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American Journal of
**PUBLIC
HEALTH**

A PUBLICATION OF
AMERICAN PUBLIC HEALTH ASSOCIATION

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AJPH

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COVER: Catholic Charities of New York, in partnership with the New York City Test and Trace Corps, host a testing and vaccination event outside of St. Theresa Church in the Pelham Bay section of The Bronx, NY, on February 6, 2022.

Cover concept and selection by Aleisha Kropf. Photo by Steve Sanchez/Sipa USA via AP Images. Printed with permission.



Promoting public health research, policy, practice, and education is the *AJPH* mission. As we widen our scope to embrace global issues, we also sharpen our focus to support the needs of public health practitioners. We invite contributions of original unpublished research, opinion and commentary, and letters to the editor.

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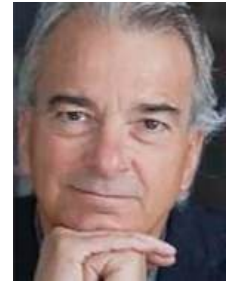
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Notes From the Field: A Repository of Best Practices



Last year we introduced the article format Notes From the Field (NFTF). NFTF articles are made to share the experiences that may improve the practice of public health. They are a popular article format. Between February 2021 and July 2022, we have published 47 of them in *AJPH* regular issues and 6 in two *AJPH* supplements. The initial NFTF article was published in February 2021. They describe successful experiences, usually at a local level, that can eventually be reproduced elsewhere. In supplements, they have the key role of illustrating meaningful field experiences related to a specific theme. With this purpose in mind, the format of NFTF ensures that the key information is provided.

In 1200 words, with an 80-word abstract, up to 12 references, and up to 2 table or figure elements, NFTF successively describe goals and objectives; how the intervention was implemented in practice; the geographic location, the years when the intervention was implemented, and the population subject to the intervention; and the motivation behind the intervention. Importantly, they provide evidence on whether the intervention worked or not and, if relevant, whether the implementation of the intervention can be expected to have adverse or other unintended consequences. The last step means that interventions that are still being programmed or in the implementation phase are not eligible as NFTF articles. Finally, NFTF state why the intervention is felt to be sustainable and the importance of the intervention for public health.

Of the 47 NFTF articles published in *AJPH* regular issues, 26 were related to responses to the COVID-19 pandemic. They dealt with topics such as contact tracing, vaccine administration, masking, and quarantines. NFTF

articles have attracted reports of public health actions in schools, in jails, and among hard-to-reach populations.

The institutional and geographic origins of the NFTF indicate that they are on the publication radar of many readers across the country. The sources of NFTF articles have primarily been universities but substantially have also featured local, city, or state health departments and the Centers for Disease Control and Prevention. Nonfederal sources have been in locations across the United States, such as Maryland, New York, California, Georgia, and Wisconsin. One NFTF article has come from Israel and 1 from Spain.

We try to process NFTF articles rapidly so that they can be quickly disseminated on social media. On average NFTF articles have been downloaded 392 times (overall 18 435 times). Among those that have generated more than 1000 downloads, there was a case-based seroprevalence survey of SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) antibodies in Arizona, Meatless Monday campaign in US adults, food environment in Washington State-run correctional facilities, contact tracing in Latinx communities, COVID-19 data publication in New York City, and COVID-19 vaccine outreach in Wisconsin.

The success of the NFTF suggests that the format responds to a need. We hope that public health departments and grassroots and frontline organizations will use this space to share their experiences with *AJPH* readers. *AJPH*

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AJPH Editor-in-Chief
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11 Years Ago

Screening for Tuberculosis at an Adult Education Center: Results of a Community-Based Participatory Process

We used a community-based participatory research (CBPR) approach to plan and implement free TB skin testing at an adult education center to determine the efficacy of CBPR with voluntary tuberculosis (TB) screening and the prevalence of TB infection among immigrant and refugee populations. We formed a CBPR partnership to address TB screening at an adult education center that serves a large immigrant and refugee population in Rochester, Minnesota. . . . A total of 259 adult learners volunteered to be skin-tested in April 2009; 48 (18.5%) had positive TB skin tests. . . . Our results imply that TB skin testing at adult education centers that serve large foreign-born populations may be effective. Our findings also show that a participatory process may enhance the willingness of foreign-born persons to participate in TB skin-testing efforts.

From *AJPH*, July 2011, p. 1264

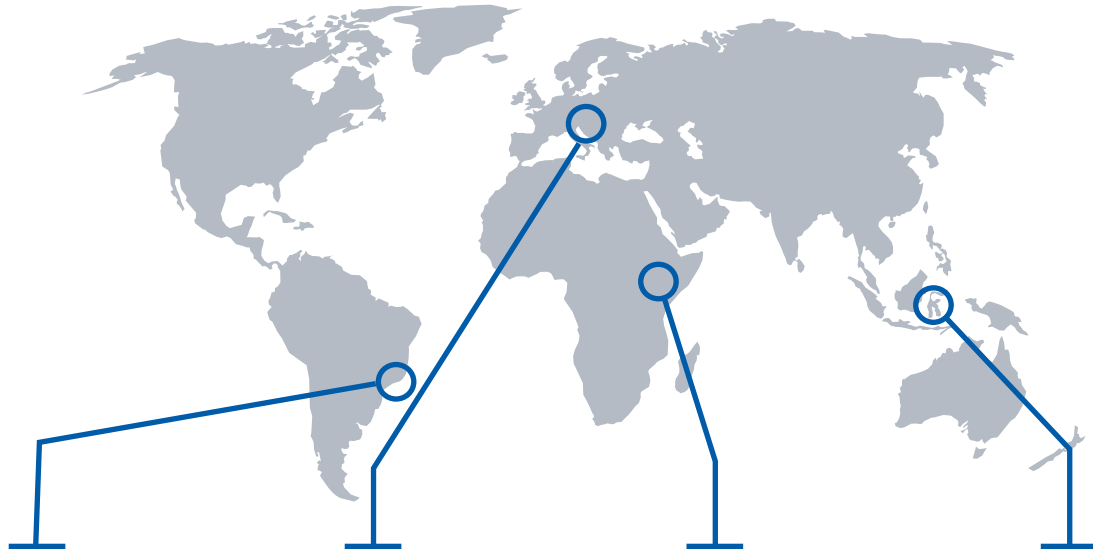
80 Years Ago

Relationship of Mental Hygiene to a Local Health Department Program

The immediate purpose of this project was a quantitative study of mental illness and maladjustment in a rural community, with the ultimate objective of devising and demonstrating methods for the inclusion of mental health procedures in the programs of existing public health agencies. . . . The experience gained in the one county used as a proving ground should determine largely the procedures to be followed in extending mental health services to other counties of the state. . . . On the whole, the results obtained with the clinic have been gratifying. It provides the county with facilities for prevention and treatment which, in our opinion, are at least the equal of those afforded by established services functioning in rural areas elsewhere. Moreover, the community is learning to take advantage of the services offered.

From *AJPH*, September 1942, pp. 1005–1011, *passim*

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Ecological and Environmental Factors in a Yellow Fever Outbreak

State of Rio de Janeiro, Brazil

Abreu et al. investigated geographical, ecological, and entomological factors contributing to a 2017–2019 outbreak of sylvatic yellow fever virus in a coastal region of Brazil previously considered free of sylvatic yellow fever virus. Yellow fever has a high mortality rate and, despite the availability of a safe and effective vaccine, there continue to be outbreaks in the Americas and Africa. The virus transmission cycle involved nonhuman primates, mosquitoes, and humans. The authors assigned functional traits related to behavior, physiology, habitats, and epidemiological importance to 89 mosquito species from 84 sampling points. Assessed spatial environmental characteristics included altitude, land use, forest fragment size, and vegetation cover. Abundance of *Haemagogus* mosquitoes, combined with lower species richness and diversity, increased infection risk. Infections were most common in large, continuous forests and in small forest fragments. This work may help predict future outbreaks and inform targeted vaccination and prevention measures.

Citation. Abreu FVS, de Andreazzi CS, Neves MSAS, et al. Ecological and environmental factors affecting transmission of sylvatic yellow fever in the 2017–2019 outbreak in the Atlantic Forest, Brazil. *Parasit Vectors.* 2022;15(1):23. <https://doi.org/10.1186/s13071-021-05143-0>

Alcohol and Tobacco Use During COVID-19

Slovenia

An increase in substance (e.g., alcohol and tobacco) use can occur in times of heightened stress as a maladaptive coping strategy to manage psychological distress. Krnel et al. explored alcohol and tobacco consumption changes during the COVID-19 pandemic among Slovenian adults. Data were from the European Alcohol Use and COVID-19 Survey (May–June 2020; n = 495). Most people reported no change in their drinking patterns, but approximately 24% increased their drinking frequency; those with financial distress were 4 times more likely to increase their drinking frequency. Few people (n = 119) used tobacco, and of those who did, nearly 50% had increased tobacco use in the past month.

Citation. Krnel SR, Kilian C, Keršmanc MH, Roškar M, Koprivnikar H. Changes in the use of alcohol and tobacco in Slovenia during the first wave of the SARS-COV-2 pandemic. *Zdr Varst.* 2021;61(1):6–13. <https://doi.org/10.2478/sjph-2022-0003>

Perceived Effects of the COVID-19 Pandemic on Female Genital Mutilation and Child and Other Forced Marriages

Kenya, Uganda, Ethiopia, Senegal

Between October and December 2020, Esho et al. conducted household surveys and 38 key informant interviews with program implementers and policymakers to determine the perceived effect of the COVID-19 pandemic on female genital mutilation and cutting and child and other forced marriages in Kenya (n = 312), Uganda (n = 278), Ethiopia (n = 251), and Senegal (n = 208). The pandemic was perceived to increase the occurrence of female genital mutilation and cutting and child and other forced marriages in Kenya and Uganda, but not in Senegal and Ethiopia. The reason for this may be that the pandemic reduced the interventions of the justice system, health care system, and civil societies. Esho et al. call for innovative approaches to reduce the prevalence of female genital mutilation and cutting and child and other forced marriages during the pandemic, such as using call centers, radio talk shows, and local influencers to communicate the risk associated with such practices, even in times of pandemic.

Citation. Esho T, Matanda DJ, Abuya T, et al. The perceived effects of COVID-19 pandemic on female genital mutilation/cutting and child or forced marriages in Kenya, Uganda, Ethiopia and Senegal. *BMC Public Health.* 2022;22(1):601. <https://doi.org/10.1186/s12889-022-13043-w>

Midwives Helping Deliver Reproductive Care in Developing Countries

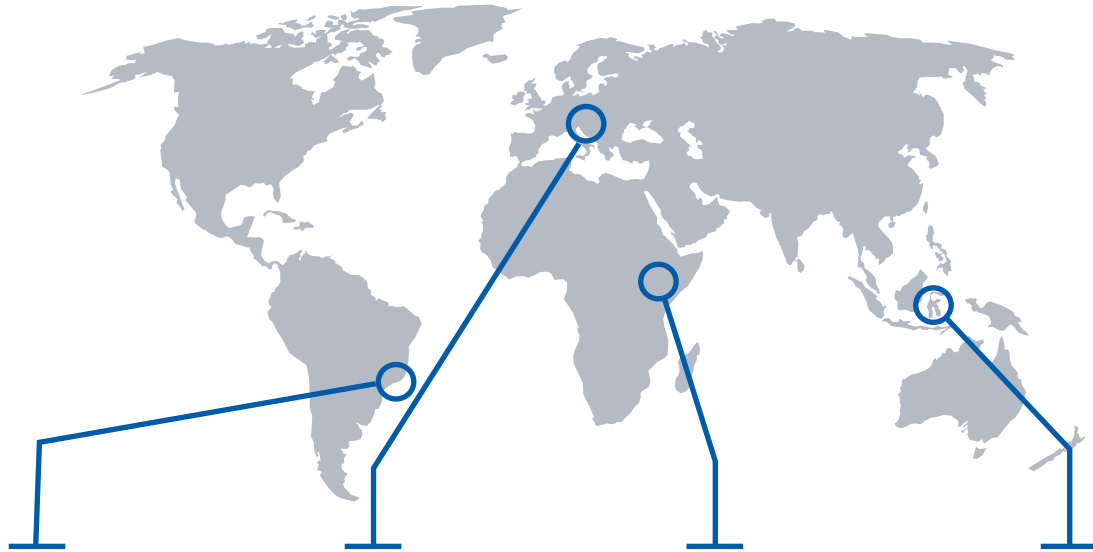
Indonesia

Improving maternal and child health is an important public health goal, and in developing countries with strained health care systems midwives can help deliver family planning services. Lai et al. analyzed data from 17 216 current users of modern contraceptive methods from 8 waves of the Indonesia Demographic and Health Survey. They found that midwives in Indonesia delivered contraceptives to 53% of modern method contraceptive users. Predictors of obtaining contraceptive methods from midwives were age, parity, urban versus rural location, region, education, wealth, exposure to family planning, and method type. Midwives could help reduce doctors' workload in developing countries and ensure equitable access to family planning services.

Citation. Lai SL, Tey NP. Midwives as drivers of contraceptive uptake: evidence from Indonesia demographic and health surveys. *Asia Pac J Public Health.* 2022;34(2–3):213–220. <https://doi.org/10.1177/10105395211058810>

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

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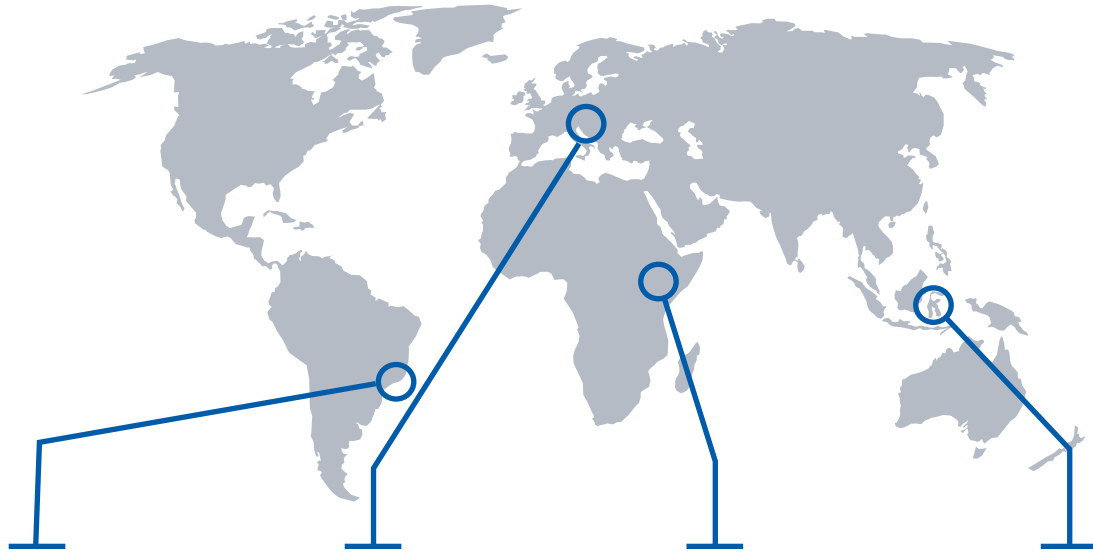
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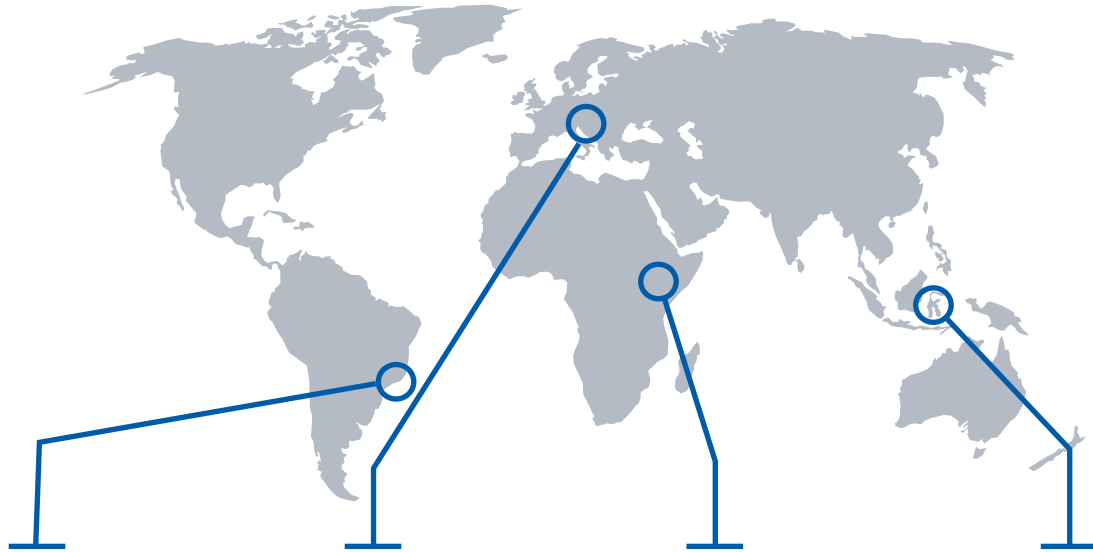
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State of Rio de Janeiro, Brazil

Abreu et al. investigated geographical, ecological, and entomological factors contributing to a 2017–2019 outbreak of sylvatic yellow fever virus in a coastal region of Brazil previously considered free of sylvatic yellow fever virus. Yellow fever has a high mortality rate and, despite the availability of a safe and effective vaccine, there continue to be outbreaks in the Americas and Africa. The virus transmission cycle involved nonhuman primates, mosquitoes, and humans. The authors assigned functional traits related to behavior, physiology, habitats, and epidemiological importance to 89 mosquito species from 84 sampling points. Assessed spatial environmental characteristics included altitude, land use, forest fragment size, and vegetation cover. Abundance of *Haemagogus* mosquitoes, combined with lower species richness and diversity, increased infection risk. Infections were most common in large, continuous forests and in small forest fragments. This work may help predict future outbreaks and inform targeted vaccination and prevention measures.

Citation. Abreu FVS, de Andreazzi CS, Neves MSAS, et al. Ecological and environmental factors affecting transmission of sylvatic yellow fever in the 2017–2019 outbreak in the Atlantic Forest, Brazil. *Parasit Vectors.* 2022;15(1):23. <https://doi.org/10.1186/s13071-021-05143-0>

Alcohol and Tobacco Use During COVID-19

Slovenia

An increase in substance (e.g., alcohol and tobacco) use can occur in times of heightened stress as a maladaptive coping strategy to manage psychological distress. Krnel et al. explored alcohol and tobacco consumption changes during the COVID-19 pandemic among Slovenian adults. Data were from the European Alcohol Use and COVID-19 Survey (May–June 2020; n = 495). Most people reported no change in their drinking patterns, but approximately 24% increased their drinking frequency; those with financial distress were 4 times more likely to increase their drinking frequency. Few people (n = 119) used tobacco, and of those who did, nearly 50% had increased tobacco use in the past month.

Citation. Krnel SR, Kilian C, Keršmanc MH, Roškar M, Koprivnikar H. Changes in the use of alcohol and tobacco in Slovenia during the first wave of the SARS-COV-2 pandemic. *Zdr Varst.* 2021;61(1):6–13. <https://doi.org/10.2478/sjph-2022-0003>

Perceived Effects of the COVID-19 Pandemic on Female Genital Mutilation and Child and Other Forced Marriages

Kenya, Uganda, Ethiopia, Senegal

Between October and December 2020, Esho et al. conducted household surveys and 38 key informant interviews with program implementers and policymakers to determine the perceived effect of the COVID-19 pandemic on female genital mutilation and cutting and child and other forced marriages in Kenya (n = 312), Uganda (n = 278), Ethiopia (n = 251), and Senegal (n = 208). The pandemic was perceived to increase the occurrence of female genital mutilation and cutting and child and other forced marriages in Kenya and Uganda, but not in Senegal and Ethiopia. The reason for this may be that the pandemic reduced the interventions of the justice system, health care system, and civil societies. Esho et al. call for innovative approaches to reduce the prevalence of female genital mutilation and cutting and child and other forced marriages during the pandemic, such as using call centers, radio talk shows, and local influencers to communicate the risk associated with such practices, even in times of pandemic.

Citation. Esho T, Matanda DJ, Abuya T, et al. The perceived effects of COVID-19 pandemic on female genital mutilation/cutting and child or forced marriages in Kenya, Uganda, Ethiopia and Senegal. *BMC Public Health.* 2022;22(1):601. <https://doi.org/10.1186/s12889-022-13043-w>

Midwives Helping Deliver Reproductive Care in Developing Countries

Indonesia

Improving maternal and child health is an important public health goal, and in developing countries with strained health care systems midwives can help deliver family planning services. Lai et al. analyzed data from 17 216 current users of modern contraceptive methods from 8 waves of the Indonesia Demographic and Health Survey. They found that midwives in Indonesia delivered contraceptives to 53% of modern method contraceptive users. Predictors of obtaining contraceptive methods from midwives were age, parity, urban versus rural location, region, education, wealth, exposure to family planning, and method type. Midwives could help reduce doctors' workload in developing countries and ensure equitable access to family planning services.

Citation. Lai SL, Tey NP. Midwives as drivers of contraceptive uptake: evidence from Indonesia demographic and health surveys. *Asia Pac J Public Health.* 2022;34(2–3):213–220. <https://doi.org/10.1177/10105395211058810>

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

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“Tell Me, Who's That They're Letting Down?": COVID-19 and the Working Class

Devan Hawkins, ScD

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 See also Heinzerling et al., p. 1180.

During the early weeks of the second wave of the 1918 influenza pandemic, the *Courier-Citizen* described the effects the pandemic had on the city of Lowell, Massachusetts, the birthplace of the US Industrial Revolution and home to a diverse and often class-conscious population of immigrant workers:

Industry during the three weeks of the epidemic was badly hurt. Our munitions plants caught the tendency early in the epidemic . . . they were unable to keep anywhere near a full working crew on the job. In the cotton mills the same situation had to be contended with.^{1(p1)}

Another article described the work of Lowell nurses during the pandemic. For one nurse—Mrs. Chase—in addition to caring for sick patients, this work also involved making “daily rounds with her car delivering nourishment to the required family from the public kitchens.”^{2(p5)} As the paper noted, there was an “urgent need of every hand that can be procured to assist the labors of these sadly overworked women.”^{2(p5)}

Both in terms of facing the disease's health consequences and fighting

those consequences, working people were on the front lines of the 1918 influenza pandemic.

COVID-19 OUTBREAKS AMONG WORKERS

As highlighted by Heinzerling et al. in this issue of *AJPH* (p. 1180), more than a century later, this situation has not changed. In their article, they record nearly 20 000 reported workplace outbreaks of COVID-19 in the state of California between January 2020 and August 2021. These outbreaks resulted in more than 300 000 cases of the disease. As the authors acknowledge, these numbers are likely underestimates of the true extent of the problem. Reporting outbreaks was only required for non-health care facilities starting in January 2021. Before that period, rules for reporting were determined by local jurisdictions. In addition, even with reporting requirements, many workplaces will likely be noncompliant, resulting in underreporting, a frequent problem in occupational health surveillance. Furthermore, these data predate the Omicron wave, which brought the highest case counts of the

pandemic. Finally, these cases only represent the workers who were infected. In many cases, these workers likely exposed household members.

