importance of going beyond clinical settings to understand the conditions in which people live, opportunities to which they have access, environments to which they are exposed, and how they are treated by others, all of which are powerfully shaped by race, ethnicity, and income.[1–3] Nonprofit health care systems have a statutory responsibility to benefit the communities they serve,[4] but their ability to leverage their clinical data to develop such an understanding is limited.[5,6] Information needed to describe the sociodemographic characteristics of the patient population is generally restricted to age, sex, race, and ethnicity, often with substantial missing data on race and ethnicity. Patients may or may not be representative of the communities in which they live.[7] A potential solution to these problems is to link clinical records to social, economic, and demographic information collected for individuals in the American Community Survey (ACS).

The ACS is an ongoing sample survey conducted by the US Census Bureau that collects information on the US population.[8] The ACS asks about a full range of personal characteristics such as education, employment status, occupation, income, marital status, detailed race and ethnicity, language, health insurance, and disabilities; housing characteristics such as type and age of dwelling, number of rooms, monthly rent or mortgage payment, and Internet access; and derivable household characteristics such as size, presence of children, family composition, and poverty status.[9] Each year, the ACS collects data for more than 2 million persons living in households and 150 000 persons living in group quarters.[10,11] Properly weighted, ACS data are representative of national, state, and local populations.

Ours is the first study to our knowledge to link electronic health records

(EHRs) with ACS microdata. Others have appended ACS-based publicly available data for small geographic areas to EHRs to improve screening for chronic disease,[12–14] to identify and characterize neighborhood contexts that contribute to or potentially exacerbate medical conditions,[15,16] and to develop population-adjusted prevalence rates for various medical conditions.[17] However, there are limitations to this area-based approach. The lowest level of geography for which ACS data are publicly available is the block group, and, because of disclosure concerns, not all information of potential interest is available at this level. Furthermore, areal ACS data do not always add meaningfully to the prediction of health outcomes.[18] With individual-level linkages between EHR and ACS data, it would be possible to systematically evaluate use of areal estimates as proxies for social determinants missing from clinical databases, correct for potential bias in EHR-based studies, and assess the extent to which integrated delivery systems care for representative populations.

To realize the value of EHR–ACS linkage requires a collaboration between a health care system and the Census Bureau that can successfully meet a series of challenges, from developing a data-use agreement that meets the stringent data protection requirements of both entities to determining whether linkages meet necessary quality standards. The health care system that is the focus of our study is composed of a large academic health center, 11 community hospitals, and hundreds of community practices across the state. Care is offered to all residents of the state regardless of ability to pay, with a generous charity care program and a vigorous population health outreach program, resulting in a diverse patient population, including citizens and noncitizens. Within the broad mix of racial, ethnic, and cultural diversity, both urban and rural populations are represented. Through expansion, the total patient population, operationalized as number of unique patients served over a 2-year period, increased from 1.9 million patients in 2016 to 3.4 million patients in 2021. This article describes the process, reports on lessons learned, and discusses future promise of an attempt to match records for a sample of these patients.

METHODS

To link EHR-derived data to data from the ACS required the following steps:

1. develop a data-use agreement between the health care system and the US Census Bureau;
2. design, select, and transmit a sample of patient records to the Census Bureau;
3. pass the records through the Census Bureau's Person Identification Validation System (PVS) to assign Protected Identification Keys (PIKs);
4. use the PIKs to match to ACS records with PIKs; and
5. assess the quality of linkage.

Each of these steps is briefly described.

Health Care System–Census Bureau Agreements

Linking data required collaboration between 2 entities with very different missions, processes, and cultures. The health care system is a not-for-profit academic integrated care delivery system and a safety-net provider for the state. Its medical records are protected by the Health Insurance Portability and Accountability Act as well as confidentiality agreements signed by all employees, medical staff, students, volunteers, vendors, and others who access these records in the process of conducting their business. Policy issues related to data use are governed by an oversight committee, with representation from the clinical enterprise, the school of medicine, other health science schools, and 2 patient representatives.

The US Census Bureau is the largest federal statistical agency with a mission to "serve as the nation's leading provider of quality data about its people and economy."[19] This project was done under the Census Bureau's legal authority, Title 13 USC, and all individuals' information was safeguarded under the confidentiality and use restrictions in 13 USC § § 8,9 and in accordance with the Census Bureau's Data Stewardship Program.[20] There are severe penalties for violating the oath to protect data at the Census Bureau. Though the primacy of data confidentiality is shared by both organizations, differences in procedures resulted in a complex negotiation to establish a governance process to link ACS and EHR data. The critical first step was, thus, to develop the necessary agreements.

A data use agreement was negotiated and approved by the health care system, including institutional review board approval and authorization of the necessary disclosures of protected health information to the Census Bureau to conduct the study. Team members made presentations regarding the long-term goals of the collaboration with the Census Bureau, the value of a joint project to assess population health, and proposed measures to ensure confidentiality of patient data. In turn, health care personnel were educated regarding

Census Bureau data governance and extensive nondisclosure and privacy policies. The resulting data use agreement, signed in late 2019, specifies the legal authorization to participate in this joint statistical project as well as its purpose, mutual interests and responsibilities of the parties, data confidentiality, system security, disclosure avoidance, and research plan. The agreement requires that the confidential data be used only for statistical purposes as described in the research plan and not disclosed or published in any way that permits identification of a particular individual or entity. For this project, only authorized Census Bureau staff can analyze the data sets and only within the Census Bureau's information technology environment. All results must pass a formal disclosure review conducted by the Census Bureau's Disclosure Review Board. This process ensures that there is no information that can identify an individual, either alone or when combined with other publicly available information. All results reported in this article have passed this review.

Electronic Health Records

The health care system uses a single, enterprise-level system (Epic) to manage and store EHR data from hospitals and outpatient practices. Data are transferred daily to a Clinical Data Warehouse and are used for both operations and research. Patient identifiers and sociodemographic information such as race and ethnicity were provided by patients and recorded at the time of registration either online or by staff interview. As part of clinical activity, some variables such as patient address are updated regularly, but, other than de-duplication to correct for multiple records in a few cases because of multiple surnames, name changes, and John Doe admissions to the emergency department, no formal data "cleaning" was performed as part of this linkage project, making these results applicable to other large integrated delivery systems.

For the purposes of this study, we drew a disproportionate stratified random sample of 200 000 patients aged 25 to 74 years with at least 2 visits between January 1, 2016, and December 31, 2019, from the Clinical Data Warehouse. The goal was to achieve approximately equal numbers of patients representing different combinations of race and ethnicity, although numbers were not always sufficient in some groups to meet this goal. The sample selected for study was as follows:

- White/not Hispanic or Latino: 32 922;
- Black/not Hispanic or Latino, or missing: 32 922;
- Any race/Hispanic or Latino: 32 922;
- Asian/not Hispanic or Latino, or missing: 16 721;
- Missing or other race/missing ethnicity: 32 922;
- Missing or other race/not Hispanic or Latino: 32 922; and
- White/missing ethnicity: 18 670.

We drew the identifying information needed to link their records with ACS data: name, address, date of birth, sex, and Social Security number (SSN). We also drew a limited number of sociodemographic variables: race, Hispanic ethnicity, language, and health insurance. These were analyzed separately.

Protected Identification Key Assignment

The record linkage identifiers used at the Census Bureau do not contain any direct identifiers. Instead, PIKs replace identifying information and are used to anonymously link to ACS microdata. PIKs are based on exact and probabilistic matching by comparing information in a given input file against a reference file generated from Social Security Administration data and other administrative records.[21] To assign PIKs, each record is passed through successive modules comparing it with the reference file based on SSN, address, name, gender, and date of birth. When a linkage can be made between the incoming record and the reference file, the PIK is appended to the record in the file transferred from the health care system. Only records that were not found move on to the next module. First, the data go through the SSN module. Those records that were not found in the SSN module move to the GEO search module. In the GEO search module, the program is looking for a match using name plus date of birth plus sex within a certain geographic radius (no more than the surrounding neighborhoods of first 3 digits of zip code from the address provided). If there is still no match, the record moves to the name module, which also uses date of birth. The match to SSN is exact; matches involving other identifiers are probabilistic.[22]

After secure transfer, Census personnel attempted to assign PIKs to approximately 199 000 patient records. The difference between this number and the 200 000 records drawn is attributable to removal of a few duplicates and the decision to drop patient records indicating nonbinary or "other" for sex because of sample-size considerations to avoid potential disclosure. All numbers were rounded to meet disclosure requirements. Once PIKs were assigned, personally identifying information was removed. None of the analytic research files for this project contain personally identifying information such as name or Social Security number, as these fields are used only in the initial PIK-generation phase with authorized access for only a few employees at the Census Bureau.

Linking to American Community Survey Data

The health care system serves mainly residents of the state (2% of patients reside elsewhere), so we first considered limiting the assessment of linkages between EHRs and the ACS to in-state addresses sampled in the ACS. After further consideration, we opted for a more expansive approach because of significant migration into and out of the state over the 17-year span of ACS data utilized, which could undermine future analyses and conclusions regarding social determinants given the intrinsic mobility of residents.[23]

Linking EHRs to the ACS means linking a subset of the population with a sample of the population. Figure 1 illustrates this process. The EHRs refer to a selected subpopulation from the state consisting of 2.1 million patients during 2016 to 2019; the sample selected for the study is a subset (~200 000), and those assigned PIKs a further subset (~187 000; Figure 1a). ACS data are a representative sample of the state population (Figure 1c). The intersection of these 2 sets (i.e., matched EHRs and ACS records) is shown in Figure 1b. Not shown in the figure is coverage error in the ACS, which increased over time.[24] Furthermore, and relatedly, not all ACS data were assigned PIKs.

RESULTS

Overall, PIKs were assigned to 187 000 of the 199 000 records, a PIK rate of 94.0%. This compares favorably to the PIK rate for the ACS (90.8%–94.4%). As shown in Table 1, 77.5% of patients in the data from the health care system were assigned PIKs based on SSN, an exact match. An additional 12.3% were found using name, date of birth, and sex within a geographic radius determined from their address, and a further 4.1% were found using name, sex, and date of birth. The latter PIK assignments are probabilistic. Of those records not successfully assigned PIKs, the large majority either lacked an SSN or provided an SSN that did not match the Census Bureau's reference file. Clearly, SSNs played an outsized role in the PIK assignment process. SSN matches provide reassurance on the quality of the linkages because they are exact. Yet, relying on exact SSN matches may not be realistic in the long run because health systems are increasingly moving away from collecting SSNs as mandatory fields. To investigate the possible consequences on non-SSN matches, we resubmitted the EHRs for PIK assignments without SSNs and using only name, address, sex, and date of birth, and succeeded in assigning PIKs for 90.0% of the sampled patients.