The article provides indispensable information about industries most impacted by these outbreaks. Nearly half of all reported outbreaks occurred within the health care and social assistance industry. However, even within the health care and social assistance industry sector, the risk of outbreak varied substantially. Remarkably, skilled nursing facilities experienced more than one outbreak per establishment on average. Residential care facilities and community food and housing, emergency services, and hospitals also had very high numbers of outbreaks per establishment.

The risk of outbreaks was, of course, not contained solely within the health care and social assistance industry. There was also a higher number of outbreaks among workers in the food, education, retail (especially grocery stores), and construction industries. All of these industries contain workers performing the essential services that society relies on.

As the authors also highlight, the burden of these outbreaks did not fall on all workers equally. As previous research has shown,³ many essential industries disproportionately employ workers of color. In the Heinzerling et al. study, this fact is reflected in Latino workers comprising a disproportionate share of cases in a number of high-risk industries. In the absence of denominator data about the number of workers in these industries by race/ethnicity, these data should be interpreted with care. However, even with race/ethnicity data missing in many instances, of the 21 industry sectors analyzed, Latino workers comprised more than 50% of

outbreak-associated cases in six of these industries, despite comprising less than 40% of the California population. The authors point to the manufacturing, retail, accommodation and food services, and transportation and warehousing industries as having both a high number of outbreaks and a high percentage of Latino workers. Other research in California has highlighted how, even when the distribution of workers by occupation is taken into account, workers of color still had elevated rates of excess mortality during the pandemic compared with White workers in the same occupations.⁴

WHAT WE KNOW ABOUT COVID-19 AND WORK

The article by Heinzerling et al. is a comprehensive and timely addition to the literature about both the impact that the COVID-19 pandemic has had on workers and the role that workplace transmission has played in the spread of the virus. This literature has revealed how early cases of COVID-19 were frequently tied to workplace exposure,⁵ how workers in high-risk industries and occupations bore a disproportionate share of the burden of COVID-19,^{4,6} how this burden contributed to racial/ethnic disparities in COVID-19,³ and how the mental strain of the pandemic on workers, especially those in health care, is having further negative health consequences.⁷

In the early days of the pandemic, there was often lack of recognition about the role of workplace exposure as an important contributor to the spread of COVID-19. This lack of recognition was seen most acutely in the initial reluctance to focus on the role of airborne transmissions of the virus. Through much of 2020, workplaces

focused on individual behavioral changes like handwashing at the cost of systematic solutions that would have been more effective like improved ventilation. The evidence is now clear that there is widespread workplace transmission of COVID-19 and that this transmission contributes to community risks for the disease. Now the question is what to do with that evidence. The fact is that the COVID-19 pandemic was not a health crisis that created worker vulnerability but rather that this vulnerability has been growing for decades, and the stress of the pandemic revealed the true extent of the problem.

THE CHANGING NATURE OF WORK AND COVID-19

Many workers, including those most affected by the present pandemic, have been increasingly marginalized, and their jobs have become less secure.⁸ The rise of the “gig economy” and other forms of insecure employment has meant that many workers no longer have the same guarantees of employment that they did in the past. In the context of COVID-19, this insecurity can mean that workers feel compelled to work even when they may be sick or may want to avoid exposure to protect themselves or household members. At the same time, compensation to workers has stagnated, even in those industries that we now recognize—even though they always have been—as essential.⁹ The decline in unions has meant that fewer workers are part of these valuable organization that once allowed negotiations for more secure and well-compensated employment.¹⁰ Such unions could have compelled management to intervene to protect workers, like meat processing workers,

who suffered an extremely high risk of contracting COVID-19.

These changes in the workplace have benefited a small class of people who can profit from more malleable and cheaper employment. These same people have often seen their profits grow rapidly during the COVID-19 pandemic.¹¹ Even in the health care industry, much of which is nonprofit and should theoretically be more immune from the compulsion to squeeze workers for all they are worth, we still see an increasingly marginalized and vulnerable workforce.¹²

WHAT CAN BE DONE

There are many actions that can be taken to protect workers—from new labor protection standards and more enforcement of existing standards to engineering controls in the workplace, like better ventilation. Unfortunately, even a supremely sensible step to protect workers and the public, like paid sick leave, which was briefly implemented during the pandemic, has been rolled back. Not having paid sick leave—in addition to other leave policies provided by almost all other countries, like parental leave—available for everyone forces workers to choose between protecting themselves and caring for their family and losing their livelihood.

At the same time, there is a need for integrating occupational information into public health surveillance systems. Work plays a fundamental role as determinant of innumerable health outcomes in addition to COVID-19. Having, at the very least, data about industry and occupation in all health surveillance systems will make it possible for more studies like the one by Heinzerling et al. so that we can better

understand how workers can be protected.

We are seeing workers beginning to solve these problems on their own terms. Workers at workplaces where there have been many health and safety concerns even before the COVID-19 pandemic, like Amazon Warehouse, have seen increasing pushes for unionization. The successful unionization of a Staten Island warehouse shows that these efforts can be successful. However, one wonders, if a global pandemic that killed thousands of vulnerable workers is not enough to encourage the government to fully protect working people—what will be? **AJPH**

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Conducting Health Research with Native American Communities

Edited by Teshia G. Arambula Solomon, PhD and Leslie L. Randall, RN, MPH, BSN



The current research and evaluation of the American Indian and Alaska Native (AIAN) people demonstrates the increased demand for efficiency, accompanied by solid accountability in a time of

extremely limited resources. This environment requires proficiency in working with these vulnerable populations in diverse cross-cultural settings. This timely publication is the first of its kind to provide this information to help researchers meet their demands.

This book provides an overview of complex themes as well as a synopsis of essential concepts or techniques in working with Native American tribes and Alaska Native communities. *Conducting Health Research with Native American Communities* will benefit Native people and organizations as well as researchers, students and practitioners.

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Challenging Health Inequities in Tuberculosis Elimination

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See also Stewart et al., p. 1170.

Tuberculosis (TB) in correctional settings remains an unaddressed health disparity in the United States.¹ Although inmates historically contribute only three to five percent of all TB cases reported in the United States, TB incidence in correctional settings is up to 10 times higher than in the general US population.^{2,3} The contribution of incarceration to the perpetuation of structural racism and health disparities has been well described.⁴ “Structural racism” refers to the cumulative effect of racial injustice resulting from mutually reinforced discriminatory systems of housing, employment, education, media, health care, and criminal justice, among others.⁵ To confront structural racism in the prevention and control of TB, knowledge of the higher burden of TB in inmates is insufficient. It becomes a public health imperative to better understand the role of TB transmission within correctional settings to address existing health inequities.

In this issue of *AJPH*, Stewart et al. (p. 1170) provide the first national survey of TB outbreaks in US state prisons, made possible through national surveillance reports enhanced with genomic analysis of *Mycobacterium tuberculosis* isolates from inmates. Genomic analysis provides information on the number

of accumulated changes in the genetic code of *M. tuberculosis* isolates. An increase in genetic changes represents a decreasing likelihood that two reported cases of TB are linked through recent transmission.⁶ In the study, the authors reviewed both TB clusters (three or more TB cases that were likely attributable to recent transmission) and TB outbreaks (six or more TB cases likely attributable to recent transmission).

STRUCTURAL RACISM AND TUBERCULOSIS PREVENTION

The findings by Stewart et al. are both reassuring and troublesome. The positive finding was that between 2011 and 2019, TB outbreaks were rare in state prisons. Only five were identified in two states, Alabama and Texas. When reviewing for TB clusters, which could be viewed as a preoutbreak stage, two thirds of patients with TB in state prisons were likely unrelated, reflecting TB acquired elsewhere that then developed into detectable disease in prison. This is an affirmation that current TB screening policies and infection control practices are generally effective, at least in most state prisons. A troublesome finding was that one third of patients

with TB in state prisons were indeed clustered or, in other words, represented likely recent person-to-person transmission events in the prisons. Clustered cases in prisons reflect systemic failures in policy and practice to protect the health of a vulnerable population from an airborne communicable disease. The additional findings that clustered patients with TB were predominantly US-born persons and more likely to be non-Hispanic Black persons than nonclustered patients are sobering and support the assertion that TB transmission in correctional settings should still be viewed as a form of structural racism.⁷

The study by Stewart et al. improves our understanding of TB disparities in our correctional systems. Yet, many unanswered questions remain. Stewart et al. report on TB clusters and outbreaks in state prisons, which represent only a segment of the carceral system. In any given year, approximately 25% of patients with TB who were in a correctional facility were in state prisons at the time of diagnosis. The other 75% were in local jails, federal prisons, and a variety of other correctional institutions.² With respect to the two types of carceral facilities with the highest TB incidence—local jails and federal prisons^{1,3}—what data systems are in place to facilitate complete contact investigations after a diagnosed case? Partially because of the rapid turnover of persons in the local jails, complete contact tracing and preventive treatment follow-up have been exceedingly difficult to conduct. We lack reliable systematic data on contact investigation completion and follow-up outcomes at these types of facilities. Without complete contact investigation data to characterize linkages between previously incarcerated individuals who now are in the general community,

local transmission rates for incarcerated individuals cannot be determined accurately. A study in Atlanta, Georgia, indicated that 43% to 46% of US-born patients with TB had a history of being in jail or prison, including 16% in the year before diagnosis.⁸ It is very likely that the impact of our carceral system on TB inequities is grossly underestimated. We need improved data collection, data sharing, better integration across social and public health systems, and continued studies to fill these knowledge gaps.

TUBERCULOSIS ELIMINATION AND HEALTH EQUITY

In 1984, the director of the Centers for Disease Control and Prevention, Dr. James Mason, challenged the public health community to develop a plan to eliminate TB from the United States. The TB Elimination Strategy, first issued in 1989, aimed to decrease TB incident cases to less than one per 1 000 000 population.⁹ In the more than three decades since its inception, marked improvement in HIV diagnosis and treatment of coinfecting persons, new TB diagnostics and treatment options, as well as renewed vigor in federal funding and global support from the World Health Organization have contributed to significant strides in decreasing TB incidence in the United States. However, recent plateaus in progress indicate that we will not reach the TB elimination goal by 2035 or perhaps even in this century unless new interventions are devised.

The elusive goal of TB elimination has fueled the public health and scientific communities to rethink strategies once again for TB prevention work. TB has long been a disease of marginalized

communities, heavily tied to poverty and social and racial inequities such as those experienced by isolated immigrant communities, inmates in correctional settings, and people experiencing homelessness. Although new mathematical models are helping to redirect TB elimination efforts,^{10,11} the study by Stewart et al. is a critical reminder to continue to evaluate the impact of these efforts on all our structurally marginalized communities, lest the existing health disparities persist or widen. As TB becomes further concentrated into more vulnerable and harder-to-reach populations in the United States, those of us persevering in efforts toward TB elimination must not lose sight of the equally important national goal of achieving health equity. *AJPH*

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Telemedicine, Medication Abortion, and Access After *Roe v. Wade*

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🔗 See also Kapadia, p. 1107, and Seymour et al., p. 1202.

For a half-century, pregnant people in the United States have had the legal right to decide their pregnancies and reproductive health. The Supreme Court's ruling in *Dobbs v. Jackson Women's Health Organization* eliminated that right for millions of people in 26 states. Legislatures in 13 states have passed "trigger" laws that ban abortion if the *Roe v. Wade* decision is overturned, and 13 have bans that have become enforceable in the absence of *Roe*. In this environment, public health must continue to seek approaches to improve access to abortion services.

In this issue of *AJPH*, Seymour et al. (p. 1202) estimate how telemedicine could increase access to medication abortion. Medication abortion—a two-medication regimen of mifepristone and misoprostol—is a safe and effective method to end a pregnancy when used within 70 days' gestation.¹ First approved in the United States in 2000, medication abortions have increased in the intervening years, and in 2020, they constituted the majority (54%) of abortions.² This growth reflects increasing acceptance by patients and providers, changes in medicine driven by the COVID-19 pandemic, and the erosion of access caused by federal- and state-level restrictions.

FEDERAL RESTRICTIONS ON MEDICATION ABORTION

Delivery of mifepristone for the medical termination of uterine pregnancy is subject to a Risk Evaluation and Mitigation Strategy (REMS) established by the US Food and Drug Administration (FDA). The purpose of the REMS is to ensure that the benefits of mifepristone outweigh its risks through the imposition of these requirements: (1) clinician certification, (2) patient signature on an FDA-approved agreement form, and (3) a requirement that mifepristone is administered under the direct supervision of a certified medical provider (also called the "in-person dispensing requirement"). The American College of Obstetricians and Gynecologists opposes REMS for mifepristone, citing safety data from two decades of use, lack of benefit for patients, barriers they create for underserved and rural communities,³ and barriers for providers and clinics that decrease the number of clinicians providing this care.⁴ In December 2021, the FDA removed the in-person dispensing requirement and added a requirement for pharmacy certification. These modifications expand the reach of

telemedicine for medication abortion (TMAB) because they eliminate the need for patients to travel to participating clinics.

STATE RESTRICTIONS ON MEDICATION ABORTION

Currently, 34 states have bans or restrictions on the provision of medication abortion. Thirty-two limit its provision to physicians, ignoring evidence that physician assistants and advanced practice nurses can safely provide medication abortion. Nineteen states have in-person dispensing requirements that supplant the in-person dispensing requirement that the FDA removed in 2021. Two states have active partial bans based on gestational age, and three additional states have passed complete or partial bans on medication abortion that are blocked by court order. Furthermore, three states banned mailing abortion pills, and three other states have mail bans blocked by the courts. New restrictions are being considered every month; between January and May 2022, 16 states introduced bills to ban or restrict medication abortion, seven sought to ban it entirely, five sought to ban mailing pills, and eight sought to ban TMAB.

TELEMEDICINE FOR MEDICATION ABORTION

The combined effects of state-level bans and restrictions have resulted in a dramatic decrease in the number of abortion providers. In their study, Seymour et al. included 925 providers identified via the Advancing New Standards in Reproductive Health abortion provider database in 2018. Just two years later, the number of abortion-providing facilities in Advancing New

Standards in Reproductive Health had decreased dramatically, with approximately 750 facilities listed in 2020.

Seymour et al. examined TMAB access where patients presented to a participating clinic, consulted a remote physician, and received their medication. The hope is that expansion of access to TMAB could increase access for women in states with abortion restrictions, because the distance from an abortion provider is a leading barrier. For example, a study by Thompson et al.⁵ found a dose-response relationship between travel distance and abortion rate—women living 120 miles or more from a provider had abortion rates one fifth of those among women living within five miles of a provider. Furthermore, shorter travel distances are associated with significant reductions in times to appointments.⁶ Finally, data from a cohort study representing 85% of medication abortions performed between April and June 2020 indicated that a hybrid TMAB at-home model had a four-day shorter waiting time and an increased proportion of medication abortions provided at six weeks' gestation or earlier.⁷

In their study, Seymour et al. identified 1091 abortion providers and Planned Parenthood clinics in the United States, geocoded all facility locations, and calculated the proportion of women of reproductive age in every census tract who live within a 30-, 60-, or 90-minute drive to a participating clinic. In 2018, 65.3% of persons of reproductive age lived within 30 minutes of a clinic, 80.5% were within 60 minutes, and 88.9% were within 90 minutes.

Seymour et al. also examined the potential effect on abortion access of two policy changes. In the first, TMAB was expanded to 241 non-abortion-providing Planned Parenthood clinics in states without a TMAB ban. This policy change

would increase access with 68.3%, 82.6%, and 90.1% of women of reproductive age within a 30-, 60-, or 90-minute drive to a clinic, respectively. The second policy change evaluated was the removal of existing TMAB bans from 19 states. Abortion access was expanded to 70.9%, 84.7%, and 91.7% of women of reproductive age. Expansion of TMAB to all Planned Parenthood clinics in non-TMAB ban states would mean an additional 781 556 women of reproductive age would live within 90 minutes of a clinic. Elimination of existing state TMAB bans would result in 1.75 million more women living within 90 minutes of a TMAB provider.

TELEMEDICINE MEDICATION ABORTION AFTER ROE

As we face a post-*Roe* world, telemedicine and medication abortion are leading options for preserving and expanding access to abortion services. Yet, as we increase our focus on these services, we must be mindful of the “digital divide.” In the United States, the populations with the greatest barriers to abortion access are disproportionately impacted by barriers to telemedicine. More specifically, vulnerable populations have greater economic and social disparities in the access to, use of, or impact of information and communication technologies. A recent *AJPH* editorial added urgency to prior calls to define broadband Internet access (BIA) as a social determinant of health because it affects access to health care, economic stability, education, food, community and social context, and neighborhood and physical environment.⁸ Notably, most people of reproductive age reported having BIA.⁹ But access varies by age, race/ethnicity,

rural residence, and other demographic characteristics. Adults aged 18 to 29 years had lower BIA (70%) than those aged 30 to 49 years (86%). White adults had higher rates of BIA (80%) than Black (71%) and Hispanic (65%) adults. Urban and suburban residents had higher rates of BIA than those living in rural areas (77%–79% vs 72%). Households with incomes of \$100 000 or more had higher rates of BIA (93%) than households with incomes less than \$30 000 (57%).

Although telemedicine breaks down barriers to abortion access, the lack of BIA in many homes puts vulnerable women at a disadvantage when identifying and contacting abortion providers and participating in telemedicine visits. As the women's reproductive health community moves forward in this fight to preserve abortion access, we must also push for an information infrastructure that will ensure equitable access to that care. *AJPH*

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Healthy Aging Through The Social Determinants of Health

Edited by Elaine T. Jurkowski, PhD, MSW
and M. Aaron Guest, PhD, MPH, MSW

This new book examines the link between social determinants of health and the process of healthy aging. It provides public health practitioners and others interacting with the older population with best practices to encourage healthy aging and enhance the lives of people growing older.

Healthy Aging: Through The Social Determinants of Health gives insight into the role each of these plays in the healthy aging process: health and health care; neighborhood and built environment; social support; education; and economics and policy.

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A Social Vulnerability Framework to Identify and Assist With Environmental Injustice

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Note. The conclusions of this article are those of the author and do not necessarily represent the official position of the ATSDR or CDC.

 See also Hollar et al., p. 1217.

It is well established that socioeconomic and demographic factors, such as race and ethnicity, income, and education, are independently linked to health disparities.¹ Tools that combine multiple socioeconomic and demographic variables into an overall rank, such as the Centers for Disease Control and Prevention (CDC)/Agency for Toxic Substances and Disease Registry (ATSDR) Social Vulnerability Index (SVI), provide a quantitative framework that can be used by policymakers to identify communities that have higher overall social vulnerability with regard to disparate health outcomes and living conditions across multiple factors, and to develop targeted interventions.² Historically, the SVI and similar frameworks have been crafted for emergency preparedness and response and used for study and practice in more extreme natural and human-caused disaster scenarios. Over the years, the SVI has been used for public health research and practice, communications, and accessibility planning, and to target geographically specific interventions related to natural disasters such as flooding

and hurricanes,³ human-caused events such as chemical spills,² and disease outbreaks like the recent COVID-19 pandemic.⁴ However, addressing issues of health inequity attributable to environmental injustice is imperative, and should not be restricted to alleviating the impact of event-specific hazards. To effect systemic change, public health researchers and practitioners must explore the use of tools like the SVI to identify and provide actionable insights for assisting communities that are subject to the effects of chronic environmental stressors and poor living conditions in their daily lives.

Environmental injustice in the built environment is often associated with the disproportionate placement of hazardous and industrial sites and polluting transportation infrastructure in socially vulnerable neighborhoods,⁵ where residents often lack the social or economic capital to influence policy decisions.⁶ Although existing research links housing and health equity,⁷ the impact of poor housing conditions and household exposures to lead, pests, and indoor air pollutants on the health and well-being of socially vulnerable

populations is an important and often overlooked aspect of environmental injustice.^{7,8} The Environmental Protection Agency's definition of environmental justice is all-encompassing and espouses the idea that environmental justice is only achieved when "everyone enjoys: The same degree of protection from environmental and health hazards, and equal access to the decision-making process to have a healthy environment in which to live, learn, and work."⁹ Can justice be achieved without addressing housing disparities?

In this issue of *AJPH*, Hollar et al. (p. 1217) explore whether there is a link between social vulnerability and substandard housing conditions in Miami, Florida, in the wake of a preventable disaster: the June 2021 collapse of the Champlain Towers. Although a human-caused disaster event is the catalyst of their inquiry, the authors' use of the SVI is not directed toward the emergency event itself. Hollar et al. ultimately find that census tracts with higher SVI scores are more likely to contain "risky housing environments" and recommend that policymakers "identify and assist vulnerable communities" experiencing unsafe housing, as these communities often do not have the social or economic capital to influence decision-makers or change their circumstances. Instead of focusing on the disaster, the article draws attention to a larger long-standing issue affecting the community and likely contributing to the cause of the disaster: environmental injustice in the form of substandard housing conditions that result in health inequities. Applying a quantitative social vulnerability framework to environmental injustice in this way opens the door for preventatively applying socially and geographically targeted interventions enacted for disaster preparedness and

response to address disparities without the catalyst of the disaster itself.

One of the key benefits of the SVI as a quantitative framework for social vulnerability is that it provides data necessary for two key activities that Hollar et al. recommend: identification and assistance. The overall ranking is a useful tool to identify communities likely to experience health disparity attributable to high social vulnerability, and the individual factors and themes that make up the index can be broken down to inform actions targeted to the specific socioeconomic and demographic factors driving vulnerability. For example, when looking at the individual indicators driving high social vulnerability in Miami-Dade County (Table 1), the study area of Hollar et al., we see that the minority and language themes, as well as the housing and transportation themes, are the main drivers of high vulnerability in the county.

Further inspection of the data in these themes shows that this county is in the highest percentile, relative to all US counties, for minority residents and residents who speak English less than well, and it ranks very high in percentiles for overcrowded, multiunit, and

no-vehicle households. Seeing the specific factors that drive social vulnerability in this county can empower policymakers to address inequities in a socially targeted way. For example, government agencies in the Miami-Dade area may use the information from the SVI to inform specific policies or initiatives such as

- Targeting safe building compliance and enforcement accountability activities in areas zoned for multiunit housing structures;
- Increasing funding or other resource allocation for improved public transportation systems; and
- Increasing the use of multilingual public service and health communications.

Using the SVI in this way takes the information included from a conceptual ranking and makes it useful for taking targeted actions. Additionally, the census tract scale data available in the SVI allow decision-makers to take assistance one step further and geographically target specific interventions to the neighborhoods within a county that are most vulnerable. In the case of Miami-Dade, initiatives would be most helpful in the

north-central regions of the county (see Hollar et al., supplemental Figure A).

The SVI has already been used outside the realm of disaster management to better characterize obesity¹⁰ and physical fitness.¹¹ Hollar et al. set a new precedent for the value it may bring to the environmental justice sector, and additional research should be done to understand its utility in identifying communities that may be more likely to experience other socially linked conditions associated with environmental injustice, such as routine exposure to indoor and outdoor environmental pollutants, chronic disease burden, poor working conditions, lack of green-space, and other issues with the built environment, in addition to housing conditions.