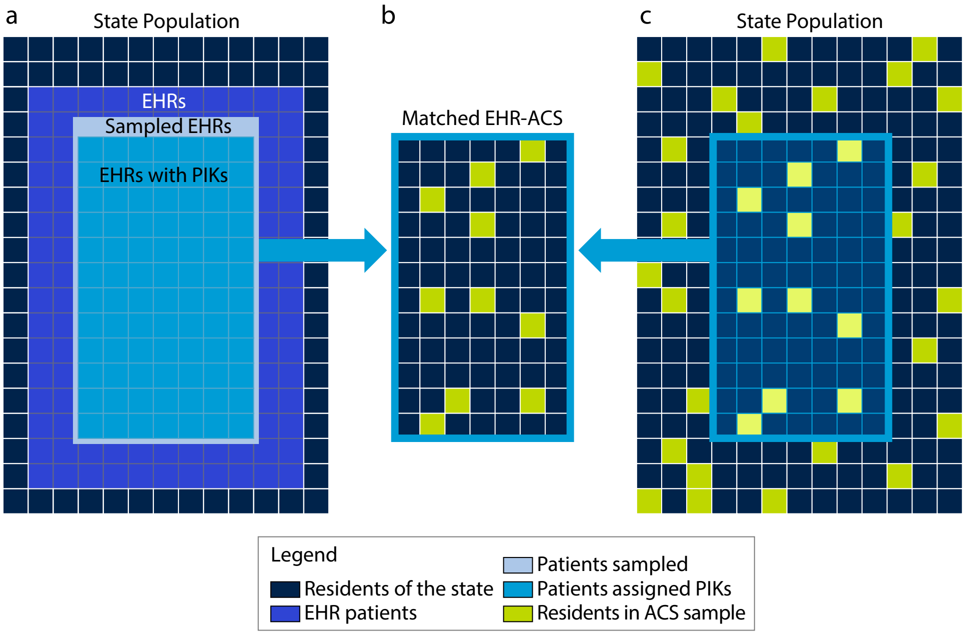

FIGURE 1— **Matching Electronic Health Records (EHRs) to American Community Survey (ACS) Sample: United States**

TABLE 1— Electronic Health Records (EHRs) Protected Identification Key Quality: United States

	No. (%)
Found, Social Security number	154 000 (77.54)
Found in geographic search	24 500 (12.34)
Found in name search	8 100 (4.08)
Found in date-of-birth search	100 (0.05)
Not found	11 900 (5.99)
Total	198 600 (100.00)

Note. The US Census Bureau reviewed this data product for unauthorized disclosure of confidential information and approved the disclosure avoidance practices applied to this release, CBDRB-FY21-POP001-0087. All numbers are rounded according to US Census Bureau disclosure protocols. The discrepancy between the total of 198 600 shown in the table and the references to 199 000 in the text reflects rounding error.

Source. American Community Survey data (2001–2017) and EHRs obtained from a health care system in the southeastern United States.

Most patients in the EHR subset will not be sampled in the ACS, and many respondents in the ACS will not be patients of the health care system. For these groups, there is no possibility of a match. Without knowing the population of eligible potential matches, it is not possible to say exactly what match rate would indicate that all eligible potential matches have been identified and linked, but, because the ACS is a true probability sample, we can put rough bounds around it. From the perspective of the EHRs, the maximal match rate will depend on the individuals sampled for the ACS each year (1%–1.5%) cumulated over years of observation (2001–2017), taking account of coverage (91.8%–94.1%), PIK rates (90.8%–94.4%), and smaller sampling fractions in 2001 to 2004 (0.2%–0.3%).[11] The maximal match rate likely lies between 12% and 18%, although we cannot know for sure. The match rate for our sample of EHRs with PIKs is within that range: 15.5%.

Table 2 shows the distribution of matched observations by year of the ACS record to which it matched. The distribution added up to 15.5%, the overall match rate. Match rates were higher for ACS data collected in 2012 or later (1.23% or higher) than for ACS data collected in earlier years, (0.21%–0.27% in the 2001–2004 period). These patterns point to a tradeoff: the greater the number of years of ACS data included in the potential match, the higher the match rate will be, but the greater time difference in the reference year for the 2 sets of data may undermine the utility. It is questionable whether social, economic, and housing characteristics in, say, 2001 add much value in an analysis of health records collected in 2016 to 2019. If we restrict our attention to more recent ACS data, say 2013 to 2017, the match rate will be lower—in this instance, 6.47%.

Table 3 enables us to look at the time trends in a different way. For each ACS year, we can examine the percentage of individuals in the survey who match to a patient with at least 2 visits in 2016 to 2019. Match rates varied between 0.043% and 0.054%. The percentages were very small because we considered for a potential match all individuals included in the ACS for a particular year, not only in the state but also across the country. Had we limited our attention to ACS records from the state, match rates would have been higher and the trend more pronounced.

DISCUSSION

Census Bureau data, such as the ACS, are collected to describe populations, follow trends in populations, and make demographic inferences useful to policymakers. In contrast, health data are collected for the express purpose of being applied to the individuals who provide it—though integrated delivery systems also routinely use aggregated data to track health care use and outcomes over time to improve care, and EHR data are increasingly used for research and to inform public health. Navigating a series of steps required for data integration, the study demonstrated a successful collaboration between a health care system and the US Census Bureau to advance a project germane to their disparate missions.

Data integration required internal review at both institutions and a data use agreement acceptable to both parties. Selected information from a sample of EHRs selected from the Clinical Data Warehouse was transmitted by secure means. Data integration proceeded smoothly: the PIK rate was high (94%), and the match rate to EHR data for observations with PIKs (15.5%) was within expectations given sampling fractions in the ACS and the 17-year span of ACS data used. Match rates are less with narrower windows—for example, 3.8% if ACS data were limited to the 2015–2017 period and 1.3% if limited to 2017. The narrower the window, the fewer the number of matched cases.

TABLE 2— Matches of Patients Having Electronic Health Records (EHRs) With Protected Identification Keys (PIKs) to Respondents in the American Community Survey (ACS) : United States

	No. of Matches	Total No. of EHRs With PIKs (Constant Over Time)	Match Rates of EHRs With PIKs
Overall, all ACS years	29 000	187 000	15.508
2001	450	187 000	0.241
2002	400	187 000	0.214
2003	500	187 000	0.267
2004	450	187 000	0.241
2005	1 700	187 000	0.909
2006	1 900	187 000	1.016
2007	1 700	187 000	0.909
2008	1 800	187 000	0.963
2009	1 800	187 000	0.963
2010	1 900	187 000	1.016
2011	1 900	187 000	1.016
2012	2 300	187 000	1.230
2013	2 400	187 000	1.283
2014	2 500	187 000	1.337
2015	2 500	187 000	1.337
2016	2 400	187 000	1.283
2017	2 300	187 000	1.230

Note. The US Census Bureau reviewed this data product for unauthorized disclosure of confidential information and approved the disclosure avoidance practices applied to this release, CBDRB-FY21-POP001-0087. All numbers are rounded according to US Census Bureau disclosure protocols.

Source. ACS data (2001–2017) and EHRs from a health care system in the southeastern United States (2016–2019).

Importantly, the expected number of matches is sufficient to support subsequent analyses. For patients seen in a particular year for a relatively common condition such as type 2 diabetes matched to 3 years of ACS data, we would expect more than 3000 matches. Even if we narrowed to 1 year of ACS data, there would be more than 1000 cases. For less common conditions, information from more than 1 medical center might be used, assuming that appropriate agreements could be negotiated. We could also boost the number of matches by expanding the Census Bureau data sources used—for example, the Decennial Census or additional sources of administrative records such as program participation from states have much greater coverage than the ACS.

Future uses could include transfer of a greater number of EHR cases to Census, addition of structured clinical fields including *International Classification of Diseases, 10th Revision* (Geneva, Switzerland: World Health Organization; 1992) diagnostic codes, medication type and refills, procedures performed, details of inpatient hospital stays, and laboratory result data. Scaling up to include other medical centers is certainly possible and would be facilitated through use of a common data model. From the Census perspective, the clinical detail of EHR-derived data will be helpful to provide clinical correlates of demographic and symptom report information. Uses can also include examination of the detailed data on household size, socioeconomic status, and structure, information that clinical systems generally lack. Clinical and health services researchers can examine the extent to which populations cared for within large integrated delivery systems are or are not representative of populations in geographic areas. In addition, the relationship of the Census "gold-standard" measures of social determinants of health and population demographic characteristics to clinical outcomes can be assessed.[7]

An issue that any research along these lines will face is timing. As noted, the wider the window of ACS data used for matching, the larger the number of matches. The advantages of having more cases must be balanced against the increasing possibility that the social, demographic, economic, and housing characteristics measured in the ACS have changed since they were collected. This timing difference is less of a problem for variables such as sex, race, ethnicity, age (which changes in predictable ways), or educational attainment (which changes little for most adults[25]) than it is for more dynamic social determinants of health such as income,[26] household composition, or place of residence. For example, according to data from the Survey of Income and Program Participation, 12.2% of the population changed residence in 2013, and 14.9% experienced a change in household composition that year.[27] Exploring these tradeoffs in the future will be instructive

TABLE 3— Matches of Respondents in the American Community Survey (ACS) With Protected Identification Keys (PIKs) to Patients Having Electronic Health Records (EHRs) With PIKs: United States

	No. of Matches	Total No. of ACS Observations With PIKs (Varies by ACS Year)	Match Rates of All ACS Observations With PIKs
Overall, all ACS years	29 000	57 160 000	0.05074
2001	450	1 038 000	0.04335
2002	400	890 000	0.04494
2003	500	1 015 000	0.04926
2004	450	1 019 000	0.04416
2005	1 700	3 323 000	0.05116
2006	1 900	3 492 000	0.05441
2007	1 700	3 440 000	0.04942
2008	1 800	3 589 000	0.05015
2009	1 800	3 567 000	0.05046
2010	1 900	3 729 000	0.05095
2011	1 900	4 045 000	0.04697
2012	2 300	4 528 000	0.05080
2013	2 400	4 612 000	0.05204
2014	2 500	4 870 000	0.05133
2015	2 500	4 856 000	0.05148
2016	2 400	4 670 000	0.05139
2017	2 300	4 502 000	0.05109

Note. The US Census Bureau reviewed this data product for unauthorized disclosure of confidential information and approved the disclosure avoidance practices applied to this release, CBDRB-FY21-POP001-0087. All numbers are rounded according to US Census Bureau disclosure protocols.

Source. ACS data (2001–2017); EHRs from a health care system in the southeastern United States (2016–2019).

in determining appropriate cutpoints for different research questions.

Conclusions

Matched EHR–ACS data offer a unique window into population health, health disparities, and social determinants. ACS data tell us about life circumstances. EHR data tell us about health circumstances. While the ACS and other demographic databases lack the medical specificity that would make them useful population health tools, EHR data provide only a limited view of social determinants as well as potentially skewed and biased depictions of the population, although the extent of the bias is uncertain. Linking Census Bureau and EHR data, though, is a promising avenue to reconcile demographic data with clinical data in a manner that improves our understanding of how disease operates in populations and the patterns of care that emerge and the role of the delivery system in assessing and improving population health.

Public Health Implications

Integrating population-representative data on social determinants of health in the ACS and data on health outcomes in EHRs makes possible a better description of population health and a deeper examination of the social determinants of health and health disparities than is possible with either source alone.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to disclose.

HUMAN PARTICIPANT PROTECTION

The study was approved by the institutional review board at UNC.

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COVID-19 Vaccine Coverage and Hesitancy Among New York City Parents of Children Aged 5–11 Years

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Objectives. To measure vaccine uptake and intentions among New York City (NYC) parents of children aged 5 to 11 years following emergency use authorization.

Methods. We conducted a survey of 2506 NYC parents of children aged 5 to 11 years. We used survey weights to generate prevalence estimates of vaccine uptake and intentions. Multivariable Poisson regression models generated adjusted prevalence ratios (APRs) of vaccine hesitancy, defined as parents who reported being not very likely or not at all likely to vaccinate their children, or unsure about whether to do so.

Results. Overall, 11.9% of NYC parents reported that their child was vaccinated; 51.0% were very or somewhat likely to vaccinate; 8.0% were not sure; 29.1% were not very likely or not at all likely to vaccinate their child. Among vaccine-hesitant parents, 89.9% reported safety concerns and 77.8% had concerns about effectiveness. In multivariable models, more vaccine hesitancy was expressed by non-Hispanic Black parents than by non-Hispanic White parents (APR = 1.41; 95% confidence interval [CI] = 1.17, 1.72) and by parents who were not themselves vaccinated than by parents who were vaccinated (APR = 1.53; 95% CI = 1.32, 1.77).