The brief by Hollar et al. primes the public health community to use tools, like the CDC/ATSDR SVI, that measure overall social vulnerability to identify and assist communities that need not only more support for disaster preparedness and response but simply more support in their daily lives to prevent health disparities. The authors rightfully assert that their findings can be used to prevent future tragedies. However, when paired with environmental data to get at the cumulative impacts of vulnerability and burden on health, the quantitative social vulnerability framework on which they pin their thesis can do much more than prevent future tragedies. Such a framework offers actionable insights to address current health disparities through preventative and restorative action. **AJPH**

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TABLE 1— CDC/ATSDR Social Vulnerability Index Overall Ranking and Theme Rankings: Miami-Dade County, FL, 2018

CDC/ATSDR Measure	Percentile Ranking ^a (Relative to all US counties)
Overall ranking	0.82
Socioeconomic theme ranking	0.69
Minority and language theme ranking	1.00
Household composition ranking	0.14
Housing and transportation theme ranking	0.90

Note. CDC/ATSDR = Centers for Disease Control and Prevention/Agency for Toxic Substances and Disease Registry.

^aPercentile rankings are calculated on a scale from 0.00 (lowest social vulnerability) to 1.00 (highest social vulnerability).

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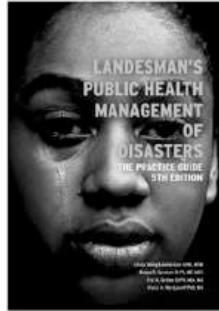
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Looking Back: The Contested Whiteness of Arab Identity

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In 2019, Abboud et al.¹ published a commentary that garnered considerable attention. The authors called for the US Census Bureau and the National Institutes of Health (NIH) to add “Arab” as a discrete identity group. They proposed that this would aid in characterizing members of this unique population and would promote research to better understand and improve their health status. Here we provide some thoughts as to why their compelling piece sparked such interest and what it may mean moving forward. Before doing so, we first provide a bit of background and summarize their essential thesis.

TERMINOLOGY

Abboud et al. focused their thoughts largely on the US Arab population, typically defined as people having origin from an Arabic-speaking country. There is also a broader, partially overlapping group, the Middle Eastern and North African (MENA) population, of which Arab individuals compose the largest segment. MENA individuals are generally defined as having heritage from one of the 22 Arab League nations and a few non-Arabic-speaking countries such as Iran, Turkey, and Israel.

In addition, the MENA category includes ethnic groups such as Assyrians and Chaldeans, who have origins in Arabic-speaking countries but do not often identify as Arab.²⁻⁴ Finally, MENA is the ethnoracial category the US census adopted as a means to provide an identity for those of Arab ancestry.^{2,5,6} Although Abboud et al. focused on Arab identity, we believe that their observations, as well as our comments, relate to the broader MENA identity. Thus, for purposes of our editorial, we address both Arab and MENA populations, acknowledging that Abboud et al. may have intentionally limited their scope to Arab Americans.

The US Arab community numbers between 2 and 3.7 million; the primary countries of origin are Lebanon, Egypt, Syria, Iraq, Yemen, and Palestine.^{2,3,7,8} The lower population figure represents the US census estimate,² whereas the upper estimate is adjusted for undercounting. When the broader MENA parameters (e.g., Iran, Morocco, Turkey) are considered, the US MENA population likely exceeds 4 million. The two largest US Arab/MENA populations are found in California and southeastern Michigan.

According to Abboud et al., members of Arab/MENA communities reside in a state of demographic purgatory. De facto they are classified as White, which Abboud and colleagues argue is both conceptually dubious and practically harmful. Because of this misclassification, Abboud et al. assert, Arab/MENA communities are demographically and epidemiologically invisible. Moreover, classifying Arab/MENA individuals as White can mask the disproportionate discrimination and health disparities they experience.⁵

The US census continues to be bound by the 1997 Office of Management and Budget standard known as Directive 15 (NOT-OD-15-089). The Office of Management and Budget defines White individuals as those “having origins in any of the original peoples of Europe, the Middle East, or North Africa.” In the 2020 census, respondents were allowed to indicate their origin in a free text field located below their selected racial category. However, given that the “origin” field is optional, it cannot be used to accurately enumerate the MENA population because many respondents ignore it. It is increasingly recognized that a separate MENA option, be it under race or ethnicity, will yield a more accurate count of this population.^{5,6}

PAST EFFORTS TO ADD A MENA RESPONSE OPTION

Since the 1980s, members of the Arab American/MENA community have been advocating for a separate identity category on the decennial US census, and MENA was almost included as a separate check box in 2020. In the early 2000s, the US Census Bureau was receptive to calls for a MENA option and in fact performed a National Content Test in 2015 that, among other areas, explored the

logistics and impact of adding a discrete MENA category.^{5,9} The results showed that when a MENA category is present, 70% to 80% of MENA individuals select the box.⁹ Another recent study similarly indicated that as many as 88% of MENA individuals will select the MENA option if offered.⁶

These findings suggest that this option, if implemented, would not only result in a more precise enumeration of Arab/MENA communities but would reduce the number of people selecting “some other race,” leading to a more granular census.⁹ These pilot results led the Census Bureau to recommend inclusion of the MENA category in future census administrations.⁹

However, this recommendation was never implemented by the Office of Management and Budget, and the reasons have not been fully articulated.^{5,6} Census staff have continued to meet with MENA community leaders and scholars (including the authors of this editorial) to discuss the inclusion of a MENA category. In September 2021 the authors, along with other scholars convened by ACCESS,¹⁰ the largest Arab American nonprofit health and social service agency in the country, submitted a series of recommendations for including a MENA option in federal data collection efforts to the Equitable Data Working Group. This working group, formed through Executive Order 13985, is tasked with developing equitable measurements throughout the federal government. Although national inclusion of the MENA category remains elusive, local implementation of a MENA option on surveys has begun in Michigan, California, Massachusetts, and Chicago, Illinois.

In addition to the US census, federal health research provides another opportunity to enumerate Arab/MENA

communities. These efforts could include the Centers for Disease Control and Prevention and the NIH, which has a robust minority health portfolio and funds the National Institute on Minority Health and Health Disparities. The NIH, as part of its minority health and health disparities research framework, identifies eight health disparity populations: American Indians/Alaska Natives, Asian Americans, Blacks/African Americans, Hispanics/Latinos, Native Hawaiians and other Pacific Islanders, sexual and gender minorities, socioeconomically disadvantaged populations, and underserved rural populations. Neither the MENA nor the Arab population is included in the list.

Absence from the list of disparity populations does not preclude the NIH from funding MENA research, as investigators can apply for funds to conduct such research under general calls for proposals (i.e., investigator-initiated proposals); it can, however, impede MENA research from being funded under announcements that fall under the “minority” or “disparity” rubric. Calls for proposals targeting minority or disparity research may consider Arab/MENA-focused applications to be nonresponsive. This is not a criticism of the NIH or the Department of Health and Human Services, because they are bound by federal regulations. Nonetheless, expanding the definition of what constitutes minority and disparity at the federal level would provide important recognition of Arab/MENA communities and would likely lead to more health research and health services for these communities.^{5,11}

Abboud et al. concluded that the absence of a discrete Arab/MENA identity option and omission from the list of disparity populations leave this population undercounted and underresearched. This may also, albeit unintentionally,

communicate that these individuals’ struggles and challenges are not worthy of our attention despite clear evidence that they exhibit significant health disparities, including lower cancer screening rates as well as higher rates of discrimination and stress over deportation (Paul J. Fleming, unpublished data, 2022).^{5,12-14}

A CONFLUENCE OF EVENTS

At that time, US president Donald Trump expressed anti-immigrant and anti-Muslim rhetoric and proposed policies consistent with these sentiments. Among his first presidential actions (Executive Order 13769, eventually reissued as 13780) was the so-called “Muslim ban,” which limited immigration from several predominantly Muslim (although not all Arab) countries.^{6,15} Citizen outrage and judicial intervention limited its impact on actual immigration, but the psychological and health repercussions in the MENA community were nonetheless immense.¹⁶ Subsequently in 2019, deriding four female members of Congress, all of whom were women of color and two of whom were Muslim (and MENA), Trump declared that they were “free to leave” the country and accused them of “hating” America. He later tweeted that they should “go back” to the “places from which they came.” One was born in Somalia; the other three were all born in the United States.

Looking back, we propose that Trump’s anti-Arab/anti-Muslim rhetoric may have unintentionally mobilized many Americans to rally to the defense of the MENA community.⁶ He may have triggered a social “reactance,” an opposite reaction of tolerance incited by his intolerance. His attacks on these communities may have spurred public empathy

and interest in such issues on the part of researchers and public health practitioners. Finally, during this time, Americans were becoming more aware of the plight of refugees displaced to the United States and elsewhere as a result of the wars and political strife that had torn through the Middle East, some of which were due to US policies and actions. Interest in the Abboud et al. article may have been intertwined with these cultural forces.

Beyond the anti-Muslim sentiments that were circulating at that time, 2019 may have been a major inflection point in our national social justice debate.¹⁷ Americans were confronting persistent unfairness, and this may have predisposed us to empathize with the plight of the MENA population. The Abboud et al. commentary may have coincided with these awakenings. An article calling for American demographers and researchers to offer MENA communities the dignity of being counted was timely.

It is interesting that, for those of us at the University of Michigan Rogel Cancer Center, 2019 marked the beginning of our MENA research initiative. The initiative was driven in part by feedback from external advisors that we were ignoring an important disparity population in our own backyard: the Dearborn enclave, the largest visible and most concentrated MENA community in the United States. This ongoing initiative has led to numerous publications documenting unique health and social issues facing the local MENA population^{12,14,18-21} and to the development of several culturally tailored interventions, including the Yallah Quit! smoking cessation program and home-based human papillomavirus testing, which aimed to assuage modesty concerns that discourage some MENA women from seeking health services.

Although not the focus of the Abboud et al. commentary, an outstanding issue regarding assessments of MENA identity is to what extent, if MENA were ultimately listed as a discrete ethnic or racial category, individuals who are members of this population would actually check the MENA box. Overall, it appears that 70% to 80% of eligible respondents would use the MENA checkbox^{6,9}; however, these percentages may vary by subgroup. For example, Maghbooleh et al. found that respondents who identified as Muslim were more likely to check the MENA box than those who identified as Christian.⁶ Similar variations in MENA affiliation by country of origin were observed in the US census pilot.⁹

Thus, some individuals who may have Arab or Chaldean origin may nonetheless still prefer to report White identity either instead of or in addition to their MENA identity. This preference may be due to the status and privilege it conveys as well as a desire to dissociate from an identity that has been viewed with suspicion and derision,^{6,22-24} particularly since the War on Terror prompted by 9/11.²⁴ Perhaps over time, when the MENA identity becomes widespread and more normative, more members of the community will check the MENA box.

The fact that affiliation with MENA identity varies within the MENA population was addressed in a letter to *AJPH* submitted by Ford and Sharif²⁵ that was prompted by the Abboud et al. article. Ford and Sharif proposed that MENA identity and related disparities are better understood through an intersectional framework. They posited that the status of MENA individuals in American society is driven not only by whether they are perceived as White but also by their gender, clothing, religion, socioeconomic status, experience with discrimination, and nationality.²⁶ Thus,

there are multiple, often interacting dimensions of identity that affect MENA communities.²⁶ For example, MENA individuals who practice Islam may have very different lived experiences in US society than those who identify as Christian. These multiple influences affect whether they identify as MENA.

Abboud et al. challenged us to reconsider what constitutes a disparity population. Health disparity is defined by the National Institute on Minority Health and Health Disparities (<https://www.nimhd.nih.gov/about/strategic-plan/nih-strategic-plan-definitions-and-parameters.html>) as a higher incidence, higher prevalence, or earlier onset of a disease or its risk factors, as well as disproportionate consequences or burdens. Disparity populations (the eight earlier-defined groups) are characterized by key criteria including racial/ethnic minority status, low socioeconomic status, residence in an underserved rural area, and membership in a sexual or gender minority group. Currently MENA health disparities, although substantial, are not fully appreciated because the MENA population is not an officially recognized race or ethnic minority group. Creating a unique MENA identity separate from White and adding MENA to the list of disparity populations seems a reasonable remedy to this problem.

Recognizing MENA as a unique demographic group and including it as a disparity population are critical steps in achieving social and health equity.⁵ However, while we wait for these broader fixes, we can address MENA health issues outside the official disparity rubric. For example, researchers can conduct epidemiological and intervention research on these communities without labeling the work as “minority” or “disparity.” The rationale for the research can still be based on the need

to understand the unique health issues of MENA communities without the research being framed as disparity or minority.

Disparities, of course, arise from the interplay of numerous factors from biology and socioeconomics to structural and interpersonal discrimination. Although it is critical to identify and understand these root causes and intervene upon them at societal levels, we can address some of these adverse consequences through tailored interventions.¹⁰ Formally recognizing MENA in demographic counts will alleviate some of the problems caused by the status quo. However, tailored interventions will still be needed moving forward to address the unique culture and social experiences of MENA communities.

Several conceptual and logistic issues regarding MENA identity remain unresolved. For example, whether Arab/MENA should be considered a racial group or an ethnic group (as we currently classify Hispanic origin) is still up for debate.⁵ Also, if MENA is granted unique status, other groups such as Afro-Caribbean Americans or Central Americans may seek discrete status. Finally, an interesting, perhaps more philosophical question is whether MENA individuals should in fact check the MENA box, an imperative reflected in the “Check it Right; You Ain’t White” campaign.²⁷

The answer to this question has significant implications. If endorsing the MENA option is considered objectively beneficial for the MENA community and broader society, then perhaps campaigns encouraging individuals to identify as such may be warranted. By contrast, if using the MENA option is considered simply a personal preference, then perhaps it should be approached with equipoise. Although we are not

certain where Abboud et al. would land on this issue, we believe that MENA communities should be provided with information about the benefits of using the MENA option and support for their personal autonomy in choosing their identity.

In summary, Abboud and colleagues’ timely piece appeared to coincide with a rising national consciousness regarding the invisibility of our MENA communities and the need to fully count them and address their health and social needs. Abboud et al. also raised important issues around how we measure and conceptualize race and health disparities that can guide our public health agenda moving forward. The addition of a unique MENA identity in the census and public health systems is a critical first step. Future efforts can focus on incorporating an intersectional perspective of MENA identity and including MENA communities within our health disparity service and research endeavors. *AJPH*

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CONFLICTS OF INTEREST

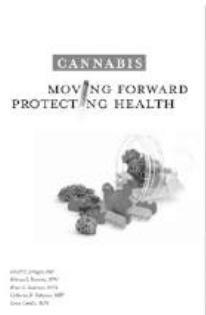
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Cannabis: Moving Forward, Protecting Health

Edited by: David H. Jernigan, PhD, Rebecca L. Ramirez MPH, Brian C. Castrucci, DrPH, Catherine D. Patterson, MPP, Grace Castillo, MPH

This new book addresses the ongoing debate on cannabis policy and provides guidance on how to regulate its sale and distribution. Instead of taking a stance for or against cannabis use, the book:

- suggests we employ strategies similar to those used in alcohol control to create a solid foundation of policy and best practices;
- focuses on how we can best regulate a complex substance.



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The History of Contact Tracing and the Future of Public Health

Allan M. Brandt, PhD

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In the years after the elucidation of the germ theory of disease in the late 19th century, public health officials began to explore new strategies to reduce transmission of infections. Public health programs tracking infectious disease transmission became an important element of infection control and response to epidemics. From an historical perspective, contact tracing focused on the idea that if those infected could be identified, isolated, and persuaded to report their contacts, outbreaks could be slowed and, in some instances, stopped.

As a result, contact tracing has frequently been used to address infectious diseases over the course of the past century. A recent review by El-Sadr et al.¹ traces the use of contact tracing for syphilis and gonorrhea, tuberculosis, HIV, Ebola, and, most recently, COVID-19. A wide range of approaches, however, fall within the general rubric of contact tracing. These strategies have been based on the authority of the state to surveil and track epidemics; require physicians and public health agencies to report certain diseases; and identify individuals for surveillance, investigation, and contact by public health authorities.²

The first major contact tracing programs targeted syphilis (Figure 1).

Historically, the tracking of sexually transmitted infections led to stigmatization. Tracing required individuals to name sexual contacts, revealing intimate details about sexual relationships, as well as perceived indiscretions and infidelities, sometimes compromising marriages, families, other personal relationships, and employment. In the 1930s, tracing of syphilis infections required what officials often called “shoe leather epidemiology” to hunt down cases (often targeting prostitutes, minorities, and immigrants), as well as the interrogation of “suspects,” mandating Wassermann tests, and eliciting “confessions.” Contact tracing augmented the existing fear, shame, guilt, and stigma of syphilis.³ Not surprisingly, already vulnerable communities have often viewed these programs as both intrusive and dangerous. The threat of public exposure, isolation, and possible quarantine often encouraged individuals to avoid the “public health police.” This historical legacy of contact tracing programs continues to serve as an important obstacle to their widespread and effective implementation. Recognizing that such approaches could have the effect of limiting the voluntary identification of contacts, public health officials during the HIV epidemic began to

adopt “partner notification programs,” which emphasized the contact case’s personal and ethical responsibilities to the health of their sexual partners.

THE PROBLEM OF EFFICACY

Although contact tracing has a clear logic, its potential effectiveness has often depended on the biological characteristics of infectious organisms. The disease-specific variables that influence the efficacy of contact tracing include the mode of transmission, the relative transmissibility of the organism, the length of an asymptomatic phase, and the length of time the agent is transmissible. Effectiveness is also related to the availability and accessibility of sensitive and specific laboratory testing regimes (and the timely access to results), as well as the potential to use treatments to render individuals noninfectious. Contact tracing is also dependent on contextual social, political, and ethical issues. These vary from the approach and skill of public health personnel to elicit names of contacts to complex questions of the social meanings, cultural contexts, and significance of the disease. Together, these biosocial variables make effective tracing challenging and sometimes impossible. For example, in many instances during the COVID-19 pandemic, individuals have been unaware of when they first acquired an infection and may have had hundreds of anonymous “contacts” before they became symptomatic. Highly transmissible, COVID-19 often outran programs for tracing contacts.

The efficacy of contact tracing, however, requires greater clarity about its goals and outcomes. As a public health strategy, contact tracing has historically depended on the participation and

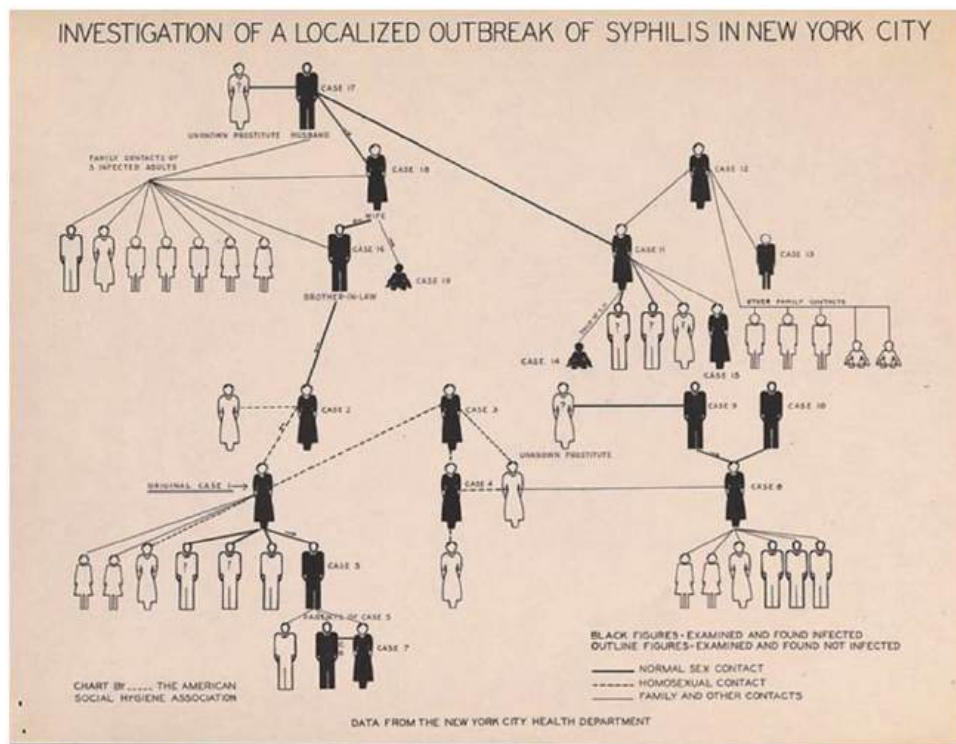


FIGURE 1— Contact Tracing Chart From the New York City Health Department, 1938

cooperation of individuals and communities. Such collaborations are sensitive to ethical considerations of protecting others who may be infected, as well as political assessments of the role of the government in preventing the spread of infectious diseases. Fear of punitive isolation or social stigma has often served as a critical obstacle to participation; in these cases, tracing programs have been seen as acts of surveillance and discipline by the state.^{4,5}

LOOKING BACKWARD, LOOKING FORWARD

The COVID-19 pandemic offers an important opportunity to assess a variety of approaches to what has been broadly deemed “contact tracing.” The pandemic has illuminated many of the strengths and weaknesses in current practices in the United States and other

countries around the world. Before the advent of vaccines, there was particular interest in contract tracing to reduce transmission of the virus through testing and isolation of the infected. As we look to the future, the COVID-19 pandemic now offers a series of “natural experiments” to assess the value of tracing, especially because policies, technologies, and strategies varied greatly across states and nations.^{6,7}

In particular, the pandemic spurred two critical innovations in approaches to contact tracing. For the first time in history, countries widely used digital technologies to identify possible exposures. Several countries (South Korea, Singapore, Australia, and New Zealand, among others) quickly introduced new digital tracing systems through smartphone applications that could alert individuals to exposures; encourage immediate testing; and, if a person was

found to be infected, promote isolation. The comparative efficacy of these programs has yet to be fully determined and requires further research. But in many nations, especially the United States, uptake tended to be relatively low, severely limiting the value of this approach. Individuals who declined to use these applications typically cited concerns about privacy and surveillance.⁸ For this type of digital tracking to be successful, it is estimated that 60% adoption would be required. This will require clearer assurances of privacy and anonymity, as well as greater understanding of the potential social value of digital public health applications.^{4,9}

In the United States, where skepticism of state authority has been particularly high, it is important that contact tracing programs be seen as serving the interests of individuals, their families, and

communities. Several state programs instituted in 2020 sought to embed these values in their approaches, centering attention on informing individuals of their infections; educating them on best practices to avoid transmission; assuring that they had resources to isolate; and providing social support, including food and other necessities. The shift from a public health approach based upon police powers of the state to one that emphasizes community social engagement and support, especially among those most vulnerable, offers an important lesson.¹⁰ In such programs, which used the potential of what the late Dr. Paul Farmer described as “accompaniment,” contact tracing assumed the goals of dedicated community health work, assuring that the needs of patients with COVID-19 and their contacts were identified and that material resources, social support, and advocacy were available.^{11,12}

This approach has important implications beyond the future of contact tracing. It offers an orientation to public health that relies on collaboration, participation, and the provision of information and services, which erodes traditional notions of state discipline, isolation, and criminalization, often centered on vulnerable minority populations. Furthermore, it suggests that contact tracing can be integral to building trust and confidence in public health efforts that serve individuals, families, communities, and wider populations. The capacity to identify individuals experiencing infectious diseases and help them access medical care and protect their contacts through prevention or treatment is at the core of public health. But how this is done has enormous implications for health outcomes, reducing disparities, promoting equity, and how we imagine the future of public health. **AJPH**

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The Growing Importance of Self-Managed and Telemedicine Abortion in the United States: Medically Safe, but Legal Risk Remains

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Excessive regulation under state law has made it increasingly difficult for Americans to get a legal abortion. State lawmakers passed more than 100 restrictions on abortion in 2021, more than any previous year.¹ Meanwhile, the Supreme Court shifted rightward with the appointment of three justices during the Trump administration, threatening constitutional protection for abortion and setting a course for state-level abortion bans.

In light of these developments and new research, we revisit the groundbreaking research article “Demand for Self-Managed Medication Abortion Through an Online Telemedicine Service in the United States”² and comment on its significance and implications since publication. This study by Aiken et al. examined the demand for remote medication abortion (a regimen consisting of mifepristone and misoprostol pills) among US residents in 2017 through 2018 and assessed variation in barriers to clinical abortion care by state policy context (hostile vs

supportive). Metrics collected by *AJPH* demonstrated that this study garnered much attention from *AJPH* readers and the media (<https://bit.ly/3kKAG0l>). The article presented a model of abortion care that sidestepped long-standing barriers to clinical abortion care and presented evidence of a strong interest in and need for this model among US residents.

The salience of the study has grown as the proportion of Americans who use medications to end their pregnancies has increased and as state-level legal barriers to abortion access have proliferated, with outright bans expected within months.³ The ongoing COVID-19 pandemic has also increased demand for at-home medication abortion because of concerns about the risk of contracting COVID-19 in a clinic or in transit; this has added to long-standing barriers to access for clinic-based abortion care, including long distances to the nearest clinic, arranging care for dependents, and more.⁴ Aiken et al. note the effect of abortion restrictions

on increasing demand for at-home medication abortion and offer a preview into the future of abortion seeking for the growing number of Americans who will be legally unable to obtain abortion in a clinical setting.

ABORTION AND THE LAW

In their study, Aiken et al. examined US residents' requests to the online telemedicine abortion service Women on Web, for which consultation included a medical doctor's review of a client intake form. The Women on Web model of online telemedicine, quite uniquely, combines elements of two models of abortion care: (1) telemedicine—“the delivery of healthcare services . . . by a healthcare practitioner to a patient in a different physical location . . . through telecommunications technology,”⁵ and (2) self-managed abortion—the use of medication to end a pregnancy on one's own, without clinical supervision.⁶ To fully understand the implications of the article by Aiken et al., we distinguish between “self-managed” abortion and “telemedicine” abortion because of differing treatments of these two models in research and law, with the acknowledgment that the Women on Web model uniquely combines both approaches.

Although the medications (misoprostol alone or in combination with mifepristone) taken through both telemedicine abortion care and self-managed abortion are the same and the process is largely similar, laws apply to self-managed abortion differently than to telemedicine. The difference is largely because telemedicine abortion involves a licensed clinician, whereas self-managed abortion does not.

After the article by Aiken et al. was published, telemedicine became legal

in some states, when, in December 2021, the Food and Drug Administration (FDA) removed an in-person dispensing requirement for mifepristone, permitting patients to access medication abortion by mail. The FDA's move codified a previous decision not to enforce the in-person dispensing requirement during the pandemic.⁷ In other states, however, laws require in-person visits or have explicit bans on telemedicine for abortion or mailing abortion pills—laws that may apply regardless of the FDA decision. Questions remain about the challenging legal issues that will arise with actions that cross borders of states with differing laws.³

Self-managed abortion may place the person having the abortion or people who help them at risk for criminal and civil penalties⁸; indeed, people who self-managed their abortion and individuals who helped them have been arrested and prosecuted in the United States.⁹ The laws of some states specifically criminalize self-managed abortion, whereas laws unrelated to abortion (e.g., fetal harm laws, homicide laws) may also be used to prosecute people who self-manage.⁹

The distinction between self-managed abortion and telemedicine is also pertinent to the study of the safety and effectiveness of telemedicine abortion, which is well-established as on par with clinic-based medication abortion.^{4,10} Research on self-managed medication abortion has similarly found levels of effectiveness and safety comparable to clinical care.^{6,11} Because of the ambiguous legality and decentralized nature of self-managed abortion, however, research on this experience faces unique challenges, such as difficulty identifying a representative sample of people who self-manage and difficulty

gaining their trust in the face of privacy and legal concerns—challenges that are less likely when researching telemedicine abortion.¹²

The model that Aiken et al. studied is somewhat of a hybrid, with the record-keeping end more closely mirroring telemedicine models and the experience of the person seeking abortion more closely mirroring that of self-managed models. There are lessons for researchers in both spaces, including the value of using existing systematic records collected by community-based organizations that provide access to or support of at-home medication abortion, as well as the central importance of close partnership with these trusted groups.

RESEARCH SIGNIFICANCE AND IMPLICATIONS

Aiken et al. compared data on requests for abortion between states, based on whether the policy context in each state was classified as hostile to or supportive of abortion access. The researchers found that demand for mailed medication abortion was higher in states with hostile policies than in those with supportive policies, with barriers related to legislative restrictions more pronounced in hostile states.

The hostility to abortion in policy will become more severe in the coming months.³ In December 2021, the Supreme Court heard arguments in *Dobbs v Jackson Women's Health Organization*, a case in which the court is predicted to overturn or significantly undermine *Roe v Wade* by June 2022. If, as anticipated, federal constitutional protections for abortion are abandoned, more than half of US states are positioned to ban abortion outright. Twelve states have laws that were

created to ban abortion automatically if *Roe* is overturned, and nine states have pre-*Roe* bans (a law enacted before 1973 that was never removed from the legal code), which will also go into effect if *Roe* is overturned. Ten states have six-week bans, and two have enacted total abortion bans.¹³ Viewing the study results of Aiken et al. through the lens of the future abortion landscape in the United States would predict an increase in demand for out-of-clinic abortion, as state law becomes more restrictive with the weakening of federal constitutional protections.

The study positions future researchers well for investigating the effect of specific state-level abortion policies, which are likely to have differential effects on different groups of people. For instance, the authors cite the Hyde Amendment as a policy that reduces clinic access for Medicaid users. Other such policies include burdensome requirements for minors and unfounded requirements for ambulatory surgical centers.¹⁴ The field of legal epidemiology offers tools for research on the relationship between restrictive abortion laws and health outcomes. For example, policy surveillance methods can account for the compounding effect of specific policies. And the development of causal models for the operation of laws can set the stage for accurately measuring the relationship between policy and demand for and incidence of self-managed abortion among specific populations.¹⁵

NEW RESEARCH

The study authors appropriately noted the growing evidence of the safety and efficacy of self-managed medication abortion through online telemedicine and highlighted that the primary risk associated with self-managed abortion

may be legal risk. Since the study was published, new research has further established the high levels of safety and effectiveness of self-managed medication abortion across a range of out-of-clinic models—ranging from 94% to 100% abortion completion without surgical intervention.^{11,16}

One recent study in particular—the SAFE (Studying Accompaniment model Feasibility and Effectiveness) study—evaluated the safety and effectiveness of self-managed medication abortion with support from accompaniment groups, whereby non-clinically trained counselors provide information and support over the telephone as needed to people self-managing their abortions.¹¹ The SAFE study further established the effectiveness and safety of self-managed medication abortion and, importantly, concluded that effectiveness in the self-managed setting is not inferior to the clinical setting. Indeed, findings from the SAFE study also indicate that self-use of misoprostol alone is similarly effective to self-use of misoprostol in combination with mifepristone—a particularly important finding given that misoprostol is much less heavily regulated and more easily accessible in the United States than mifepristone.

CONCLUSIONS

In short, the findings of Aiken et al. establish that there is a demand for telemedicine and self-use of medication abortion in the United States and that this demand increases in hostile policy climates. Given the anticipated major shift toward even more hostile policy climates in the United States in the coming months,³ we can extrapolate from the article of Aiken et al. that demand for at-home medication

abortion will increase. Considered in light of recent research such as the SAFE study, we can set aside public health and clinical safety concerns following an increase in self-managed medication abortion. However, legal risk remains, and people who self-manage and those who support them are especially at risk for criminalization. Further research collaboration between legal and public health experts using legal epidemiology approaches will produce a fuller picture of the effect of post-*Dobbs* state abortion restrictions.

The evidence base continues to overwhelmingly lead to the conclusion that telemedicine abortion and self-managed abortion, with misoprostol alone or in combination with mifepristone, are safe and effective modes of abortion care. As legislatures hostile to abortion rights move to ban abortion altogether, state lawmakers who support evidence-based policy must take steps to remove legal risk for everyone involved in self-management of abortion. It is a public health imperative. **AJPH**

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Improving National Public Health Data Collection as an Act of Antiracism

Sarah Polk, MD, ScM, MHS, and Kathleen R. Page, MD

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🔗 See also Aliseda-Alonso et al., p. 1161.

Two months after COVID-19 was declared a pandemic in the United States, George Floyd was murdered. Just after the announcement of the 1 000 000 000th death from COVID-19 in the United States, a gunman killed 10 Black people in a Buffalo, New York, grocery store in a racially motivated act of domestic terrorism. The murder of George Floyd, the murders in Buffalo, and the distribution of infection and death from the pandemic make manifest the toll of racism in the United States. In response, individuals and institutions have made commitments to counteract racism. It is past time to move from solidarity to action.

The findings of Aliseda-Alonso et al. (presented in this issue of *AJPH*; p. 1161) indicate that deaths from COVID-19 far exceed 1 000 000 000, with communities of color bearing an unrecognized extra toll in addition to previously well-documented disparities.

Latinos and Blacks not only have suffered a disproportionate burden of infection and mortality but also were more likely to die younger than their non-Latino White counterparts. During the first wave of the pandemic, for example, approximately one third of COVID-19 deaths among non-Whites

occurred among individuals younger than 65 years, compared with only 13% among non-Latino Whites,¹ and this pattern persisted through 2020.² All-cause excess mortality that year increased for all racial and ethnic groups but was much worse among Latinos (53.6%) and non-Latino Blacks (34.6%) than among non-Latino Whites (11.9%).³

It is alarming that these profound disparities may be worse than we thought. In their study, Aliseda-Alonso et al. compared publicly available surveillance data from the Centers for Disease Control and Prevention (CDC) to data on COVID-19 cases and deaths from state and territorial governmental sources; they found that the CDC consistently underreports the cases and deaths of Blacks and Latinos as well as people younger than 65 years. These findings justify investment in a reliable national data-monitoring system with standardized data reporting for key variables.

WHY IMPROVE DATA COLLECTION

Systematic bias in the reporting of demographic data is harmful because data drive investment and policy. Appropriate

allocation of resources for the hardest hit communities relies on accurate data to track pandemic trends and concentrate investments in primary and secondary prevention, ongoing scientific inquiry, and community reinvestment.

Despite COVID-19 fatigue, the pandemic is not over. Infection and hospitalization are increasing because of waning immunity and relaxed prevention measures. Accurate testing and treatment data inform where testing should be offered, hospital planning, and continued funding for test and treat efforts if the burden persists in low-income communities, where rates of uninsurance and other health care access obstacles are prevalent.

The COVID-19 pandemic is ongoing, and its aftereffects will continue for decades; secondary prevention is vital for preventing harms to physical health, mental health, and the economy. It is estimated that up to 30% of people who recover from COVID-19 may develop persistent symptoms (“long COVID”).^{4,5} Mental health problems related to COVID-19 are the subject of consternation and considerable media coverage and include posttraumatic stress disorder among those hospitalized with COVID-19 and depression and anxiety in people whose loved one has died of COVID-19. In addition, the financial harms from economic slowdown, lost wages because of illness or death, and lost potential among youths whose education was disrupted by the pandemic will radiate from the COVID-19 sufferer to their families and ultimately their communities. Given the disproportionate impact of COVID-19 in communities of color, it is likely that the most affected by the long-term effects of COVID-19 will be the uninsured or underinsured, who will have high out-of-pocket costs for long-term physical and mental

COVID-19 care after the expiration of the Coronavirus Aid, Relief, and Economic Security Act (Pub L No. 116-136).

The work of Aliseda-Alonso et al. also highlights the importance of data in scientific inquiry. Accurate reporting of the proportionate burden of COVID-19 by race and ethnicity is important for researchers to ensure that emerging data on COVID-19 are representative of the affected population and for inclusive study design. Ongoing scientific inquiry must include communities that have suffered and continue to suffer the greatest rates of and harms from COVID-19. Many questions remain unanswered. What conditions allowed COVID-19 to flourish? What does recovery from COVID-19 at all levels look like? What does equitable participation in clinical trials look like?

Investment in communities to facilitate pandemic recovery should be guided by residents of the most affected communities. Investment must be paired with evaluation in an iterative process of community engagement, program and policy implementation, and program and policy improvement. Successes in some hyperlocal COVID-19 response efforts have again demonstrated the benefit of community engagement and responsiveness. CommuniVax was a national, multisite rapid ethnographic research project with the aims of (1) advancing awareness of, access to, and acceptability and uptake of COVID-19 vaccines among Black and Latino communities; and (2) accelerating the development of local public health governance systems in which marginalized populations can exercise collective agency over their health and wellness. Black and Latino community members participated in CommuniVax in six communities across the United States and expressed what they wanted for their

community so it could emerge from the pandemic stronger and more resilient. Two recommendations distilled from dozens of individual interviews and other qualitative methods were to “Rebuild the public health infrastructure, properly staffing it for community engagement” and “Stabilize the community health system as the backbone for equity and resilience.”⁶

HOW TO IMPROVE DATA COLLECTION

Three requisites of an improved national data collection system are suggested by the findings of Aliseda-Alonso et al.: standardization, interoperability, and accountability. The authors had to reconcile 402 unique combinations of sociodemographic data to create a national-level data set; 402 combinations is unreasonable and unworkable. States need to receive a template for collecting and reporting a manageable and sufficient number of sociodemographic variables to accompany essential health outcome data. States would not be precluded from collecting additional data of regional importance. Why not use the US census questions as the basis for the template? Any template will have critics, but the status quo prevents us from addressing disparities.

Standardizing data collection and reporting is necessary, but not sufficient, for interoperability—the ability of the US health system’s many sectors to easily exchange information to benefit clinical, public health, and research efforts. The decentralized, fractured nature of the US health system increases the challenge of interoperability. A wide variety of data sources will be required, including, but not limited to, public health surveillance data, clinical data from public and private health systems,

death certificates, claims, and administrative and survey data. The Office of the National Coordinator for Health Information Technology has created an Interoperability Standards Advisory process to provide information regarding standards needed for interoperability, although without the authority to require implementation or adoption.⁷ In a 2020 report, interoperability between health systems in the United States was reported to be improving, albeit slowly; it is concentrated in cities, is highly variable, and is associated with health system size.⁸ In Iran, Shanbehzadeh et al. consulted the literature and convened experts to create a COVID-19 minimum data set and interoperable reporting framework to support their nation’s public health pandemic response.⁹

Following the implementation of a standardized, interoperable data collection system, states must be held accountable for data reporting. The Ryan White program provides a model.¹⁰ The federal government disburses money to states for the care of persons living with HIV or AIDS. States must report data regarding program participants and the use of funds to maintain funding. Another example is the system of value-based payments, one version of which requires health systems to report quality metrics to avoid hefty penalties and be eligible for incentive payments.¹¹ Finally, the US census again comes to mind. Although the work of maximizing census participation is distributed, states have a vested interest in census completion rates, as they determine congressional representation and federal funding.

A CALL TO ACTION

Standardizing local health-reporting systems, creating a national-level

interoperable data system, and holding states financially accountable for reporting data are acts of antiracism whose time has come. *AJPH*

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Reproductive Justice Matters: A Public Health of Consequence, August 2022

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🔗 See also Allsworth, p. 1086, and Seymour et al., p. 1202.

In the summer of 1994, a group of 12 Black women convened a meeting in Chicago, Illinois, to discuss the reproductive healthcare needs of Black and Brown women as well as the disparities in care that were being ignored in discussions of health care reform. The group named itself the Women of African Descent for Reproductive Justice¹ and drafted a new framework—the Reproductive Justice framework—grounded in an intersectional approach and a human rights framework. Published in a full-page ad in the *Washington Post* on August 16, 1994, the new Reproductive Justice framework called for broader recognition of contraception and abortion not only as key components of reproductive health but also as critical to ensuring reproductive autonomy and self-determination. The Reproductive Justice framework called for women to have the right to

1. decide if and when she will have a baby and the conditions under which she will give birth,
2. decide if she will not have a baby and her options for preventing or ending a pregnancy, and
3. parent the children she already has with the necessary social

supports in safe environments and healthy communities and without fear of violence from individuals or the government.

At this critical moment, with the Supreme Court's ruling on *Dobbs v Jackson Women's Health Organization* overturning 50 years of a constitutional right to abortion care, reaffirming our commitment to reproductive justice is imperative. Since *Roe v. Wade* was decided in 1973 and then *Planned Parenthood v. Casey* (505 US 833) in 1992, a long, steady, and calculated stream of attacks on women's legal right to abortion has been waged by conservative legislatures at state and federal levels, culminating in the overturning of *Roe v Wade*. Yet these attacks on abortion care and reproductive justice, both in the United States and across the world, have not stopped and will not stop women from seeking or obtaining abortions. Rather, these attacks have undermined the health and well-being of women, children, and families as well as the economic, political, and social fabric of our society. The social, economic, and health-related evidence of these real-world impacts is ignored in the majority opinion of the six conservative Supreme

Court justices who overruled *Roe v Wade* and, for that matter, in most legislation that seeks to limit access to safe abortion. Continuing to ignore the depth and breadth of health-related harms that women, children, and families will face by restricting abortion access will undermine the essential tenets of the reproductive justice framework. Here, we employ a reproductive justice lens to understand how curtailing access to abortion will ultimately undermine efforts to achieve health equity.

REPRODUCTIVE HEALTH AND HEALTH CARE

Unlike other high-income countries that have invested in maternal and child care as well as comprehensive reproductive and sexual health care, the US health care system has failed to provide women adequate and appropriate health care. The most glaring indicator of this failure is the 2020 maternal mortality rate of 23.8 per 100,000—the highest maternal mortality rate among all high-income countries.² In the United States, the maternal mortality rate among Black mothers is almost three times higher than that of White mothers: 55.3 deaths for every 100,000 live births among Black women compared with 19.1 deaths per 100,000 births among White women.² Factors underlying this racial and ethnic disparity include lack of adequate and culturally competent pre- and postnatal care as well as poor quality of care for handling complications that develop or worsen during pregnancy. In fact, according to a recent March of Dimes survey, 34.8% (1095/3139) of counties in the United States are maternity care deserts—where timely access to quality pre- and postnatal care is unavailable or cost prohibitive (<https://bit.ly/3LCbS63>).

Another potential driver of the heightened maternal mortality rate in the United States is restrictive abortion policies. As shown by Vilda and colleagues, states with more restrictive abortion policies—particularly ones where the only health care professional allowed to perform an abortion is a board-certified obstetrician–gynecologist—are likely to see higher maternal mortality.³

In addition, a study conducted in Wisconsin found that 91% of physicians believed that overturning *Roe v. Wade* (410 US 113 [1973]) would worsen health care for women.⁴ Similarly, the overwhelming majority of physicians in this study were worried that overturning *Roe v. Wade* would make it difficult to provide good reproductive health care for women. In states with abortion restrictions and policies that allow civil lawsuits against any clinician providing support to a woman seeking an abortion, recruiting and hiring physicians—not just obstetrician–gynecologists but also primary care physicians—will become harder. And this loss will hit states where the medical and health care infrastructure is already woefully inadequate to meet the needs of women.

ABORTION RIGHTS ACROSS THE UNITED STATES

The health status of women, children, and their families is, on average, worse among those residing in rural areas than among those residing in urban areas. Underinvestment in health care infrastructure coupled with higher unemployment, lower educational attainment, and greater concentrated poverty are all drivers of the poor population health status for women and children. For women and children of color in rural areas, these

health outcomes are starker, and health disparities even more pronounced. What does this have to do with abortion rights? Against the backdrop of these already existing sociostructural disparities, states with larger rural populations have enacted some of the harshest abortion restrictions and bans. In Ohio, more than 15 abortion-restricting laws became effective between 2010 and 2018.⁵

Women living in rural counties were hit hardest by Ohio's new abortion laws and experienced greater delays in abortion care and declines in abortions. In Georgia, implementation of a 22-week gestational age limit on abortion decreased access to abortion services in Georgia as well as in neighboring states.⁶ With the US Supreme Court's decision to strike down *Roe v. Wade* on June 24, 2022, nine states have already banned abortion care (i.e., Alabama, Arkansas, Kentucky, Louisiana, Missouri, Oklahoma, South Dakota, Utah, and Wisconsin). (<https://bit.ly/3NvNhkl>).

These wide-sweeping abortion bans and further restrictions will result in severe consequences for the health and well-being of the more than 30 million women of reproductive age who live in these states. Women and families in rural areas, those living in poverty or on the margins of poverty, and women of color are likely to further lose whatever tenuous access to abortion care they currently have (<https://nyti.ms/3a9BsCl>). Medication abortion via telemedicine could expand access to abortion services for women in rural areas, as reported in this issue of *AJPH* by Seymour et al. (p. 1202). However, this would necessitate overturning laws restricting telemedicine provision, which in the current political climate is unlikely to happen. Recognizing the deleterious effect of this loss on such a significant portion of our populations is a clarion

call for protecting the right to abortion care.

SAFE ENVIRONMENTS FOR FAMILIES

“There is no such thing as a single-issue struggle because we do not live single-issue lives.”

—Audre Lorde

Reflecting on this powerful quote by Audre Lorde, the loss of abortion rights will auger a cascade of harmful outcomes that will take generations to undo. A recent study by Foster et al. showed that women are more likely to live in poverty after being denied abortion.⁷ This is a setback for women and a harsh lived reality that is compounded by being less likely to find full-time employment and therefore being more likely to require public assistance. These economic setbacks described by Foster et al. are inextricably tied to greater food insecurity for families, greater likelihood of delayed or missed preventive health care for adults and children, housing insecurity, poor educational outcomes for children, damaged relationship quality, and poorer parenting ability. The layering of social and structural disadvantages is not a negligible occurrence for women denied abortions or for their families. Rather, it undermines the very fundamental social determinants of health and well-being that affect population health. These compounded disadvantages perpetuate and deepen health disparities for women, particularly women living in poverty and women of color, who bear the disproportionate burdens of abortion restrictions.