Conclusions. In a survey conducted after authorization of COVID-19 vaccines for children aged 5 to 11 years, significant hesitancy among parents was observed. (*Am J Public Health*. 2022;112(6):931–936. https://doi.org/10.2105/AJPH.2022.306784)

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In October 2021, the Centers for Disease Control and Prevention (CDC) recommended use of the Pfizer BioNTech COVID-19 vaccine for children aged 5 to 11 years,[1] prompting concerns about parental acceptability and uptake. National polls conducted before authorization found that only one third of US parents planned to vaccinate their 5- to 11-year-old child right away, and the same proportion planned not to.[2]

Vaccination is critical for protecting children from SARS-Cov-2 infection, which can cause severe disease, prolonged symptoms, and death.[3,4] High pediatric vaccination coverage will also help contain the COVID-19 pandemic.[5] New York City (NYC), the first epicenter of the pandemic in the United States, has the nation's largest public school system. High vaccination coverage among school-age children will keep students and staff safe, lead to fewer educational disruptions, and lower the risk of community spread. We measured parent-reported COVID-19 vaccination intentions for children aged 5 to 11 years following emergency use authorization.

METHODS

We conducted this cross-sectional survey using a stratified random sample of NYC parents. NYC residents aged 18 years or older, self-identifying as a parent or legal caregiver of a child aged 5 to 11 years, were eligible. We collected data from November 10 to 18, 2021, through surveys in English, Spanish, and Mandarin. Participants were recruited through address-based random sampling. Participants contacted by cellphone completed Web-based surveys; those contacted by landline used interactive voice response.

The study included 2506 eligible adults and had a margin of error of 1.8%.[6] The sample was weighted to reflect the population of parents of children aged 5 to 11 years based on US Census and other survey estimates for child age and race/ethnicity, and for adult education, within each borough of NYC.[7] Appendix A (available as a supplement to the online version of this article at http://www.ajph.org) has further information on sampling and weights.

We measured vaccination intention through parent report for the youngest child aged 5 to 11 years. Parents were asked, "Has your child received the COVID-19 vaccine?" (responses: "yes," "no," "not sure"). Those responding "no" or "not sure" were asked, "How likely are you to get your child vaccinated against COVID-19 now that it is available for 5–11 year olds?" (responses: "very likely," "somewhat likely," "not very likely," "not at all likely," and "not sure"; online Appendix B). Parents responding "not very likely," "not at all likely," or "not sure" were considered vaccine hesitant and asked to agree or disagree with reasons for hesitating, including safety, effectiveness, medical, religious or philosophical, believing children do not need the vaccine, and cost or time concerns.

All parents reported demographic information about their child and themselves, including their own COVID-19 vaccination status, whether the child was up-to-date with routine vaccines and influenza vaccination, and concerns about the child becoming infected or infecting others with COVID-19. Descriptive statistics (unweighted counts and percentages using survey weights to generate prevalence estimates) are reported along with characteristics of children vaccinated at the time of the survey. To assess the relationship between characteristics and vaccination intentions, we divided the sample into 4 groups: (1) child already vaccinated, (2) parent very or somewhat likely to vaccinate, (3) parent unsure, and (4) parent not very likely or not at all likely to vaccinate. We compared prevalence estimates for groups by characteristics using the Rao adjusted Pearson χ^2 test. We fitted Poisson regression models (incorporating survey weights) with robust standard errors to estimate prevalence ratios of parental vaccine hesitancy, comparing vaccine-hesitant parents to parents of vaccinated children and parents very or somewhat likely to vaccinate children. We adjusted models for demographic and household characteristics to yield the adjusted prevalence ratio (APR).

RESULTS

Among all participants, 90% of children were reported to be up-to-date with routine vaccines, 44.0% had received the flu vaccine, and 84.6% of parents were vaccinated. Overall, 11.9% of NYC parents reported that their child had been vaccinated; 51.0% were very or somewhat likely to vaccinate their child; 8.0% were not sure; 29.1% were not very or not at all likely to do so (Table 1). Characteristics of children who had received COVID-19 vaccination at the time of the survey are shown in online Table A.

In univariable analysis, prevalence of vaccine hesitancy differed by characteristics including child and parent race/ethnicity, child's routine vaccination and flu vaccine status, parent's gender and vaccination status, parental concerns about COVID-19, and borough of residence. Among vaccine-hesitant parents, 89.9% reported safety concerns, 77.8% had concerns about effectiveness, 56.7% believed children do not need vaccination, 35.6% reported medical reasons, 29.2% cited philosophical or religious beliefs, and 11.0% reported time or cost concerns.

In multivariable models, compared with parents of children vaccinated for flu, parents not planning to vaccinate their child for flu (APR = 2.09; 95% confidence interval [CI] = 1.67, 2.62) and those unsure (APR = 2.16; 95% CI = 1.62, 2.88) were more vaccine hesitant (Table 1). Non-Hispanic Black parents compared with non-Hispanic White parents (APR = 1.41; 95% CI = 1.17, 1.72), parents who were not vaccinated themselves compared with vaccinated parents (APR = 1.53; 95% CI = 1.32, 1.77), and parents with some college compared with those with an undergraduate college degree or more (APR = 1.22; 95% CI = 1.02, 1.44) were also more vaccine hesitant. Parents reporting little or no worry about children infecting household members were more vaccine hesitant than very or somewhat worried parents (APR = 1.50; 95% CI = 1.18, 1.91). NYC parents who did not vote in the 2021 mayoral election (APR = 1.41; 95% CI = 1.13, 1.76) and those who voted for the Republican candidate (APR = 1.27; 95% CI = 1.03, 1.57) were more vaccine hesitant than those voting for the Democratic candidate. Compared with parents in Manhattan, those from Staten Island were more vaccine hesitant (APR = 1.44; 95% CI = 1.05, 1.98).

DISCUSSION

In this representative sample of NYC parents surveyed 2 weeks after emergency use authorization of COVID-19

TABLE 1— Characteristics of Children Aged 5–11 Years and Their Parents or Caregivers, Estimated Prevalence of Intention to Have Children Vaccinated for COVID-19, and Prevalence Ratios for Vaccine Hesitancy: New York City (NYC), November 10–18, 2021

Characteristic	No. (%)[a]	Child Already Vaccinated, % (95% CI)[b]	Parent Very Likely or Somewhat Likely to Vaccinate Child, % (95% CI)[b]	Parent Not Sure Whether to Vaccinate Child, % (95% CI)[b]	Parent Not Very Likely or Not at All Likely to Vaccinate Child, % (95% CI)[b]	APR for Vaccine Hesitancy[c] (95% CI)
Total sample	2506 (100.0)	11.9 (10.6, 13.2)	51.0 (47.7, 54.3)	8.0 (6.0, 9.9)	29.1 (26.2, 32.0)	
Child characteristics						
Age, y						
5–8	1528 (56.8)	12.5 (10.7, 14.3)	50.4 (46.1, 54.6)	7.7 (5.3, 10.2)	29.4 (25.5, 33.3)	1.12 (0.75, 1.32)
9–11	978 (43.2)	11.1 (9.2, 13.0)	51.9 (46.8, 57.1)	8.3 (5.1, 11.4)	28.7 (24.3, 33.1)	1 (Ref)
Gender						
Female	1230 (46.4)	13.4 (11.4, 15.4)	49.0 (44.5, 53.5)	7.8 (5.5, 10.1)	29.8 (25.8, 33.9)	1.00 (0.86, 1.17)
Male	1276 (53.6)	10.6 (8.9, 12.3)	52.8 (48.0, 57.6)	8.1 (5.1, 11.2)	28.5 (24.4, 32.6)	1 (Ref)
Race/ethnicity[e,f]						
Non-Hispanic Black	366 (23.2)	7.5 (5.2, 9.8)	46.2 (39.0, 53.5)	13.0 (8.1, 17.8)	33.3 (26.4, 40.2)**	
Asian	196 (14.5)	18.2 (12.6, 23.7)	61.6 (52.8, 70.5)	6.5 (1.7, 11.3)	13.7 (7.5, 20.0)	
Hispanic	450 (28.9)	8.0 (5.9, 10.1)	60.3 (53.4, 67.1)	7.9 (3.7, 12.1)	23.8 (17.9, 29.7)	
Non-Hispanic White	1243 (23.5)	19.1 (16.8, 21.3)	44.8 (40.3, 49.3)	4.0 (1.9, 6.2)	32.1 (28.0, 36.2)	
Other non-Hispanic	98 (4.3)	5.4 (1.8, 8.9)	27.5 (15.5, 39.4)	5.5 (0.0, 11.0)	61.7 (48.8, 74.6)	
Multiple	153 (5.6)	8.9 (3.9, 13.8)	40.1 (29.3, 50.8)	9.4 (0.8, 18.0)	41.7 (31.2, 52.2)	
Child up-to-date with routine vaccines						
Yes	2254 (90.0)	12.8 (11.3, 14.2)	51.6 (48.1, 55.1)	7.6 (5.6, 9.6)	28.0 (24.9, 31.0)*	1 (Ref)
No	190 (8.0)	2.9 (1.0, 4.7)	48.0 (37.2, 58.9)	9.1 (1.3, 16.8)	40.0 (29.2, 50.8)	1.18 (0.91, 1.54)
Not sure[d]	62 (2.0)					
Child influenza vaccine status						
Received	1255 (44.0)	20.7 (17.9, 23.4)	55.3 (50.4, 60.3)	6.2 (3.3, 9.1)	17.8 (13.7, 22.0)**	1 (Ref)
Will get	685 (28.6)	8.4 (6.4, 10.5)	70.3 (65.0, 75.5)	5.5 (2.4, 8.6)	15.8 (11.7, 19.9)	0.87 (0.66, 1.16)
Will not get	465 (22.3)	1.6 (0.7, 2.6)	22.0 (15.7, 28.3)	8.2 (4.3, 12.1)	68.2 (61.5, 74.8)	2.09 (1.67, 2.62)
Not sure	101 (5.1)	0.8 (0.1, 1.6)	33.2 (19.6, 46.8)	35.6 (22.2, 49.0)	30.4 (18.9, 41.8)	2.16 (1.62, 2.88)
Parent characteristics						
Age, y						
18–29	230 (13.1)	10.3 (6.7, 13.9)	48.6 (38.9, 58.2)	7.1 (2.3, 11.8)	34.0 (24.4, 43.7)	1.19 (0.91, 1.57)
30–39	1155 (42.3)	12.7 (10.6, 14.7)	54.5 (49.6, 59.5)	7.2 (4.1, 10.3)	25.6 (21.5, 29.7)	1 (Ref)
≥ 40	1121 (44.6)	11.6 (9.7, 13.6)	48.4 (43.4, 53.4)	9.0 (6.0, 11.9)	31.0 (26.7, 35.4)	1.07 (0.89, 1.29)
Gender						
Male	1204 (36.1)	18.6 (15.9, 21.3)	48.1 (42.9, 53.3)	6.4 (3.2, 9.5)	26.9 (22.3, 31.6)**	1 (Ref)
Female	1252 (61.6)	8.4 (6.9, 9.8)	53.3 (49.0, 57.6)	9.1 (6.5, 11.7)	29.2 (25.5, 33.0)	1.08 (0.89, 1.30)
Transgender/other[d]	50 (2.3)					
Race/ethnicity[f]						
Non-Hispanic Black	361 (22.8)	7.2 (5.0, 9.4)	47.0 (39.7, 54.3)	12.9 (7.9, 17.9)	32.9 (26.1, 39.7)**	1.41 (1.17, 1.72)
Asian	204 (15.3)	17.6 (12.3, 22.9)	58.7 (49.7, 67.6)	5.0 (0.9, 9.0)	18.7 (11.5, 26.0)	0.97 (0.69, 1.35)
Hispanic	462 (29.6)	8.3 (6.2, 105)	60.8 (54.1, 67.5)	8.3 (4.1, 12.5)	22.6 (16.9, 28.2)	0.96 (0.76, 1.21)