At this writing, the overturning of *Roe v. Wade* after 50 years of having the Constitutional right to abortion care

has become a rallying cry for advocates of reproductive justice. The stakes are high: access to safe abortions as part of comprehensive, holistic, and culturally competent sexual and reproductive health care hangs in the balance for more than 30 million women. The right to such care, in conjunction with economic, social, and political power, will improve the health and well-being of women, their children, their families, and their communities. Abortion rights, as part of the reproductive justice framework, must be recognized as human rights and must be recognized regardless of which political party is in power and at every level of government. *AJPH*

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Government Patent Use to Promote Public Health in the United States: Overcoming Nonpatent Exclusivities

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The costs to public health that patented prescription drugs present are widely discussed. Patents, by design, facilitate high prices as a reward to inventors of novel products by providing a temporary right to prevent other manufacturers from copying the product. For new drugs, taxpayers or patients ultimately underwrite this reward either directly or through higher insurance costs, sometimes preventing or hindering access to life-preserving medications.

Patents, however, are not the sole legal barrier to accessing these drugs in the United States. New medications are often additionally protected by nonpatent exclusivities under other statutes, such as the Hatch-Waxman Act (1984, Drug Price Competition and Patent Term Restoration Act, Pub L No. 98-417). Although a statutory regime governs remedies for government use of patented medications without a patent holder's authority, the extent to which US law allows the government to deal with nonpatent exclusivities is unclear.

Given that access to high-value medications is a matter of public health importance, we analyze four potential pathways that could permit government patent use for new drugs in the service of public health even before nonpatent exclusivities expire. We argue that of these options, legislative reform is arguably the most desirable long-term solution. Yet, although each of these pathways is available to meet public health needs, each involves a largely reactive intervention and confronts challenges. For this reason, it would also be beneficial to have a greater emphasis on innovation policy levers through which the government could retain greater control over resulting products' accessibility or preempt concerns about exclusivities altogether.

GOVERNMENT PATENT USE

One way to facilitate public access to high-cost medications is through

government patent use.¹ Given sovereign immunity—a legal doctrine immunizing the government from being sued without its consent—the federal government and its agents, such as generic drug manufacturers, have the ability to make or use patented inventions without the permission of the patent holder; in other words, protected by sovereign immunity, the federal government could use inventors' US patents without legal consequence (US patent rights do not apply overseas). In 1910, Congress sought to protect patent holders from government use without authorization, ultimately enacting 28 USC § 1498. This statute allows patent holders to bring a lawsuit against the United States for “reasonable and entire compensation.” Injunctions are unavailable.

Government patent use without patent holder permission was employed for military purposes in the 1950s and 1960s (e.g., for the antibiotic tetracycline). Some have suggested that this model could be more broadly applied in the civilian context for today's patented drugs (e.g., naloxone for opioid drug overdoses, or direct-acting antivirals for hepatitis C) to help lower prices and improve access. It is expected that any compensation awarded under § 1498 would be lower than the prices set by drug companies.

Yet government manufacture of patented drugs without a license faces numerous potential hurdles—both legal and political. One of the greatest legal challenges is that for the newest drugs, other barriers to generic competition exist besides patents. Among these are nonpatent exclusivities that other statutes grant to drug manufacturers. Nonpatent exclusivities include exclusivity under the Hatch-Waxman Act for new formulations of existing

products (three years) or new chemical entities (five years), seven years of exclusivity under the Orphan Drug Act (1983, Pub L No. 97-414) for drugs treating rare diseases, and 12 years of exclusivity under the Biologics Price Competition and Innovation Act of 2009 for new biologic drugs.

These periods generally start at the date of Food and Drug Administration (FDA) approval of new drugs and run concurrently with any patent protection. Unlike patents, which allow patent holders to sue infringing competitors, nonpatent exclusivities prevent the FDA from receiving or approving generic or biosimilar drug applications. Although some might question whether the government must obtain FDA approval for drugs that it manufactures and distributes, this analysis proceeds on the premise that nonpatent exclusivities are potential barriers to government use.

Nonpatent exclusivities arose decades after § 1498 was enacted and create uncertainty for government manufacture and procurement of new drugs. For example, after sofosbuvir (Sovaldi), an extremely effective direct-acting antiviral for the hepatitis C virus, was first approved in 2013, its initial price was set at \$84 000 for a 12-week course of treatment. At the time, some suggested that the government could procure the medication more cheaply from a generic manufacturer and then pay only a reasonable royalty to the originator manufacturer for its infringed patents if sued under § 1498. The government thereby would address a pervasive condition afflicting a large patient population for which the manufacturer's high price was blocking access. (By 2016, competition led the prices that US private payors negotiated for drugs in this class to decline by up to 85%.) Similar discussions arose after the FDA approved

remdesivir (Veklury) for COVID-19 in October 2020, and the price was set at \$3120 for a five-day course of therapy. (By January 2022, alternative COVID-19 medicines became available at lower costs.)

In both cases, operation of the five-year new drug Hatch-Waxman exclusivity was a possible sticking point if the government had decided to manufacture or procure products in the absence of the patent holder's authorization. More recently, access concerns have surfaced relating to Merck's new COVID-19 antiviral drug molnupiravir, which received FDA emergency use authorization in December 2021. The US government agreed to an approximately \$700 price tag despite substantial public investment in its development and a cost of production of closer to \$20. Although the relevant contract limits government use of molnupiravir to the United States, Merck has taken steps to facilitate broad international access in other countries by entering into a licensing agreement with the Medicines Patent Pool. If it is eventually FDA approved, and if domestic access became a concern, nonpatent exclusivity likely could prove a relevant issue to any government patent use conversations.

OVERCOMING NONPATENT EXCLUSIVITIES

When negotiations for voluntary agreements fail, at least four potential strategies are available to pursue government use even before nonpatent exclusivities expire. First, nonpatent exclusivities generally prohibit the approval of competing products only if they rely on data generated by another manufacturer. Thus, the government or any third party could submit full new drug applications with original data.^{1,2} This strategy would

not be able to circumvent Orphan Drug Act exclusivity for rare disease drugs because that act blocks the FDA from approving the "same drug" for the same disease or condition if it is a generic; however, because full trials would be needed, it might be feasible to pursue approval of a chemically distinct but therapeutically identical drug. Furthermore, most diseases of substantial enough public health importance to merit considering government patent use may be unlikely to count as "rare" under the Orphan Drug Act.

Second, many agency actions are judicially reviewable under the Administrative Procedure Act (1946, Pub L No. 79-404)—a statute that waives the federal government's sovereign immunity. Agency enforcement discretion, however, has long been considered presumptively unreviewable under the Administrative Procedure Act.^{3,4} Thus, the government could introduce a generic version of a drug (or contract with a third-party manufacturer to do so) without seeking FDA approval by relying on FDA enforcement discretion. The FDA has long exercised enforcement discretion in a variety of circumstances, such as when individuals import limited amounts of unapproved drugs for personal use. Although agency discretion has its limits, the Supreme Court has upheld the FDA's broad use of such discretion, and in light of this precedent an aggrieved manufacturer of the FDA-approved product would likely be unable to compel the FDA to act because of a presumption that agency enforcement discretion is not judicially reviewable.^{3,5}

Third, during emergencies, the US president possesses authority under the Defense Production Act (1950, Pub L No. 81-774) to compel owners of patents covering key treatments to

prioritize and accept government contracts, such as a contract to produce and sell drugs or vaccines.^{6,7} Reliance on Defense Production Act authority could overcome barriers that patent and nonpatent exclusivities alike pose by directing the patent-holding entity to increase production. During the COVID-19 pandemic, for example, the Defense Production Act has been used in several ways. A priority rating for vaccine contracts with Pfizer, for instance, helped the company procure raw materials for expanded production by forcing others in the supply chain to prioritize fulfilling Pfizer's needs.

Fourth, Congress could amend the Federal Food, Drug, and Cosmetic Act (1938, Pub L No. 75-717) and the Public Health Service Act (1944, Pub L No. 78-410) to carve out exceptions to existing nonpatent exclusivities for government use.^{1,8} Although an exception exists for biologics the Public Health Service prepares when the biologic is unavailable from the license holder,⁹ this kind of authority could be expanded in terms of both to whom and to what it applies as well as under what conditions. Exceptions to intellectual property rights for purposes of public health are widely recognized in international agreements. For instance, a key global treaty on intellectual property rights, the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) as well as some US free-trade agreements,¹⁰ allow countries to provide exceptions to data exclusivity rights when necessary to protect the public. More recently, to address the COVID-19 pandemic, several countries have proposed broadly waiving certain TRIPS provisions, including protections of undisclosed data submitted to governments for the approval and marketing of pharmaceuticals. Even if such a waiver is enacted, new national

legislation generally would be required for actual implementation.

Under US precedent, it is unclear whether a remedy (e.g., a reasonable royalty) for government use of data protected by nonpatent exclusivity is constitutionally required, and it likely depends on a new proposed law's specifics.^{11,12} Nevertheless, if Congress wanted to take a more conservative approach, it could require that the government engage in good faith negotiations with drug manufacturers before use, with some exceptions, including in cases of emergency. It could also provide a reasonable royalty to the patent holder, consistent with its obligations under TRIPS.¹³ Drafters of recently proposed federal legislation, the Make Medications Affordable by Preventing Pandemic Price Gouging Act of 2020, adopted a related approach.¹⁴ This bill, if enacted, would have required reasonable pricing for drugs during a public health emergency and provided that if prices were "excessive," nonpatent exclusivities would be waived and non-exclusive licenses granted freely.¹⁴ Holders of a nonexclusive license, however, would have had to pay a reasonable royalty to any holder of an FDA exclusivity that was terminated.¹⁴

These four approaches involve largely (but not exclusively) post hoc interventions. None is without challenge. Collecting trial data to support a duplicative new drug application is costly, is inefficient, and raises ethical concerns for humans participating in research generating little new knowledge.¹ Relying on enforcement discretion to introduce a drug without FDA approval would be a departure from the agency's standard procedures and could undermine public trust in the intervention. Defense Production Act powers apply only during emergencies and need to consider

potential adverse repercussions if non-prioritized contracts are delayed. Furthermore, although it appears to retain the right to do so, the Department of Health and Human Services indicates it will not require the fulfillment of prioritized contracts if the price terms are inconsistent with those of nonprioritized contracts.¹⁵⁻¹⁷

Congressional action is susceptible to political headwinds. Even if enacted, reasonable pricing requirements can be difficult to define, depending on their specifics; potentially create uncertainties for manufacturers when making investment decisions; and may be challenging for an implementing agency to enforce. Regarding agency involvement, for example, "march-in rights" provisions included in the Bayh-Dole Act (1980, Pub L No. 96-517) related to government use of taxpayer-funded health care-related inventions have lain largely dormant, and a National Institutes of Health reasonable pricing policy was, controversially, rescinded.¹⁸

It is the government's role to protect and promote public health, particularly in times of crisis. Although the government can use privately held patented inventions without permission subject to the requirement that it provide reasonable compensation, nonpatent exclusivities for drugs also potentially constrain the government's ability to address emerging threats to public health related to newly approved products. Of the four options considered, legislative reform arguably offers the most desirable solution to address accessibility issues posed by nonpatent exclusivities. It would create a long-standing resolution to the unanticipated barrier that now exists for modern government patent use and § 1498. Change brought through legislative reform would be more resilient to administration

changes. Ideally, it should clearly lay out expectations while being carefully crafted to address a variety of circumstances.

Yet, all pathways discussed face challenges, and their underlying mechanisms remain reactive. Therefore, the federal government should also consider prospective interventions that promote new drug development while retaining greater control over resulting products' accessibility or preempting accessibility issues generated by all exclusivities. Although political hurdles may exist, such proactive interventions could avoid the limitations of the four approaches described while blunting the near-term costs to public health that patent and nonpatent exclusivities pose.

Most ambitiously, the government should consider placing greater emphasis on conducting in-house the research and manufacturing activities needed to produce interventions most likely to be of importance during future global pandemics. In addition to drug development, the government could increase investment in the platform technologies (as it did for the widely used COVID-19 vaccines) needed to allow rapid customization and deployment of infectious disease products when urgent public health emergencies unexpectedly arise. Because private industry is less likely to be interested in pursuing drugs that may be needed only in times of public health crises, the timing and nature of which are difficult to predict,¹⁹ the government could develop these products through production²⁰ with potentially less resistance from the drug industry. This approach permits the government itself to obtain any patents and nonpatent exclusivity rights, circumventing these hurdles altogether.

Alternately, the US government could expand the model of advance purchase commitments for new drug development in the service of public health. Advanced purchase commitments were used, arguably effectively, for COVID-19 vaccines—broader concerns about their equitable international distribution notwithstanding. Although advance purchase commitments would require congressional funding, they are a logical extension of current government procurement practices, in which the government describes the products or services it requires and allows private contractors to fulfill those needs; industry players presumably are unlikely to oppose greater funding to purchase their products. Commitments could be offered for needed products on prespecified price and volume terms and on the condition that defined safety, efficacy, and other criteria are satisfied. This approach would better accommodate the need for revenue predictability when investment decisions are made.

In sum, important new medications are often protected by not just patents, but nonpatent exclusivities. Government patent use to address pressing public health needs therefore often requires consideration of supplemental tools to meet these additional challenges for the newest medicines. If the government decides to pursue one of the alternatives we have noted (e.g., reliance on FDA enforcement discretion or legislative amendment) or to invest more generally in innovation and procurement strategies to address the issue upstream, it can ensure that nonpatent exclusivities do not prevent access to products essential for public health, particularly during times of urgent need. **AJPH**

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Not in Our Name: The Disingenuous Use of “Public Health” as Justification for Title 42 Expulsions in the Era of the Migrant Protection Protocols

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Like many of the asylum seekers turned away at the border by the United States, Celina (name changed to protect her identity) left her home country of Honduras in early 2020 in hopes of a better life, to escape violence and harsh economic conditions, and wishing to reunite with family members living in the United States. However, on reaching the US border, Celina and her child were returned to Mexico because of a policy known as the Migrant Protection Protocols (MPP). Celina was then kidnapped in Mexico, causing her to miss her immigration hearing. When she was finally released and attempted to cross into the United States a second time, she was turned back again, this time because of a second US public health policy known as Title 42, which prevents would-be migrants from entering the country or seeking

asylum because of concerns that they may spread COVID-19.

While waiting in Mexico for a chance to reopen her closed MPP case, Celina became worried that she might be pregnant. She had missed her menses, which was not atypical given her history of irregularity, but she started having severe abdominal and pelvic pain accompanied by fevers. A home pregnancy test confirmed her condition. Concerned, she attempted to obtain pregnancy care in Mexico five times but was turned away each time because of her migrant status and her inability to pay for her care. This experience, combined with her history of trauma in her home country and her kidnapping, led Celina to have suicidal ideation. Fortunately for Celina, she was one of the lucky few asylum seekers who was able to secure assistance from a legal team. Members of the legal team approached

local border physicians (S. D. R. and M. G.) requesting a letter of declaration attesting to the seriousness of her medical condition. With this letter, the legal team was able to obtain approval for humanitarian parole, which allowed Celina to enter the United States, reunite with her family, and, ultimately, receive appropriate medical care for her pregnancy.

Sadly, Celina's experience at the US border is not uncommon, although her ultimate admission to the United States is rare indeed. Because of the confluence of MPP and the 2020 invocation of 42 US Code § 265 (hereafter “Title 42”), an obscure public health policy last updated in 1944, more than a million expulsions of migrants and asylum seekers occurred at the US border in fiscal year 2021 alone, contrary to international law.¹

POLICY BACKGROUND

The policy known today as Title 42 originated in a 1944 law called the Public Health Service Act, which (among other things) granted the federal government quarantine powers and the power to prevent the introduction of disease at the border. Section 265 of the law notes:

Whenever the Surgeon General determines that by reason of the existence of any communicable disease in a foreign country there is serious danger of the introduction of such disease into the United States, and that this danger is so increased by the introduction of persons or property from such country that a suspension of the right to introduce such persons and property is required in the interest of the public health, the Surgeon General . . . shall have the power to prohibit, in whole

or in part, the introduction of persons and property from such countries or places as he shall designate in order to avert such danger, and for such period of time as he may deem necessary for such purpose.²

In March 2020, the Trump administration invoked Title 42 to justify turning away migrants and asylum seekers who presented at ports of entry on the Mexican and Canadian borders and deporting those who were detained within US borders. Robert Redfield, then director of the Centers for Disease Control and Prevention (CDC), determined that

introduction into congregate settings of persons from Canada or Mexico would increase the already serious danger to the public health of the United States to the point of requiring a temporary suspension of the introduction of covered aliens into the United States.³

The same order also noted the logistical challenges of preventing the transmission of COVID-19 at the border:

Unfortunately, at this time, there is no vaccine that can prevent infection with COVID-19, nor are there therapeutics for those who become infected. . . . Commercial test results are typically available within three to four days. Currently, the time required to obtain test results—coupled with the incubation period of the disease—makes it impracticable to confirm whether each person moving into the United States is infected with COVID-19 at the time of the movement. Widespread, compulsory federal quarantines or isolations of such persons pending test results are impracticable due to the numbers of persons involved, logistical challenges, and CDC resource and personnel constraints.³

Although the US government did not have access to vaccines or rapid tests in March 2020, they need not have adopted such an extreme policy to protect the public's health. Consider, for instance, the reasoning of CDC director Redfield, who stated that invoking Title 42 was necessary to protect the public's health because detained migrants would be held in "congregate areas of [Customs and Border Protection (CBP)] facilities."³ However, it was never necessary to hold asylum-seeking immigrants in congregate areas of CBP facilities for an extended period of time. As Lopez et al. argue:

Given the barriers to effective implementation of PPE [personal protective equipment] and administrative controls to prevent the spread of [COVID-19] in immigration detention centers, an evidence-based public health approach suggests . . . the release of detainees from immigration detention centers, as this strategy will reduce the likelihood of person-to-person infection and enhance the possibility of engaging in meaningful social distancing and hygienic practices as directed by the CDC.^{4(p112)}

That the US government invoked Title 42 for those coming through land borders but instituted only temporary travel bans for other international travelers and did not institute interstate travel bans underscores how unnecessary these extreme measures truly were, even in the early days of COVID-19.⁵

In addition to the challenges posed by the use of Title 42 to prevent the entry of asylum seekers during COVID-19, MPP—often referred to as the Remain in Mexico program—creates additional barriers for migrants

seeking to enter the United States. Under MPP, individuals who arrive at the southern border and ask for asylum (either at a port of entry or after crossing the border between ports of entry) are given notices to appear in immigration court and sent back to Mexico.⁶ They are instructed to return to a specific port of entry at a specific date and time for their next court hearing. The program, which went into effect in January 2019, was used to send more than 70 000 migrants back to Mexico before it was suspended after President Biden took office.⁶ In August 2021, a federal court in Texas ordered the Department of Homeland Security to reinstate MPP—a decision that is currently under appeal—and in the meantime, MPP has been reinstated and new enrollments are continuing at several ports of entry.⁷ The policy was reviewed by the Supreme Court in April 2022, and a decision is expected this summer.^{7,8} However, even if MPP is ended, the effect of Title 42 will still be felt. The American Immigration Council, a nonpartisan advocacy group, notes that after Title 42 was invoked, "new placements into MPP were almost entirely replaced by Title 42 expulsions, meaning that people would be sent back to Mexico without being placed into any kind of court process."⁹

CLINICIAN PERSPECTIVE

For a glimpse at the on-the-ground impact of these policies, consider the case of the Rio Grande Valley Sector of the Texas–Mexico border, where S. D. R. and M. G. live and help coordinate medical care for immigrants with serious medical conditions. After Title 42 was invoked in 2020, the number of asylum-seeking families released into

this country by CBP decreased dramatically.¹ Families that are released to local nonprofit humanitarian shelters generally include women in their third trimester of pregnancy and their children. Department of Homeland Security policies indicate that pregnant people experiencing medical complications of pregnancy or in their third trimester are not subject to MPP,^{10,11} and, anecdotally, many pregnant women we see in humanitarian shelters report being turned away multiple times by CBP before reaching their third trimester. The mothers and their children who are refused admission in the Rio Grande Valley are returned to one of the most dangerous regions of northern Mexico, the State of Tamaulipas, where they are exposed to the risk of violence, kidnapping, and sexual assault. An alarming number of the released mothers report that their pregnancies are a product of rape on their journey through Mexico or at the US–Mexico border, and many volunteer aid organizations no longer travel to these regions of Mexico to provide humanitarian aid because of the extreme danger.

The pregnant mothers arriving at local humanitarian shelters report fearing for their own lives and their children's lives while being forced to remain in Mexico. Such fear, attributable both to Title 42 and MPP, is a form of toxic stress, which has been shown to contribute to adverse health effects in immigrant families.¹² This constant level of fear and the lack of access to basic hygiene and health needs, such as showering facilities, safe outdoor portable toilets, clean water, soap, and nutritious food, can have lasting impacts on the health of the mother and the fetus.

Clearly, Title 42 presents a significant threat to immigrant health by abusing

public health law to enact unjust immigration policies in violation of international law, and this threat is compounded by the continued use of MPP. Despite the Biden administration's previous indications that they planned to rescind Title 42, to date it remains in place and indeed has been defended in court by the Biden administration itself. We argue that this unjust and irregular application of public health law to deter migration severely undermines the stated purpose of promoting public health, exacerbates existing health inequities, and places legitimate asylum seekers, including women and children, at grave risk. We call on the public health community to denounce Title 42 and on the Biden administration to immediately rescind its use as an immigration deterrence measure.

GOING FORWARD

Even granting that caution was warranted in March 2020, when there was very little information about COVID-19 transmission or treatment, it is worth noting that these circumstances have changed. The US government now has many more resources available to address COVID-19 through less-restrictive means than a total bar to entry, including multiple vaccine options and rapid testing. In the face of the CBP's refusal to initiate testing and vaccinations, citing lack of capacity as the excuse, many border communities and local nonprofit humanitarian shelters have taken on the burden of testing and vaccinating.

Despite these changing circumstances, the Biden administration has left Title 42 in place and has used it to justify the expulsion of asylum-seeking migrants, including the well-publicized

expulsion of more than 7000 Haitian migrants in October 2021.¹³ Homeland Security secretary Alejandro Mayorkas defended the policy, saying, "Title 42 is not an immigration authority, but a public health authority. To protect the American public. To protect the communities along the border. And to protect the migrants themselves."¹⁴

In the ongoing litigation on the current use of Title 42, a recent ruling in the US Court of Appeals for the DC Circuit underscores the absurdity of this claim. In this case, Circuit Judge Justin R. Walker observed:

We are not cavalier about the risks of COVID-19. And we would be sensitive to declarations in the record by CDC officials testifying to the efficacy of [Title 42]. But there are none. To be sure, as with most things in life, no approach to COVID-19 can eliminate every risk. But from a public-health perspective, based on the limited record before us, it's far from clear that the CDC's order serves any purpose.¹⁵

Judge Walker's acknowledgment that Title 42 does not appear to serve a legitimate public health purpose did not, however, prevent him from finding that migrants could still be expelled without being allowed to make a case for asylum. And indeed, in another case that was decided the same day, a judge in the US District Court for the Northern District of Texas ruled that the Biden administration could not exempt unaccompanied children from Title 42 expulsions. Within a week, the CDC revised its guidance to once again exclude unaccompanied children from Title 42, noting, "Expulsion of unaccompanied noncitizen children is not warranted to protect the public health."¹⁶ Secretary Mayorkas's insistence that

Title 42 is intended to protect “the migrants themselves” appears almost laughable in light of these decisions. His defense of the policy fails to account for the irreparable harms that can result from returning asylum seekers to Mexico, their country of origin, or a third country without allowing them to make a case for asylum, in violation of international law.¹⁷

Another issue with continuing Title 42 expulsions in violation of international law is that the United States may in fact be contributing to the spread of COVID-19 to underresourced nations that do not have the same tools available to curb the spread of the pandemic. Given the wide availability of vaccines and rapid tests in the United States and the limited access to these resources in many of the countries from which asylum seekers hail, Title 42 has the potential to compound global health inequities. This is in stark contrast with the United States’ stated position of pursuing global vaccine equity. President Biden said in a statement:

As long as this pandemic is raging anywhere in the world, the American people will still be vulnerable. And the United States is committed to bringing the same urgency to international vaccination efforts that we have demonstrated at home.¹⁸

It is striking that US policy can recognize that the health of all members of the global community is interrelated with regard to the international distribution of vaccine doses but not with regard to the health of migrants at our borders. By failing in its duties toward migrants and asylum seekers during a global pandemic, the United States takes a dangerously narrow view of whose health is included in public

health, and in so doing fails in its obligations to promote and protect public health within and beyond its borders.

Public health professionals and human rights advocates alike have denounced both Title 42 and MPP as deeply harmful to public health and to the United States’ standing as a world leader.^{19,20} As a result of this advocacy, the Biden administration has indicated that it plans to end Title 42 restrictions on asylum seekers within the next few months, although they are currently unable to do so because of an injunction by a federal court.²¹ We call on the Biden administration to remain steadfast in their decision to withdraw Title 42 guidance; to continue efforts to end MPP and resume regular processing for migrants and asylum seekers at the US border; to increase the capacity of CBP to provide testing, isolation, and vaccination; and to stop relying on impoverished border communities and local nonprofit humanitarian organizations to provide these critical services. *AJPH*

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A Rights-Based Approach to Youth Inclusion in Public Health Policy

Danielle Layton, MSW, Michael Forst, MA, and Beth Broderick, JD

ABOUT THE AUTHORS

Danielle Layton, Michael Forst, and Beth Broderick are with the Maine Youth Action Network, Portland.

The overall health of the US population has steadily improved over the last century.¹ However, this progress has not been experienced equally, indicated by widening health disparities rooted in unfair social, political, and economic arrangements governing people's living conditions.¹ Youths have historically been kept at the margins of processes that differentially shape the social contexts patterning their health experiences and potentials. Drawing on examples of youths engaged in public policy in the US state of Maine, we argue that youths have a right to meaningful inclusion in public health policymaking as laid out in the UN Convention on the Rights of the Child. Furthermore, we assert that youths' developmental strengths, as seen through the lens of positive youth development (PYD), are uniquely valuable in structural health equity initiatives.

YOUTHS' RIGHT TO HEALTH-AFFIRMING SOCIAL CONTEXTS

People are embedded within neighborhoods, communities, political atmospheres, and economic systems; these contexts determine living conditions such as access to quality education,

employment with living wages, adequate and appropriate health care, affordable healthy food and physical recreation, and community support. These contexts, known as social determinants of health, shape people's health outcomes.¹

Social determinants of health begin shaping youths' lives and health potentials before they are given opportunities to participate in shaping the policies that affect them. Yet youths have inherent rights to health, enumerated by the UN Convention on the Rights of the Child.² Among these are the rights to "the highest attainable standard of health" (Article 24), and to "a standard of living adequate for the child's physical, mental, spiritual, moral and social development" (Article 27). Furthermore, Article 12 affirms children's right to formulate and "express [their own] views freely in all matters affecting [them], [their] views . . . being given due weight in accordance with [their] age and maturity." When youths participate in matters of public policy that affect them, they are often met with patronizing, dismissive, or derogatory reactions from adults.³ This norm undermines youths' right to participate in decision-making processes that shape

their living conditions, which in turn determine their health.

SOCIETY'S NEED FOR POSITIVE YOUTH DEVELOPMENT

Aligned with the social determinants of health framework, which situates individuals' health outcomes within social contexts, PYD regards human development as a product of youths' internal assets functioning in tandem with their environmental resources and supports.⁴ As a strengths-based perspective, PYD maintains that all youths have internal and external assets that make their individual development and their contributions to society unique.⁵

Aligned with the UN Convention on the Rights of the Child, PYD insists that society is responsible for fostering environments where youths have the resources they need to thrive and, importantly, for involving youths as partners in shaping their world, as contribution is both a means and an end to PYD.⁵

Although favorable environmental contexts are essential for positive development, Yeager identifies four internal drives that help youths develop through adolescence⁵: (1) to stand out: to develop a personal identity; (2) to fit in: to develop a sense of connectedness; (3) to measure up: to develop competence and find ways to achieve; and (4) to take hold: to make commitments to particular goals, activities, and beliefs. Two hallmark internal strengths of adolescence help fulfill these drives: an increased willingness to take risks for social rewards⁶ and an increased drive to participate in community and be included by peers.⁷ These attributes position youths to be uniquely daring,

innovative, and justice-conscious contributors to initiatives addressing structural justice and health equity.

PARTNERING WITH YOUTHS TO EFFECT HEALTH JUSTICE

Maine contends with significant and persistent health disparities stemming from inequitable social contexts.⁸ The COVID-19 pandemic made this apparent when in 2020 the state experienced some of the country's lowest rates of cases and deaths but saw the greatest racial disparity in the United States.⁹ Black, Latino, Indigenous, and other community leaders of color demanded substantive action to address these disparities emerging from Maine's "legacy of racism."¹⁰ In response, Maine's Department of Health and Human Services announced the establishment of the Office of Population Health Equity (OPHE) within the Maine Center for Disease Control (MCDC) to collaborate within and beyond the MCDC to achieve health justice.¹¹

The MCDC prioritizes youth participation through its funding to the Maine Youth Action Network (MYAN), which is composed of community-based, PYD-guided programs that engage youths on issues of public health education, research, and policy. Through this network, the MCDC supports youths' knowledge of local needs and solutions, which inform state-level policies and resource allocation. PYD principles guide MYAN-affiliated programs in supporting youth development, activating youths' strengths, and avoiding harms such as tokenizing, condescending, and inadequately supporting or micromanaging youths. However, mirroring the limited scope of issues prioritized for youth engagement

federally,¹² MCDC-funded youth engagement has so far focused on primary prevention of substance use, commercial tobacco use, obesity, and suicide. The MCDC's recommitment to health justice presents an opportunity to leverage youths' developmental orientation toward justice and capacity for innovation by expanding the scope of youth engagement to include the work assigned to the OPHE.

Changes to Maine's social contexts wrought by youth activism indicate that the MCDC can accelerate health equity work by extending more power to youth partners. Maine youths are dynamically engaged in social justice issues in their communities and exert increasing influence in Maine's government and public systems via a Young People's Caucus and a deepening bench of youth advisory stakeholders.¹³ Maine youths are active in national and global movements such as March For Our Lives campaigning to change gun control legislation and Youth Climate Strikes urging large-scale climate action. OUT Maine's Trans Youth Health Board conducted research linking health disparities affecting lesbian, gay, bisexual, transgender, and queer (LGBTQ) Mainers to inadequate and exclusionary sex education taught in schools. Their work yielded detailed recommendations for inclusive health education in schools as well as training and inclusive protocols for health care practitioners.¹⁴ Indigenous Wabanaki youths supported a years-long effort to remove Native mascots, conducting research on Indigenous misrepresentation and producing a public awareness campaign about how dehumanizing, hypersexualized, and commercialized misrepresentation contributes to adverse health experiences and ongoing erasure of Indigenous people.¹⁵ These and other examples of MYAN-affiliated work

demonstrate that youth inclusion can effectively dismantle structures that produce health disparities and establish more just and health-affirming norms.

CONCLUSION

Structural inequality results in health disparities in Maine, as elsewhere. This status quo is incompatible with PYD and fails to uphold youths' right to health. PYD's embrace of context and interconnectedness makes it an apt lens for seeing our health outcomes as intertwined. Furthermore, PYD's rejection of paternalism means that youths' contribution to our shared social contexts is both a necessary component for youths' individual development and an invaluable asset for actualizing health justice. PYD is therefore a framework for a justice-oriented social contract that takes a holistic view of health and development in social contexts and insists on both society's accountability to youths and youths' contribution to society. In fulfillment of the UN Convention on the Rights of the Child and guided by PYD, public health policymaking in Maine and beyond should include youths as valued collaborators and equal stewards of the social contexts shaping people's health. **AJPH**

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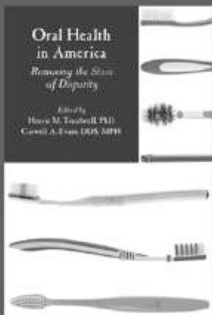
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Preventing Childhood Vision Loss Through Exploitative Prison Labor: A Call for Action

Julius T. Oatts, MD, Jacob Hutt, JD, and Alejandra G. de Alba, MD, MPH

ABOUT THE AUTHORS

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In July 2020, together with a corneal surgeon, I (J. T. O.) performed complex eye surgery for a two-month-old baby born with a congenital malformation of the front of the eye requiring corneal transplantation and cataract removal. Postoperative care required obtaining a pair of glasses as soon as possible to prevent irreversible vision loss from amblyopia. Conversations with the optical dispensary revealed a several month delay in glasses production with an unexpected cause: COVID-19 outbreaks in the California prison system.

The California Prison Industry Authority (CALPIA), a semiautonomous prison labor agency under the California Department of Corrections and Rehabilitation, runs two optical laboratories operated by people incarcerated at Valley State Prison and California State Prison, Solano,¹ and these laboratories supply ophthalmic lenses to eligible Medicaid recipients, such as this young patient. Three months before this child's surgery, CALPIA had paused the vast majority of its operations, including those at its optical laboratories, because of the COVID-19 outbreak.² This situation did not just illuminate a surprising connection between public health care and prisons.

It caused the authors—two physicians and one lawyer in California—to rethink public health care stakeholders' participation in a system that supports exploitative prison labor.

With more than 1.5 million people incarcerated in state and federal prisons and approximately half of the incarcerated population assigned to work programs, the United States is home to a sprawling prison labor economy.^{3–5} Prison labor, which refers to the work performed by incarcerated individuals, was explicitly licensed by the Thirteenth Amendment, which states that slavery and involuntary servitude may serve as “punishment for crime whereof the party shall have been duly convicted.”

This practice became common in post-bellum Southern states and allowed private companies and slave labor camp owners to “rent” predominantly Black imprisoned people to perform uncompensated work. Despite this practice falling out of favor, the underlying philosophy behind state-controlled prison labor remains essentially unchanged in 2022: the government, without violating the Constitution, may order incarcerated people to perform uncompensated or

minimally compensated labor. Incarcerated people may be required to perform tasks to keep the prison running, work for private companies that contract with prisons, or work for public entities such as CALPIA, California's prison labor agency, that create products (e.g., eyeglasses) to supply both public and private entities.

An example of prison labor's entrenchment in US commerce is its use in public health care. Documents we obtained through a public records request revealed that our state's public health agency, the California Department of Health Care Services (DHCS), agreed to pay CALPIA up to \$37.9 million for the 2021/22 fiscal year for optical services alone. A CALPIA representative confirmed that DHCS, through its Medicaid contracts, makes up 74% of CALPIA's optical service revenue. In other words, California's Medicaid program is far and away the largest funder of the optical division of the state's prison labor system.

So, despite the virtuous principles underlying public health care, DHCS relies on unambiguously exploitative labor. CALPIA wages in prison-based optical shops range between \$0.35 and \$1.00 per hour,⁶ up to 55% of which can be deducted by law for restitution and administrative costs, resulting in an effective pay rate as low as \$0.16 per hour.⁷ Courts have routinely rejected legal challenges to these meager wages by concluding that, because the Thirteenth Amendment permits the involuntary servitude of incarcerated people, the federal minimum wage law does not apply to prison labor.⁸

The result is a strange supply chain that is not always transparent or top of mind: medical devices produced by poorly paid imprisoned people are provided to the poorest members of free society, such as the infant who needed

sight-saving glasses. We (two medical providers and a lawyer for incarcerated people) have observed firsthand how interconnected the two groups' vulnerabilities are. The medical care of poor, publicly insured patients depends in part on the low wage labor performed by incarcerated workers. The low wages of incarcerated workers depend in part on a complacent buyer—the public health department—and, arguably, complacent medical providers who prescribe devices purchased by state Medicaid entities.

Put simply, a system designed to protect children who otherwise would not have access to care supports exploitative conditions affecting another vulnerable population. Money allocated for public health ultimately funds an institution known to disproportionately punish marginalized people.⁹ This use of prison labor to manufacture glasses is not unique to California and has been described in Pennsylvania and New York, but more research is needed to determine whether this labor relies on publicly funded resources.^{10,11}

Some argue that prison labor benefits incarcerated people. For instance, an incarcerated worker could learn marketable skills through their assigned job and may derive meaning from contributing to society by making medical devices that will help someone's sight. In our state, for example, the incarcerated people working for CALPIA's prison-based optical laboratories can and should be credited with producing the device that prevents childhood vision loss. Participation as a prison laborer can also be viewed favorably with regard to decisions about parole. But these "benefits" must not distract from the exploitative context in which they arise. In our state, prison work is not only

extremely undercompensated but also mandatory—governing law states that incarcerated people are "obligated to work"¹² and subjects them to discipline if they do not.¹³ How meaningful is a benefit that one is forced to accept?

Ultimately, this situation illuminates a complex system that ties physicians and their patients to the prison industrial complex. Increasing awareness of this relationship could result in a greater understanding of the far-reaching effects of prison labor and greater scrutiny of the role of physicians in acknowledging and addressing the systems we support through our clinical care. The two-month-old patient was not the first and will not be the last to rely on an exploitative system to provide a medically necessary and sight-preserving treatment prescribed by her physician.

Others have called for public health officials, researchers, and physicians to address the sprawling reach of the prison industrial complex.¹⁴ Medical providers could use their position of authority to advocate better pay and conditions for incarcerated workers who produce the very devices that providers prescribe. Alternatively, medical providers could organize around resisting a systematic reliance on prison labor-sourced medical devices. In other words, "First, do no harm" may extend beyond the patient-doctor relationship and include a broader obligation to think critically about how one's medical practice is indifferent to, or even causes, harm to others besides the patient. As care providers, we are not free from the social complexities that underlie the US history of incarceration or prison labor. **AJPH**

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Racism: Science & Tools for the Public Health Professional

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This important publication builds on the racial health equity work that public health advocates and others have been doing for decades. They have documented the existence of health inequities and have combatted health inequities stemming from racism. This book, which targets racism directly and includes the word squarely in its title, marks an important shift in the field's antiracism struggle for racial health equity. It is intended for use in a wide range of settings including health departments, schools, and in the private, public, and nonprofit sectors where public health professionals work.

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The Opioid Industry Documents Archive: A Living Digital Repository

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After 20 years and more than one million deaths, the overdose epidemic continues to take a major toll on communities across the United States.¹ Although many drugs are implicated in the crisis, opioids have played a central role, and nearly half of opioid-related deaths between 1999 and 2019 involved prescription opioids. A number of factors have contributed to the opioid epidemic, including aggressive marketing of pharmaceutical opioids, misleading claims about their potential to cause physical dependence or opioid use disorder, and lax monitoring and control of pharmaceutical distribution and dispensing by wholesalers and pharmacies.

The magnitude of harms, as well as the role of defendants in causing them, has generated thousands of lawsuits against manufacturers, distributors,

pharmacies, and others. The lawsuits argue that pharmaceutical manufacturers engaged in deceptive marketing while distributors and pharmacies failed to identify or stop suspicious shipments of controlled substances through the pharmaceutical supply chain, driving the opioid crisis.² The evidence uncovered in these lawsuits has revealed startling shortcomings in how prescription opioids have been marketed, promoted, and managed throughout the pharmaceutical supply chain.

Following the precedent of state and federal litigation against the tobacco industry in the 1990s,³ recent and proposed settlements against defendants in opioid litigation, including Insys, Malinckrodt, McKinsey, and Purdue, have included requirements that documents produced during legal discovery be

made public.⁴ To make such documents public requires a system to ingest, process, curate, and host the documents to facilitate their use and impact. We report on an undertaking by the University of California, San Francisco (UCSF) and Johns Hopkins University to consolidate these materials into a free, accessible Opioid Industry Documents Archive (OIDA). Ultimately, the archive is designed to maximize the generation of fundamental new knowledge regarding the opioid overdose epidemic that can inform policies and practice changes to prevent future harms. The archive may also serve a number of additional purposes, ranging from providing the bereaved with greater accountability to supporting historical scholarship that generates fundamental new insights regarding systematic factors that have driven the opioid epidemic.⁵

BUILDING ON TRUTH TOBACCO INDUSTRY DOCUMENTS ARCHIVE

The OIDA is the newest addition to the UCSF Industry Documents Library (IDL), a digital repository that provides access to millions of documents from the tobacco, chemical, drug, food, and fossil fuel industries. In addition to supporting in-depth explorations of specific industries, the IDL allows users to search across industries to find common threads. The IDL originated with UCSF's Truth Tobacco Industry Documents Archive, a digital portal to more than 15 million internal tobacco industry documents, with most funding supporting the archive coming directly or indirectly from litigation against the tobacco companies.

The tobacco documents reveal industry strategies to question science, cast

doubt about the health harms of its products, delay public health regulation, and increase profits by marketing to targeted groups, including youths, women, African Americans, Latinx communities, and the LGBTQ (lesbian, gay, bisexual, transgender, queer) population. Scholarship using the Truth Tobacco Industry Documents Archive⁶ has driven transformative public policy governing tobacco products—most notably, state and local ordinances mandating smoke-free public spaces and workplaces⁷—as well as the adoption of the World Health Organization (WHO) Framework Convention on Tobacco Control, the first global health treaty negotiated under the auspices of the WHO.⁸

The ability to search across industries in the UCSF IDL has enabled researchers to identify links among alcohol, chemical, drug, food and drink, fossil fuel, and tobacco companies in terms of their strategies and political influence, as well as shared corporate ownership. Each of these industries has pursued similar efforts to undermine regulations regarding the use of unhealthy products.⁹⁻¹¹

The opioid industry has used many of these approaches, including racially and ethnically targeted marketing.^{12,13} Collectively, these strategies provide compelling examples of the “commercial determinants of health”¹⁴ and highlight the often-overlooked influence of private-sector companies on population and individual health outcomes.¹⁵ The archive also builds upon growing interest in the digital humanities. Sometimes called “public humanities” or “translational humanities,” it is an emerging field that is based on the application of computational methods to explore difficult-to-discern patterns, insights, or themes within large corpora of materials.¹⁶

WHAT DOES THE OPIOID INDUSTRY DOCUMENTS ARCHIVE CONTAIN?

As of May 2022, the OIDA contained 1 526 747 documents (7 842 493 pages; Table 1). With new settlements in the coming months, the archive is likely to continue to grow. Current documents have been contributed from US District Court records, several state attorneys general investigations, journalists, plaintiff and defendant exhibits and depositions, bankruptcy cases (e.g., Insys, Mallinckrodt), and legal settlements (McKinsey and Co). The collections contain e-mails, memos, presentations, sales reports, budgets, audit reports, Drug Enforcement Administration briefings, meeting agendas and minutes, expert witness reports, and depositions by pharmaceutical company executives. The exhibits in Table A and the Appendix (available as a supplement to the online version of this article at <http://www.ajph.org>) are examples that illustrate the range of materials in the OIDA.

WHAT QUESTIONS CAN THE ARCHIVE SUPPORT?

Appendix Table B lists questions, varied in nature and scope, that the documents from the archive can help answer. For example, materials related to pharmaceutical distributors speak to the methods that they used to monitor the opioid supply chain, and the degree to which indicators of potential high-risk opioid distribution were acted upon. Policy analyses might examine how manufacturers engaged with advocacy organizations to achieve their policy objectives and strategies that manufacturers may have used to respond to regulatory concerns regarding opioid safety.

The varied nature of the documents, which include corporate e-mail chains and internal company documents in connection with brochures and pamphlets, allow researchers to compare internal marketing strategies against the claims of safety and due diligence presented to practitioners and regulatory bodies. Because the litigation also includes a focus on abatement, the documents also contain extensive information regarding how to best prevent further harms, and at what cost.

A DYNAMIC COLLECTION

The OIDA is a dynamic, growing repository that is likely to add several million documents over the next 18 months. Based on the successful tobacco model, future opioid settlements and judgments, including those arising from distributors and pharmacies rather than manufacturers alone, should make discovered materials public and support their accessibility and use in perpetuity.

As the archive expands, nonlitigation materials can also be included, some of which are already in the public domain yet difficult to identify, access, and analyze in context, such as state and national public health policies, professional society activities and guidelines, Food and Drug Administration regulatory reviews, white papers, and other gray literature. Future additions to the archive may also help to ensure awareness of how morbidity and mortality from opioid use have been intertwined with harms arising from heroin, illicit fentanyl, and other substances.¹⁷ The archive might also support the preservation of information from advocacy groups, as well as individuals and family members directly affected by the epidemic, as part of communities’ efforts to preserve the history of those with

TABLE 1— Key Collections in the Opioid Industry Documents Archive, March 2022

Content (Source)	Dates	Documents (Pages)	Description
OxyContin marketing and budget records (Kaiser Health News)	1996–2002	9 (370)	Internal marketing plans and budget report produced by Purdue Pharma for the promotion and sale of OxyContin
<i>State of Oklahoma v Purdue Pharma, et al.</i> (Office of the Oklahoma Attorney General)	1995–2011	505 (62 810)	State and defendant exhibits admitted during lawsuit brought by the State of Oklahoma against Johnson & Johnson, Purdue Pharma, and other drug companies
Defendant exhibits from MDL 2804 (<i>Washington Post</i> and <i>Charleston Gazette-Mail</i>)	2007–2019	55 (1 400)	Depositions of Mallinckrodt executives as well as their e-mails, memos, and presentations
National prescription opiate litigation documents from MDL 2804 (Public Record)	1988–2019	2 402 (11 420)	Depositions from pharmaceutical company employees, DEA agents, plaintiffs as well as court exhibits, filings, and motions
<i>Kentucky v Purdue Pharma</i> (STAT News)	1991–2015	281 (5 570)	Court motions, filings and depositions of employees, as well as internal company documents that have been publicly filed in the court’s docket as exhibits: e-mails, memos, reports, sales and marketing materials, and articles
Insys litigation (US Bankruptcy Court for the District of Delaware)	2000–2019	9 587 (56 453)	Transcripts from the trial; internal sales training materials, sales rep data, and compensation strategies; submissions to regulatory agencies regarding consumer guides, brochures, and prescribing information; graphics designs for product packaging and labeling; brochures and prescribing publications intended for physicians and the general public; advertisements and marketing materials; and other internal documents
Mallinckrodt litigation (US Bankruptcy Court for the District of Delaware)	2002–2020	1 398 993 (7 413 659)	Deposition transcripts, exhibits, and videos for more than 40 leadership, sales, marketing, and compliance figures at Mallinckrodt; e-mails, reports, presentations, and other documents detailing Mallinckrodt’s relationships with prescribers, many of whom lost licenses or faced criminal charges relating to opioid prescribing; sales data including charge-back reports; marketing and promotional materials, including images and videos
McKinsey litigation (Court orders entered in 47 States; expected June 2022)	2000–2020	114 915 (290 811)	Statements of work, e-mails, reports, memos, presentations, spreadsheets, invoices, and other materials relating to McKinsey’s consulting work for Purdue Pharma and other opioid manufacturers
Totals		1 526 747 (7 842 493)	

Note. DEA = Drug Enforcement Administration; MDL = multidistrict litigation.

lived experience of the crisis. The information the archive contains may be of interest not only to those personally affected, but also to researchers, journalists, policymakers, and the general public, as it can be used to generate fundamental new knowledge regarding the opioid epidemic that informs policies and practice changes to prevent future harms.