Continued

TABLE 1— Continued

Characteristic	No. (%)[a]	Child Already Vaccinated, % (95% CI)[b]	Parent Very Likely or Somewhat Likely to Vaccinate Child, % (95% CI)[b]	Parent Not Sure Whether to Vaccinate Child, % (95% CI)[b]	Parent Not Very Likely or Not at All Likely to Vaccinate Child, % (95% CI)[b]	APR for Vaccine Hesitancy[c] (95% CI)
Non-Hispanic White	1317 (26.3)	18.1 (16.0, 20.2)	43.9 (39.5, 48.3)	5.8 (3.1, 8.5)	32.2 (28.2, 36.4)	1 (Ref)
Other non-Hispanic	102 (3.7)	5.3 (1.7, 8.8)	26.9 (14.9, 38.9)	6.4 (0.0, 12.8)	61.4 (48.4, 74.5)	1.03 (0.84, 1.27)
Multiple[d]	60 (2.3)					
Education (highest completed)						
High school or less	353 (39.2)	9.4 (6.8, 12.0)	51.5 (44.7, 58.3)	10.6 (6.4, 14.8)	28.5 (22.6, 35.0)**	1.06 (0.87, 1.29)
Some college or tech school	387 (20.7)	5.2 (3.6, 6.8)	50.9 (44.4, 57.4)	8.1 (4.7, 11.6)	35.8 (29.7, 41.8)	1.22 (1.02, 1.44)
Completed college or more	1734 (38.6)	18.5 (16.6, 20.4)	50.2 (46.6, 53.8)	5.0 (3.1, 6.8)	26.3 (23.2, 29.5)	1 (Ref)
Missing[d]	32 (1.5)					
Household income, US$						
< 50 000	527 (40.1)	7.2 (5.4, 9.1)	56.2 (50.1, 62.3)	11.5 (7.5, 15.5)	25.1 (19.9, 30.2)**	0.85 (0.68, 1.06)
50 000–99 999	558 (21.5)	11.6 (8.8, 14.5)	54.8 (48.7, 60.8)	7.2 (3.4, 10.9)	26.4 (21.1, 31.5)	0.84 (0.68, 1.02)
≥ 100 000	1256 (28.3)	20.0 (17.5, 22.5)	42.8 (38.3, 47.3)	2.8 (1.2, 4.4)	34.4 (29.7, 39.0)	1 (Ref)
Not sure/missing	165 (10.1)	8.1 (3.9, 12.3)	45.7 (34.3, 57.1)	9.9 (3.8, 16.0)	36.3 (26.2, 46.3)	0.85 (0.64, 1.11)
Parent COVID-19 vaccination status						
Vaccinated	1899 (84.5)	13.5 (12.0, 15.1)	58.3 (54.7, 61.9)	7.3 (5.1, 9.4)	20.9 (17.9, 24.0)**	1 (Ref)
Not vaccinated	518 (11.6)	2.2 (1.4, 3.1)	11.6 (7.9, 15.2)	9.7 (5.3, 14.1)	76.5 (71.0, 82.0)	1.53 (1.32, 1.77)
Prefer not to answer[d]	89 (3.9)					
Parent concerned child will become sick from COVID-19						
Very or somewhat worried	1578 (63.6)	13.4 (11.7, 15.1)	60.4 (56.4, 64.4)	7.8 (5.4, 10.2)	18.4 (15.0, 21.8)**	1 (Ref)
A little or not at all worried	905 (34.9)	9.3 (7.2, 11.4)	34.9 (29.5, 40.3)	6.8 (4.1, 9.5)	49.0 (43.7, 54.2)	1.13 (0.91, 1.42)
Not sure[d]	23 (1.5)					
Parent concerned child will infect others family members						
Very or somewhat worried	1586 (64.1)	13.8 (12.0, 15.6)	61.7 (57.8, 65.7)	7.8 (5.4, 10.1)	16.7 (13.5, 19.9)**	1 (Ref)
A little or not at all worried	898 (34.2)	8.5 (6.6, 10.4)	31.1 (25.6, 36.6)	6.9 (4.1, 9.7)	53.5 (48.1, 58.9)	1.50 (1.18, 1.91)
Not sure[d]	35 (1.7)					
Vote in 2021 mayoral election						
Did not vote	786 (51.7)	7.6 (5.8, 9.3)	51.4 (46.4, 56.4)	10.3 (7.1, 13.6)	30.7 (26.2, 35.1)**	1.41 (1.13, 1.76)
Eric Adams (Democrat)	1112 (32.1)	19.9 (17.2, 22.6)	55.8 (50.9, 60.7)	6.4 (3.6, 9.2)	17.9 (13.8, 22.0)	1 (Ref)
Curtis Sliwa (Republican)	397 (14.0)	9.4 (6.6, 12.3)	39.0 (29.2, 48.7)	1.8 (0.1, 3.4)	49.8 (40.9, 58.7)	1.27 (1.03, 1.57)
Other	211 (2.2)	12.8 (8.4, 17.2)	50.2 (39.1, 61.4)	12.6 (4.6, 20.4)	24.4 (15.9, 32.9)	1.29 (0.96, 1.72)
NYC borough						
Bronx	396 (21.0)	6.8 (4.6, 8.9)	56.7 (49.3, 64.1)	8.1 (4.1, 12.1)	28.4 (21.7, 35.2)**	1.07 (0.78, 1.47)
Brooklyn	743 (33.5)	10.8 (8.7, 12.9)	49.3 (43.7, 54.8)	8.6 (5.1, 12.2)	31.3 (26.3, 36.2)	1.09 (0.82, 1.46)

Continued

TABLE 1— Continued

Characteristic	No. (%)[a]	Child Already Vaccinated, % (95% CI)[b]	Parent Very Likely or Somewhat Likely to Vaccinate Child, % (95% CI)[b]	Parent Not Sure Whether to Vaccinate Child, % (95% CI)[b]	Parent Not Very Likely or Not at All Likely to Vaccinate Child, % (95% CI)[b]	APR for Vaccine Hesitancy[c] (95% CI)
Manhattan	671 (13.5)	28.4 (23.1, 33.7)	45.1 (37.5, 52.7)	5.8 (2.1, 9.6)	20.7 (12.8, 28.6)	1 (Ref)
Queens	482 (26.1)	10.2 (7.5, 12.9)	56.5 (49.6, 63.5)	7.7 (3.4, 11.9)	25.6 (19.9, 31.3)	1.01 (0.74, 1.38)
Staten Island	214 (5.9)	5.9 (3.1, 8.7)	30.4 (20.9, 39.8)	9.8 (2.5, 17.1)	53.9 (43.8, 64.0)	1.44 (1.05, 1.98)

Note. APR = adjusted prevalence ratio; CI = confidence interval.