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G. C. Alexander, L. A. Mix, S. Glantz, and K. Tasker conceptualized the study. G. C. Alexander, L. A. Mix, M. Mooghali, A. Fan, S. Glantz, and K. Tasker drafted the report. All remaining authors made substantive and iterative revisions to the draft to

improve its clarity, precision, and breadth. All authors approved of the final manuscript version.

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CONFLICTS OF INTEREST

G. C. Alexander is past chair and a current member of the Food and Drug Administration’s (FDA’s) Peripheral and Central Nervous System Advisory Committee; is a co-founding principal and equity holder in Monument Analytics, a health care consultancy whose clients include the life sciences

industry as well as plaintiffs in opioid litigation, for whom he has served as a paid expert witness; and is a past member of OptumRx's National P&T Committee. This arrangement has been reviewed and approved by Johns Hopkins University in accordance with its conflict of interest policies. D. Ciccarone serves as a paid scientific advisor to Celero Systems and is a plaintiffs expert in opioid litigation. He has served as a Special Government Employee at the behest of the FDA on the Drug Safety and Risk Management Advisory Committee. M. A. Steinman was an unpaid expert witness in *United States of America ex rel. David Franklin v Parke-Davis, Division of Warner-Lambert Company and Pfizer, Inc.*, and assisted in the creation of the UCSF Drug Industry Documents Archive.

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Assessing the Impact of Vaccine Lotteries on COVID-19 Vaccination Rates in the United States in 2021

Jeffrey Sload, MPhil, Benjamin Bechtolsheim, MBA, and Deidre Gifford, MD, MPH

We assessed the impact of COVID-19 vaccine lottery programs on COVID-19 vaccination coverage using Centers for Disease Control and Prevention–reported first-dose vaccination administration rates for the population aged 18 years and older for 19 states that adopted lottery-based incentive programs. We did not find evidence of increased first-dose vaccination rates following lottery announcements across participating states and, therefore, find little justification for the use of COVID-19 vaccination lotteries to increase vaccination rates. (*Am J Public Health.* 2022;112(8):1130–1133. <https://doi.org/10.2105/AJPH.2022.306863>)

As COVID-19 first-dose vaccination rates slowed in the late spring of 2021, several US states launched cash lottery programs to incentivize vaccine uptake. As COVID-19 continues to be a global public health challenge, and as public health officials continue their efforts to support routine vaccinations, understanding the impact of these lotteries, as well as other incentives, is critical to effective public health policy and program design.

INTERVENTION AND IMPLEMENTATION

For much of the past two years, our team has focused on ensuring that as many residents of Connecticut as possible receive a COVID-19 vaccine. Like nearly every other state in the country, in April 2021, the dynamics of our COVID-19 vaccine program changed: for the first time since vaccines were introduced, supply outpaced demand. The urgency of building demand for vaccines and continuing to address

access barriers became our primary concern. As part of this effort, we closely observed the national interest in incentives and, specifically, states utilizing large-scale cash lotteries to encourage vaccination. During this time, we conducted an analysis based on Centers for Disease Control and Prevention (CDC) data to discern whether lotteries were encouraging vaccinations. This analysis has been updated and is presented here.

PLACE, TIME, AND PERSONS

On May 12, 2021, Ohio announced the first lottery program to incentivize COVID-19 vaccine uptake. Ohio offered five, \$1-million prizes to individuals aged 18 years and older who had received at least one vaccine dose and entered the drawing either online or by phone; separately, Ohio gave away five state scholarships to adolescents aged 12 to 17 years under the same guidelines.¹

Ohio's announcement garnered national media attention, and Arkansas, California, Colorado, Delaware, Maryland, New York, and Oregon subsequently announced similar programs in late May. These, as well as additional lottery programs in June and July, may have been influenced by early reports² that Ohio's vaccination rates increased substantially week-over-week following the lottery announcement.

PURPOSE

The initial launch of the Ohio lottery coincided with the expanded age indication for those aged 12 to 15 years (May 13, 2021) and CDC changes to masking guidance for vaccinated individuals (May 13, 2021); these and other structural factors may have contributed to the perceived "lottery bump." Indeed, previous work^{3,4} has cast doubt on the effectiveness of Ohio's lottery, as well as of vaccine lotteries broadly. Here, we offer a more specific look at the impact of lotteries on state vaccination rates.

By comparing trends in vaccination in the periods before and after the announcement of a lottery in each individual state, we investigated the unique impact that a lottery announcement had on state vaccination rates. Because these lottery announcements were spaced out over time, the broader trends driving vaccination rates, such as changing public health guidance, expansion of age eligibility, or trends in vaccine hesitancy, were mitigated in our analysis, and the effect of the lottery announcements was isolated as our subject of analysis.

To assess the impact of these vaccine lotteries, we analyzed CDC first-dose vaccination data for individuals aged 18 years and older, both to exclude the impact of vaccinations on individuals aged 12 to 15 years as they became newly eligible and because the states had inconsistent policies for the prizes for children aged younger than 18 years. Our analysis included the 19 states identified previously³ as offering cash or in-kind lotteries (full list in Table A, available as a supplement to the online version of this article at <https://ajph.org>).

EVALUATION AND ADVERSE EFFECTS

For an initial view of lottery impact on vaccination rates within each state (i.e., as a result of different-sized hesitant populations), we compared the vaccination rates in the three weeks following the lottery announcement with the state's vaccination rate for the two weeks before the lottery announcement. Our analysis does not regard lotteries successful if they arrest or reverse trends in declining vaccination rates; rather, we seek to observe whether there are incremental vaccinations that can be attributed to lottery

states subsequent to announcement (even if overall trends continue to decline). To account for these factors, we compared the change in vaccination rates within lottery states to the change in vaccination rates for the rest of the United States (i.e., excluding the 19 lottery states) over each of the relevant time periods. This final measure of lottery impact is represented in terms of aggregate impact on the first-dose coverage rate for the population aged 18 years and older.

We chose the window of analysis because three weeks generally covered at minimum the first round of selection of winners. We evaluated the sensitivity of this analysis to other control and effect periods with similar results (Table A). We express the output figures in terms of the aggregate impact on the first-dose vaccination coverage rate for the population aged 18 years and older.

Table 1 presents this analysis for the "early adopter" May announcement states. Of the early lottery states, only Ohio increased its vaccination coverage relative to the rest of the United States, and only by 0.2% of the population aged 18 years and older, considerably within the bounds of the 2.1% standard deviation in percent change of vaccinations observed across all states over this period. More broadly, only Ohio, Arkansas, and New York demonstrated increased coverage at the third week mark or later versus the rest of the United States, and only marginally (Table A). Overall, lottery states underperformed the rest of the United States by 0.6% coverage of the population aged 18 years or older in the three weeks after announcement versus the two-week preceding baseline.

It is possible that either the lotteries did not move a meaningful number of individuals to receive a COVID-19

vaccine or that the lotteries did encourage some vaccinations that were ultimately offset by other individuals for whom the lotteries had a negative impact on vaccine acceptance. In addition, other states and private institutions offered more targeted incentives; it is possible that these were more effective strategies, contributing to the aggregate underperformance of the lottery states as these sorts of initiatives were crowded out. Overall, our analysis does not support the idea that lotteries themselves drove incremental vaccinations at the population level when compared with national performance.

SUSTAINABILITY

We did not find evidence that lotteries systematically increased first-dose vaccination rates in the population aged 18 years or older. Furthermore, the public health impact of these programs may prove to be worth neither the cost nor the negative externalities associated with gambling-related activities.

We also have concerns about the precedents that such lotteries set for other vaccination and public health efforts. COVID-19 is one of several life-saving vaccines that we want adults and children to receive. We must focus not just on ensuring COVID-19 vaccine coverage but also on ensuring that children catch up on routine vaccines—some of which were missed during the COVID-19 pandemic, presenting yet another threat to lives and livelihoods yet to emerge. As an alternative to lotteries, our state pursued a more targeted and modest set of incentive programs and redoubled efforts to tap into peer-to-peer and trusted messenger activation and engagement.

TABLE 1— Assessment of Lottery Impact on Coverage Rates in Lottery States vs the Rest of the United States: 2021

	AR	CA	CO	DE	MD	NY	OH	OR
Lottery announcement date	May 25	May 27	May 25	May 25	May 20	May 20	May 12	May 21
Lottery states								
Baseline: first dose volume in 2 weeks before announcement	46 853	1 001 616	151 413	26 207	206 314	584 333	268 424	177 602
Adjusted baseline: inferred 3-week first dose volume baseline	70 280	1 502 424	227 120	39 311	309 471	876 500	402 636	266 403
After lottery: first dose volume in 3 weeks after announcement	46 458	1 086 695	138 863	26 237	191 588	705 643	331 851	144 378
Absolute change: first dose volume after announcement vs adjusted baseline	-23 822	-415 729	-88 257	-13 074	-117 883	-170 857	-70 785	-122 025
% change: % of population aged ≥ 18 years getting incremental first doses relative to baseline	-1.0	-1.4	-2.0	-1.7	-2.5	-1.1	-0.8	-3.6
Non-lottery states								
Baseline: first dose volume in 2 weeks before announcement	4 399 842	4 176 882	4 399 842	4 399 842	4 603 315	4 603 315	5 444 947	4 690 358
Adjusted baseline: inferred 3-week first dose volume baseline	6 599 763	6 265 323	6 599 763	6 599 763	6 904 973	6 904 973	8 167 421	7 035 537
After lottery: first dose volume in 3 weeks after announcement	3 908 640	3 927 389	3 908 640	3 908 640	4 802 015	4 802 015	5 687 109	4 601 125
Absolute change: first-dose volume after announcement vs adjusted baseline	-2 691 123	-2 337 934	-2 691 123	-2 691 123	-2 102 958	-2 102 958	-2 480 312	-2 434 412
% change: % of population aged ≥ 18 years getting incremental first doses relative to baseline	-1.0	-0.9	-1.0	-1.0	-0.8	-0.8	-1.0	-0.9
Implied lottery impact: % population aged ≥ 18 years in lottery state getting first dose vaccine relative to rest of United States	0.0	-0.5	-0.9	-0.7	-1.7	-0.3	0.2	-2.7
SD in % change of incremental doses for the given date across all states	2.5	2.5	2.5	2.5	1.7	1.7	2.1	1.8

Note. The two weeks before the baseline includes the 14 days preceding the vaccine announcement (e.g., for May 12, this would be April 28–May 11), while the three subsequent weeks are inclusive of the day of the announcement (e.g., for May 12, this would be May 12–June 1). The US data are the figures for the entire United States, excluding the 19 states included in this analysis. Population figures are used from the same Centers for Disease Control and Prevention (CDC) data source. SD calculations are based on the percent change of the population aged 18 years and older for all 50 states for each reference period.

Source. Data are from the CDC aggregate first-dose vaccine reporting, available at https://covid.cdc.gov/covid-data-tracker/#vaccinations_vacc-total-admin-rate-total.

PUBLIC HEALTH SIGNIFICANCE

Continued efforts to encourage vaccination among the remaining unvaccinated population are essential to achieving and maintaining herd immunity levels of coverage and protecting the population against the continued threat of COVID-19. We recognize that this is a preliminary analysis, and we urge the continued use of more detailed and rigorous methods to continue to elucidate the impact of these lotteries (particularly with regard to the impact of lotteries on more “vaccine-hesitant” populations).

We hope that by sharing this analysis, we can not only encourage further research into this important topic but also encourage other states to thoughtfully consider how to best deploy their vaccine incentives in a way that will not only encourage vaccination but also serve their broader public health, economic, and equity goals. *AJPH*

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CONTRIBUTORS

J. Sload conducted the analysis and led the writing of the article. B. Bechtolsheim provided guidance on the analysis and assisted with writing and revision. D. Gifford provided guidance on the analysis and writing of the article.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

HUMAN PARTICIPANT PROTECTION

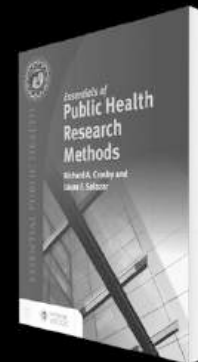
The study used only population-level data and was not subject to institutional review board approval.

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Rapid Antigen Screening of Students and Staff for SARS-CoV-2 in Rural School Districts, Pierce County, WA, 2020

Daniel R. Stutman, MPH, Julie K. Tergliafera, MPH, Morgan E. Black, MPA, Anthony L-T. Chen, MD, MPH, Lori L. Karnes, BS, Nigel A. Turner, MPH, Gregory R. Wagner, BA, and Jennifer M. Thompson, MPH

During fall 2020 in rural Pierce County, Washington, school districts and the county health department offered weekly rapid antigen screening to students and staff. Asymptomatic screening identified 42.5% of confirmed cases from the population. Parents reported it was a positive experience for their children. The program supported decisions to return to in-person learning, but screening ended because of resource and technical limitations. When planning in-school screening, stakeholder engagement and resource sustainability are important factors to consider. (*Am J Public Health*. 2022;112(8):1134–1137. <https://doi.org/10.2105/AJPH.2022.306875>)

In spring 2020, the State of Washington paused in-person learning in K–12 schools because of the COVID-19 pandemic. By fall, educational, social, health, and safety concerns and a lack of local data prompted a pilot for school testing and transmission to inform decision-making about returning to school.

INTERVENTION AND IMPLEMENTATION

In fall 2020, Tacoma-Pierce County Health Department (TPCHD) partnered with three rural school districts to test for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) using Abbott BinaxNOW COVID-19 Ag Card (Abbott Diagnostics Scarborough, Inc., Scarborough, ME) rapid antigen tests donated by the State of Washington Department of Health. Modeling suggests there are more surveillance

benefits of rapid antigen tests than of slower conventional tests.^{1,2} Public health staff and contractors tested students, teachers, and staff from the three rural school districts. These health care workers collected anterior nares samples from each nostril, and results were available in 15 minutes. Those who tested positive were offered confirmation testing via onsite polymerase chain reaction (PCR) tests. Antigen-positive individuals and their close contacts were excluded from school.

Starting a month before implementation, public health staff prioritized stakeholder engagement and met with each district one to three times per week to coordinate goals, logistics, and public messaging. Public messaging about screening was provided to local communities through school districts and local news. At the encouragement of school district leadership, TPCHD hosted public forums so families and

staff could voice concerns and receive information about the screening model. The health officer and TPCHD staff addressed concerns empathetically and directly. Questions focused on the safety of testing in schools, the reliability of results, the safety of in-person learning, logistics, and COVID-19.

Screening took place over three weeks. Participants consented using paper forms, and we verified identities before collection. Pierce County hired more than 60 contractors to conduct the pilot, including testing site staff. During the pilot, to understand community perceptions about screening, districts distributed separate online surveys for staff and faculty and for parents and guardians. After screening concluded, we matched testing records, demographic data, and geographic data from district rosters with TPCHD case data to assess participation, retention, and case rates.

PLACE, TIME, AND PERSONS

We offered three rural school districts in Pierce County, Washington, weekly antigen screening at schools in November and December 2020 of students, teachers, and staff served or employed by the districts. Participation was voluntary and we obtained consent before testing. Symptomatic participants were uncommon because testing occurred at schools where those with symptoms were excluded from in-person learning. The student population included kindergarten through 12th grade (K–12) students residing in or near the district's geographic borders. Students in the three districts were 75% to 82% White, 9% to 12% Hispanic/Latino, 6% to 11% two or more races, and less than 5% any other race. Low-income students comprised 20%, 28%, and 43% of students in each district, respectively, according to the Office of the Superintendent of Public Instruction.

PURPOSE

Local elected officials expressed concerns about students' declining mental health and rural families' physical and economic barriers to accessing testing services. They felt students struggled with distance learning during the COVID-19 pandemic, but logistical and safety questions remained among many school leaders, parents, and staff. Setting public health policy requires balancing the educational and social needs of students, balancing the health of students and staff, and controlling community spread of disease. In response, TPCHD piloted a screening program to gather data in support of local policy development for safe K–12 in-person learning. At that time, there were no similar efforts in Washington State K–12 schools.

EVALUATION AND ADVERSE EFFECTS

Participation and retention among students and staff differed by district and

corresponded to the level of in-person learning at the time. Of 14 867 individuals, 4019 students and staff registered for screening, with 4012 (99.8%) testing at least once. Highest participation occurred in the district that produced and distributed a video of local students taking the test (Table 1).

We registered 9884 antigen tests: 28 (0.3%) resulted positive, 9753 (98.7%) resulted negative, 23 (0.2%) refused at point of care, and 80 (0.8%) were inconclusive. All antigen-positive individuals agreed to confirmatory PCR tests. We confirmed 19 (67.9%) antigen-positive tests with PCR collected onsite.

We computed crude, age-adjusted, and community rates of COVID-19 per person-year. Crude case rates include all students and staff identified from district-provided potential participation lists regardless of whether testing occurred at schools or in communities. After age adjustment, districts B and C approached the community rates corresponding to their district geographic regions. We calculated community

TABLE 1— Participation Rates of Those Offered Program Testing, Cases Identified Among All Participants Who Tested at Least Once During the Program, and Annualized Case Rates of Cases Identified: Rural School Districts in Pierce County, WA, 2020

School District	Overall Students and Staff Eligible for the Testing Program, No.	Participants Tested at Least Once During the Program, No. (%)	Participants Who Tested at Every Opportunity, No. (%)	Cases Identified Through Asymptomatic Program Testing, No. (%)	Cases Identified Through Other Testing Methods, ^a No. (%)	Crude Case Rate per 100 000 ^b	Age-Adjusted Case Rate per 100 000	Community Case Rate per 100 000
A	2 109	259 (12.3)	80 (30.9)	4 (57.1)	3 (42.9)	6 376	24 677	7 507
B	10 599	1 947 (18.4)	973 (50.0)	5 (23.8)	16 (76.2)	3 806	5 143	6 338
C	2 159	1 806 (83.6)	1 223 (67.7)	8 (66.7)	4 (33.3)	8 115	8 456	10 956

Note. Confirmed case calculations excluded in-school testers who previously tested positive with a polymerase chain reaction. Confirmed case incidence measures were annualized to rates per 100 000 people and age adjusted. Age-adjustment weights assumed that district populations' age distributions matched those of their corresponding communities.

^aOther testing methods included testing symptomatic students and staff in the program and reported testing that occurred outside the program among students and staff identified in district-provided potential participation lists.

^bDates of testing were November 30, 2020–December 18, 2020, in districts A and B and November 23, 2020–December 17, 2020, in district C. Our calculations were based on 19 and 25 days, respectively, relative to the eligible school populations.

rates from mandatory reporting to the department. District A had the lowest proportion of eligible individuals tested, potentially resulting in selection bias in results.

In participating districts, we confirmed 40 cases. Screening identified 17 asymptomatic cases (Table 1). District C had the largest proportion (66.7%) of asymptomatic cases and the highest participation and retention rates. District A, with limited onsite learning and few community testing sites, had the lowest participation (12.3%) and retention rates (30.9%). The higher age-adjusted rate may indicate that accessibility is an added value of in-school testing for this community. Low positivity rate found by this screening model increased local decision-maker confidence and supported policies to expand in-person learning.

During one week of the program, the health department opened a survey to all parents in the three districts. We asked parents who consented to their child's participation to explain what worked well and what could be improved. All parents were asked if the testing program changed their feelings about in-person schooling during winter 2021. Process questions were open response, and questions regarding changing feelings used a 5-point Likert scale.

Parent and guardian survey results reflected the success of stakeholder engagement done before pilot testing. In district C, with the highest participation and retention rates, almost 24% of parents said their child's experience was positive in open-response questions. Some parents (32.7%) agreed that screening changed their minds about in-person learning. Of those who agreed, 58% wanted their child tested at school. The remainder chose other reasons or did not provide a reason,

and 19% of parent survey respondents said result notification time could be improved. The use of paper forms slowed notifications.

SUSTAINABILITY

Although asymptomatic screening identified 42.5% of the known cases in this population and stakeholder support was high, the program could not be sustained in its implemented form owing to resource constraints. Districts were unable to access the required volume of tests and staff without help from TPCHD. Because of federal funding structures, TPCHD could not pay for the contractors and test kits outright.

Paper forms increased staffing needs while also increasing notification time. We explored digital reporting and found it would have required increased staff capabilities, costs, and planning time to implement. Subsequent changes in regulations (i.e., medically authorized staff no longer required for antigen collection) and technology (i.e., efficient digital reporting solutions) have streamlined several of the bottlenecks identified.

PUBLIC HEALTH SIGNIFICANCE

As children commonly experience mild to no symptoms,^{3,4} asymptomatic screening is likely an important intervention to reduce SARS-CoV-2 spread in schools⁵ and increase the safety of in-person K–12 school instruction and extracurricular activities, when deployed in conjunction with recommended school mitigation measures.⁶ Although schools may employ multiple mitigation measures to reduce in-school spread, asymptomatic cases can spur outbreaks, resulting in large numbers of quarantines, school closures, and vulnerable

individuals being exposed. Regular asymptomatic screening can identify SARS-CoV-2-infected individuals⁷ missed by symptom screening or attestations, perhaps reducing introduction and spread in the school setting. With increased transmissibility of the subsequent viral variants,^{8,9} screening may be more valuable to maintain safe in-person learning. However, we must consider potential resource constraints for screening models in rural school districts. For school districts considering regular in-school screening programs, adequate preparation, stakeholder engagement, and sustainable funding are critical. *AJPH*

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CONTRIBUTORS

D. R. Stutman designed and performed analyses of participation and case rates. D. R. Stutman and J. K. Tergliafera contributed significantly to drafting and revising the article. J. K. Tergliafera designed the survey tool and analyzed the survey answers. M. E. Black, G. R. Wagner, and J. M. Thompson drafted sections of the article. M. E. Black and J. M. Thompson contributed to the concept and design of the program. A. L.-T. Chen contributed substantially to the conceptualization, design, and implementation of the research project and approved the final version of the article. L. L. Karnes developed testing plans with school districts, met with and engaged stakeholders, and established and modified testing process and methods as needed during the testing model. N. A. Turner provided input on study design and results interpretation. G. R. Wagner contributed

to the concept and design of the testing pilot. J. M. Thompson compiled the sections of the article. All authors reviewed and revised the article.