[a] Survey weights applied to sample to represent NYC population of parents by race, ethnicity, education, and borough.
[b] Weighted percentages are prevalence estimates of NYC parents reporting vaccination plans for their youngest child aged 5 to 11 years.
[c] Adjusted models compare parents who were unsure, not very likely, and not at all likely to vaccinate children with parents of vaccinated children and parents very or somewhat likely to vaccinate children; models include all variables shown in the table except child race/ethnicity (see footnote e).
[d] Categories are not presented in the table as they yielded unreliable standard error estimates.
[e] Child's race/ethnicity excluded from adjusted models because of collinearity with parent's race/ethnicity.
[f] Survey respondents could indicate 1 option for race/ethnicity from the following options: African American or Black, Asian, Hispanic or Latino/a, Caucasian/White, multiple, and other.
**P* < .05; ***P* < .001.

vaccines for children aged 5 to 11 years, almost 40% were vaccine hesitant. This is consistent with a March 2021 survey of NYC parents[8] and suggests that many parents may not vaccinate their children. Also consistent with previous studies, the main reasons for vaccine hesitancy included safety and effectiveness.[8,9] These findings are concerning; however, our data provide information that can inform efforts to increase vaccine acceptability.

Similar to previous studies, non-Hispanic Black parents expressed more vaccine hesitancy compared with non-Hispanic White parents.[8] Racial disparities in vaccine hesitancy are driven by multiple factors—including mistrust and misinformation as well as structural racism—that may require interventions that not only target individuals but also reduce structural barriers.[10] More than half of vaccine-hesitant parents do not believe children need COVID-19 vaccination, suggesting that greater awareness is needed about the risk of COVID-19 infection in children and their role in transmission. Finally, we observed that poor uptake of routine pediatric vaccinations was not associated with COVID-19 vaccine hesitancy, likely because of school-based vaccine mandates[11]; however, lack of flu vaccination in children was. Previous studies have shown higher parental hesitancy for flu compared with routine vaccines.[12] Our data provide evidence of this effect with regard to COVID-19, underscoring the importance of vaccine mandates and suggesting that uptake of COVID-19 vaccines will likely be lower in children than mandated immunizations.

Limitations of our study include combined race/ethnicity—which may mask heterogeneity within groups—and lack of information about the specific vaccine-related safety concerns of parents.

PUBLIC HEALTH IMPLICATIONS

In a survey conducted after emergency use authorization of COVID-19 vaccines for children aged 5 to 11 years, we found that many parents were vaccine hesitant. Greater efforts are needed to increase parental awareness about the safety and efficacy of COVID-19 vaccination to foster vaccine confidence, acceptance, and uptake. AJPH

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CONTRIBUTORS

C. A. Teasdale helped design the study and develop the survey instrument, and conducted the analyses and drafted the initial manuscript. S. Ratzan and A. El-Mohandes designed the study, including the sampling strategy, and oversaw development of the survey instrument, reviewed data, and drafted, reviewed, and revised the manuscript. S. Kimball assisted in the design of the sampling strategy, oversaw data procurement and cleaning, and reviewed the manuscript. H. S. Lanthan and L. Rauh contributed to the design of the data collection instrument and to data procurement, reviewed findings, developed figures, and revised manuscript drafts. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

HUMAN PARTICIPANT PROTECTION

The CUNY School of Public Health and Health Policy institutional review board approved the protocol.

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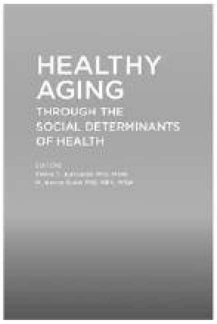

Erratum In: “Deconstructing ‘Normal’ for a More Equitable Post–COVID-19 World”

In: Park SY, van Doren TP, Frederick J, Butler SA, Chen ZJ, Carroll L. Deconstructing “Normal” for a More Equitable Post–COVID-19 World. *American Journal of Public Health* 2022;112(4):533-533. https://doi.org/10.2105/AJPH.2022.306743

Two author degrees were incorrect in the online version of the article. Lorne Carroll’s degree was missing and Zhangying Jennie Chen’s degree was incorrectly listed as BSN. The byline should read:

Susanna Y Park, MA, Taylor P. van Doren, MA, Jynx Frederick, BSPH, Sabrina Azemar Butler, MS, Zhangying Jennie Chen, BS, and Lorne Carroll, BSN

This change does not affect the paper’s conclusions.

https://doi.org/10.2105/AJPH.2022.306743e AJPH

Erratum In: “Understanding Racial Inequities in the Implementation of Harm Reduction Initiatives”

In: Lopez AM, Thomann M, Dhatt Z, et al. Understanding racial inequities in the implementation of harm reduction initiatives. *Am J Public Health*. 2022;112(S2):S173–S181.

An author’s name was incorrectly listed. On page S173, the author byline should read:

Andrea M. Lopez, PhD, Matthew Thomann, PhD, Zena Dhatt, BS, Julieta Ferrera, MAA, Marwa Al-Nassir, MPH, Maggie Ambrose, BA, and Shane Sullivan, BA.

On page S180, the About the Authors section should read:

ABOUT THE AUTHORS

Andrea M. Lopez, Matthew Thomann, Zena Dhatt, Julieta Ferrera, and Shane Sullivan are with the Department of Anthropology, University of Maryland, College Park. Marwa Al-Nassir and Maggie Ambrose are with the Center for Substance Abuse Research, University of Maryland.

This addition does not affect the paper’s conclusions.

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