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CONFLICTS OF INTEREST

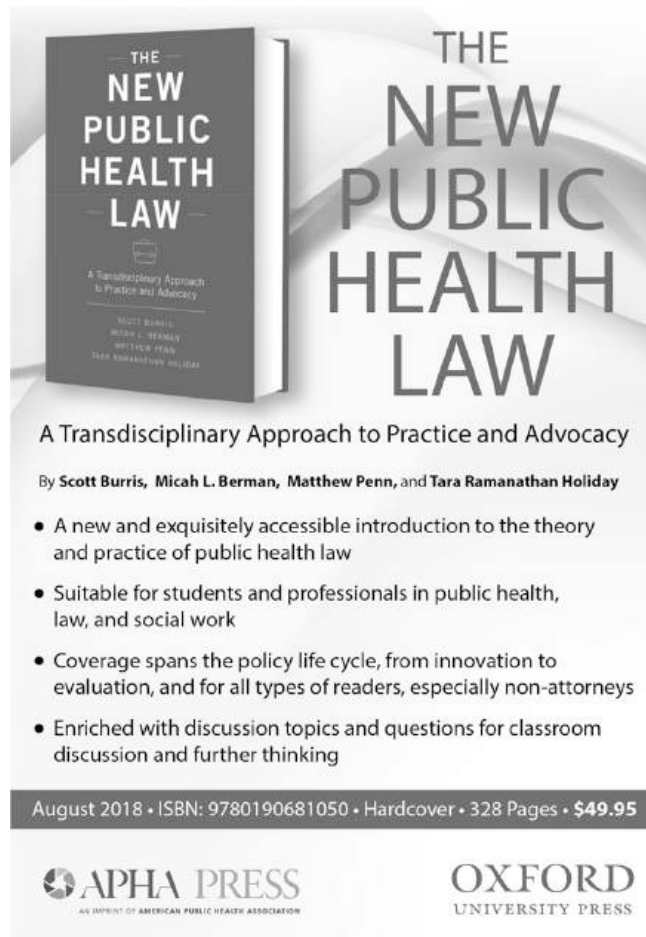
A. L.-T. Chen has long-term stock holdings in Abbott, the manufacturer of the BinaxNOW tests used in this testing model. We have no other potential or actual conflicts of interest to disclose.

HUMAN PARTICIPANT PROTECTION

We are a local public health department and were responding to a declared public health emergency. We took steps to protect the privacy of participants in accordance with their Health Insurance Portability and Accountability Act rights. We obtained written consent for all participants and parents.

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NIOSH Risk-Based Model to Resume Field Research and Public Health Service in 2020 During the COVID-19 Pandemic

Douglas O. Johns, PhD, MS, Kristin M. Yeoman, MD, MPH, Joshua M. Harney, MS, John Howard, MD, MPH, and Gerald S. Poplin, PhD, MS

In the early months of the COVID-19 pandemic, field research and public health service work conducted by the National Institute for Occupational Safety and Health (NIOSH) was put on hold. During this time, NIOSH developed a risk-based model to resume fieldwork, balancing the public health benefit of such fieldwork with the risks of severe acute respiratory syndrome coronavirus 2 exposure and transmission. We describe our experiences with this model, along with the broader public health significance of the methods used to inform risk management decisions. (*Am J Public Health*. 2022;112(8):1138–1141. <https://doi.org/10.2105/AJPH.2022.306882>)

We developed and implemented travel risk management decision tools to facilitate limited mission-critical fieldwork while protecting field staff and workers during the COVID-19 pandemic because of the real public health risks from delaying critical work conducted by the National Institute for Occupational Safety and Health (NIOSH)—the only federal institute mandated to conduct research and public health service work to prevent work-related injuries and illnesses.

INTERVENTION AND IMPLEMENTATION

An initial travel risk management decision tree (Figure A, available as a supplement to the online version of this article at <https://www.ajph.org>) considered four major determinants of risk of a NIOSH employee becoming infected with or transmitting severe acute respiratory

syndrome coronavirus 2 (SARS-CoV-2) while conducting field visits: (1) site conditions and work requirements, (2) level of COVID-19 community spread at the site and surrounding area, (3) mode of transportation and length of stay, and (4) controls in place. The decision tree presented these determinants of risk in the far left column, with descriptors of increasing risk presented from left to right for each category.

We designed the decision tree so that potential risk can stay the same or increase in navigating through the arrows from top to bottom but cannot go from a higher to a lower level of risk between steps. The final risk determination for the field visit is the potential risk level reached at the bottom of the decision tree. Elements of the decision tree were informed in large part by workplace COVID-19 investigations early in the pandemic,^{1–3} months before vaccines were available to

prevent SARS-CoV-2 infection and serious illness from COVID-19.

In applying the decision tree in the first year of the pandemic, NIOSH investigators were asked to prioritize travel requests supporting only the most critical and time-sensitive research and public health service work. Between October 2020 and July 2021, NIOSH investigators submitted 55 requests for field travel, 51 of which were approved. Three requests were rejected because the potential risk was high and the public health benefit of the activity did not outweigh the potential risk. A fourth request was initially put on hold owing to extremely high levels of community spread but was ultimately approved after community case counts decreased.

PLACE, TIME, AND PERSONS

A group of senior NIOSH leaders convened in April 2020 to develop plans

Step 1. Use this matrix to identify the risk rating for your travel location. <https://covid.cdc.gov/covid-data-tracker/#county-view>

Percentage of Adult Population Fully Vaccinated at Destination	SARS-CoV-2 Community Transmission Total new cases per 100 000 persons in the past 7 days			
	Low Transmission 0.00–9.99	Moderate Transmission 10.00–49.99	Substantial Transmission 50.00–99.99	High Transmission ≥ 100
≥ 70%	1	3	6	10
50%–69%	2	5	9	13
40%–49%	4	8	12	15
< 40%	7	11	14	16

Travel decisions should be made in consideration of travel risk level, risk mitigation measures, vaccination status of travelers, and public health benefits of proposed travel. Travel determined to be high risk does not preclude approval but may require additional review.

Step 2. Use this table to determine risk ratings for other consequential determinants of risks: 1) personal contact and 2) mode of transportation.	Other Risk Factors	Description of Risk Factor Ratings	Risk Rating
	Personal Contact ^a	Infrequent and short = 0 Frequent or extended = 2 Frequent and extended = 4	
	Mode of transportation	Vehicle travel 1 occupant = 0 Vehicle travel ≥ 2 occupants = 2 Public transportation = 4	
Step 3. Add your rating from step 1.	Travel location risk rating from risk matrix		
Step 4. Add all numbers to determine your travel risk rating	Travel risk rating		

Step 5. Use this color-coded scale to determine travel risk level.

Travel Risk Rating	Travel Risk Level
1 to 6	Low
7 to 10	Medium
11 to 13	Elevated
≥ 14	High

FIGURE 1— Revised Risk Matrix Framework for Use in Assessing COVID-19 Risk to Investigators and Workers Involved in NIOSH Research and Public Health Service Work: United States, August 2021–March 2022

Note. SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2.

^aSpecific details on frequency and duration of personal contact must be included on Travel Request Form.

to resume paused research and public health activities at NIOSH research field sites and workplaces throughout the United States.

PURPOSE

We initiated this intervention early in the COVID-19 pandemic in an effort to facilitate and safely conduct high-priority NIOSH occupational health and safety fieldwork.

EVALUATION AND ADVERSE EFFECTS

Although somewhat complex and difficult to navigate, the model presented in Figure A facilitated the continuation of limited mission-critical occupational

health and safety research relatively early in the pandemic. The evaluation of our risk decision tree included consideration of easier access to frequently updated data, increased knowledge regarding the effectiveness of various control measures, and, importantly, the widespread availability of effective vaccines. We subsequently replaced the risk decision tree with a relatively simple risk matrix framework (Figure 1) that was finalized in August 2021. This model integrates county-level data on SARS-CoV-2 transmission with percentage of adult population fully vaccinated, two important determinants of risk of transmission, infection, and illness,⁴ and characterizes varying levels of both metrics in terms of a travel location risk rating. The model also considers

information on personal contact and mode of transportation in estimating a travel risk level. This model is intended to serve as an initial “snapshot” of potential risk, with final decisions made after considering travel risk level, travelers’ vaccination status, specific details on the nature and extent of personal contact, control measures in place, and public health benefits of the proposed travel.

We determined the vast majority of approved travel during the first year of the pandemic (45 of 55 requests) to be medium or elevated risk. For example, two research engineers were able to travel together in a car for four hours to conduct maintenance on a seismic monitoring station, which is critical in conducting safety research on the impacts of seismic events in the mining industry.

Additionally, a few requests for travel determined to be high risk with extensive COVID-19 transmission were approved (3 of 55) that we deemed to involve an urgent public health need. In one such case, two investigators traveled to a worksite to investigate a suspected relationship between workers performing welding operations and serious illness involving novel bacteria.

No adverse effects (e.g., reported COVID-19 illness or SARS-CoV-2 infection) were observed. We cannot discount the possibility that the absence of adverse effects is attributable at least in part to a small sample size or lack of data.

SUSTAINABILITY

The process we have used for estimating risk can easily be adapted by other organizations, and alternative metrics can easily be substituted with the current approach if found to be more reliable for informing and managing risk. The risk matrix we developed is just one tool that can be used in a larger risk assessment process. The matrix does not attempt to estimate the probability of an outcome; however, the effectiveness of a simple and sensible approach to risk management in work settings has significant advantages over more complex models, as described elsewhere.⁵⁻⁷

The models NIOSH developed and used have limitations. The complexity of the initial risk decision tree made it difficult to navigate but also may have provided users with an unwarranted sense of confidence in the overall estimate of risk. Furthermore, the simplified risk matrix did not explicitly include some important risk factors (e.g., contact duration, personal risk factors for developing severe illness), and the cut points dividing potential levels of risk for each metric in both models were

based largely on convenience rather than an in-depth analysis. Nonetheless, many components of our risk matrix are reflected in the Centers for Disease Control and Prevention's recently updated guidance related to COVID-19 community levels,⁸ notably the use of a simple model that integrates a limited number of reliable COVID-19-related metrics to inform decision making.

PUBLIC HEALTH SIGNIFICANCE

The work described had a direct impact on the health and safety of US workers, as it facilitated the continued work of NIOSH soon after the start of the COVID-19 pandemic. Our flexible approach may be adopted and modified by those who are charged with managing risk in their organizations, and it acknowledges that rules and regulations cannot always account for all risk for all sites at all times. Organizations and their employees benefit by developing and clearly communicating mitigation strategies in anticipation of changing risk to minimize potential disruptions to employees and work processes. This may include, as appropriate, categories of risk with an a priori layered approach for control measures at each risk level to increase transparency. In other words, it is clear what mitigation measures will be put in place if the level of risk increases and what controls may be lifted if risk decreases. If executed and documented properly, the approach also creates an ability to track and evaluate what metrics and measures of control work best under varying conditions, which can lead to more consistent implementation strategies and communications across locations. *AJPH*

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CONTRIBUTORS

D. O. Johns led the writing. D. O. Johns and J. M. Harney designed the travel guidance and risk management decision tree. J. Howard oversaw the implementation of the intervention. G. S. Poplin led the design of the risk matrix with input from D. O. Johns and clinical direction from K. M. Yeoman. All authors contributed to the writing of the article.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

HUMAN PARTICIPANT PROTECTION

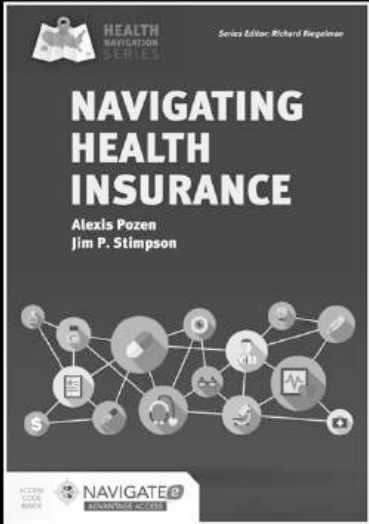
Institutional review board approval was not required as the work described did not involve human participants.

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Healthy Davis Together: Creating a Model for Community Control of COVID-19

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While many higher-education institutions dramatically altered their operations and helped mitigate COVID-19 transmission on campuses, these efforts were rarely fully extended to surrounding communities. A community pandemic-response program was launched in a college town that deployed epidemiological infection-control measures and health behavior change interventions. An increase in self-reported preventive health behaviors and a lower relative case positivity proportion were observed. The program identified scalable approaches that may generalize to other college towns and community types. Building public health infrastructure with such programs may be pivotal in promoting health in the postpandemic era. (*Am J Public Health*. 2022;112(8):1142–1146. <https://doi.org/10.2105/AJPH.2022.306880>)

In response to the COVID-19 pandemic, many institutions of higher education dramatically altered their operations¹ to mitigate transmission on campuses.² Actions included testing, contact tracing, isolation and quarantine support for students and employees, wastewater monitoring, and a variety of behavior change interventions (e.g., masking, remote classes). While at many institutions of higher education campus life extends into the community where local economies depend on students, few institutions of higher education fully extended their mitigation efforts into their surroundings.³

INTERVENTION AND IMPLEMENTATION

The University of California, Davis (UC Davis) and the City of Davis, located within Yolo County, California,

partnered to develop a community COVID-19 pandemic response program, Healthy Davis Together (HDT),⁴ which combined epidemiological infectious disease control measures and health behavior change interventions to mitigate the impact of the COVID-19 pandemic.

Together with UC Davis, the City of Davis, and key community stakeholders, HDT deployed several strategic approaches that fell under two thematic areas: epidemiology (such as testing, contact tracing, and quarantine and isolation) and health behavior change (focused on communication). Project organization is shown in [Figure 1](#).

Epidemiology strategies included expanding access to polymerase chain reaction (PCR) testing by adding new testing sites to those that were otherwise available to Yolo County residents and by offering voluntary, free-of-

charge COVID-19 testing. Additional strategies included augmenting the county's contact tracing capacity with rapid triage to isolation and quarantine, implementing citywide sub-sewershed-level wastewater monitoring, personal protective equipment (PPE) distribution, and severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) vaccination. Health behavior change interventions included targeted COVID-19 health education, mass communications through different media channels, and personal, group, and business incentives.

Built on a framework of community trust that meaningfully engaged citizens, businesses, and local government officials in planning and operations, we strengthened partnerships among the university, city, and county, and established new partnerships with private and community entities that enhanced communications capabilities,

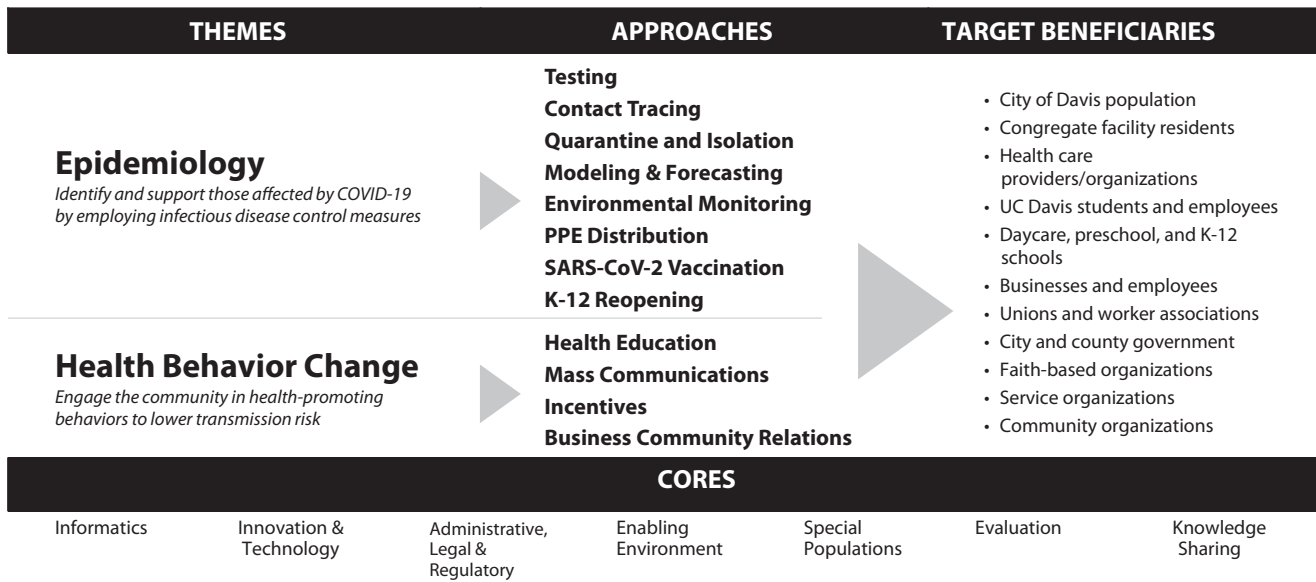


FIGURE 1— Healthy Davis Together Program Organization

Note. PPE = personal protective equipment; SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2. Each overarching theme (epidemiology and health behavior change) includes several approaches. Seven enabling cores provide support across the project. The targeted beneficiaries represent components of the Davis community.

enabled implementation of joint local responses, and facilitated community-wide testing.

Epidemiological Approaches

SARS-CoV-2 RNA was detected by using a saliva-based reverse transcription-quantitative PCR test from the Clinical Laboratory Improvement Amendments-approved laboratory at the UC Davis Genome Center for asymptomatic individuals who live or work in Davis. BinaxNOW point-of-care tests⁵ were administered for symptomatic individuals. Testing was offered to all Davis kindergarten through grade 12 schools. Quarantine and isolation facilities were offered to newly identified cases and close contacts, along with other need-based wraparound services such as housing, food, and transportation support. Administrative data were used to target some interventions to

marginalized populations including persons with less than a four-year college degree, unemployed individuals, the Latinx community, those who were retired or aged 65 years or older, farmworkers, people living in high-density or congregate housing, and individuals utilizing government assistance. Wastewater from the treatment plant and from autosamplers located at 25 subwatershed nodes throughout the city were analyzed for the presence of SARS-CoV-2 RNA by reverse transcriptase-droplet digital PCR.

A PPE procurement and distribution system for Davis residents was established at easily accessible locations (e.g., campus, businesses, K-12 schools, homeless shelters). When COVID-19 vaccines became available, we partnered with Yolo County Public Health and CommuniCare, a multi-county Federally Qualified Health Center, to equitably augment vaccination access.

Health Behavior Change Approaches

HDT implemented several health behavior-change approaches to prevent community spread. A new workforce of more than 200 “Aggie” public health ambassador students was established and deployed on campus and throughout Davis. Ambassadors encouraged healthy behaviors through educational messaging, championing health-promoting behaviors, and distributing incentives. Mass communications, used to drive testing and health-promoting behaviors, were aimed at general as well as specific sectors of the community using print, broadcast, and social media. Incentives included gift cards, PPE, hand sanitizer, snacks and meals, HDT merchandise, prize drawings, and small grants for group-coordinated activities. A business partners program provided onsite consulting to help business owners adopt or adapt practices to

increase safety and provided partners with grants, PPE, employee COVID-19 testing, patron incentives, marketing, and public health educational materials.

PLACE, TIME, AND PERSONS

HDT began implementing community-wide interventions on November 18, 2020, in Davis. HDT extended campus efforts (for 39 074 students enrolled in fall 2020)⁴ to the entire community that worked or lived in Davis (with a city population of approximately 70 000 residents).

PURPOSE

Our goal was to determine whether a program combining epidemiological infectious disease-control measures and health behavior-change interventions could lower the burden of COVID-19 beyond university campus borders and into an entire surrounding community.

EVALUATION AND ADVERSE EFFECTS

We assessed knowledge and practice of COVID-19 health behaviors through a series of repeated cross-sectional surveys using a randomly selected sample of approximately 600 individuals (equally stratified by City of Davis residents or Yolo County residents outside of Davis). We summarized test positivity using a seven-day moving average. We assessed change in test positivity proportion over time using a repeated-measures expanded beta-distributed generalized linear mixed-effects model to compare Davis with non-Davis.

From November 18, 2020, through February 23, 2022, there were 733 606

tests conducted in the Davis community with 13 066 positive results. In September 2021, individuals who reported testing at least once were 85.0% versus 75.5% for Davis residents versus non-Davis residents, respectively ($P = .002$; Table A, available as a supplement to the online version of this article at <https://ajph.org>). In November 2021, testing rates further increased to 92.3% versus 79.1% ($P < .001$), and 72.3% of Davis residents reported being tested three or more times compared with 41.8% for non-Davis residents ($P = .029$). For Davis residents, 95.0% reported being fully vaccinated in November 2021 compared with 80.4% of non-Davis residents ($P = .034$).

Figure 2 shows the test positivity proportion for Davis, Yolo County,⁶ and California from January 1, 2021, to February 23, 2022. Positivity was lower in Davis compared with Yolo County as a whole (overall difference -1.42 ; 95% confidence interval [CI] = $-1.45, -1.38$), and significantly lower for Davis compared with California (overall difference -2.15 ; 95% CI = $-2.18, -2.12$). Positivity was significantly lower for Yolo County compared with California (overall difference -0.73 ; 95% CI = $-0.75, -0.71$). During both the SARS-CoV-2 Delta and Omicron surges, more striking differences were observed when positivity proportion remained lower in Davis in contrast to the steep increases in Yolo County and California.

Because the pandemic's deadly consequences accelerated the timeline for implementing control measures, our ability to evaluate incremental contributions of each program component was limited. While many components targeted Davis residents, there was spillover to individuals who lived outside of Davis; some interventions such as PCR testing were made available to

individuals who worked in Davis but resided elsewhere. Therefore, positivity proportion comparisons by geographic area may be biased by spillover effects, although most likely in the direction of the null value. The observed differences in positivity between Davis and Yolo County are likely understated. No adverse effects were reported or observed that were attributed to project interventions.

SUSTAINABILITY

Several HDT elements directly contributed to the development of local infrastructure in response to the COVID-19 pandemic and can be leveraged to address future public health challenges. These include new or strengthened public-public and public-private partnerships, an undergraduate community health promotion workforce, relatively low-cost measures such as multilevel incentives, and community-wide testing that can be used for other infectious agents. Even measures that required substantial upfront capital investment, like establishing our PCR testing platform, resulted in reduced unit costs more than an order of magnitude less expensive than commercial alternatives and rapidly returned results (typically within ≤ 24 hours). While the utility of wastewater surveillance has yet to be fully realized at a population level, it has the potential to be cost-efficient and complementary to individual testing efforts.⁷

PUBLIC HEALTH SIGNIFICANCE

Community interventions were built on successful efforts to mitigate infectious disease transmission on a university campus²—comporting with the highly

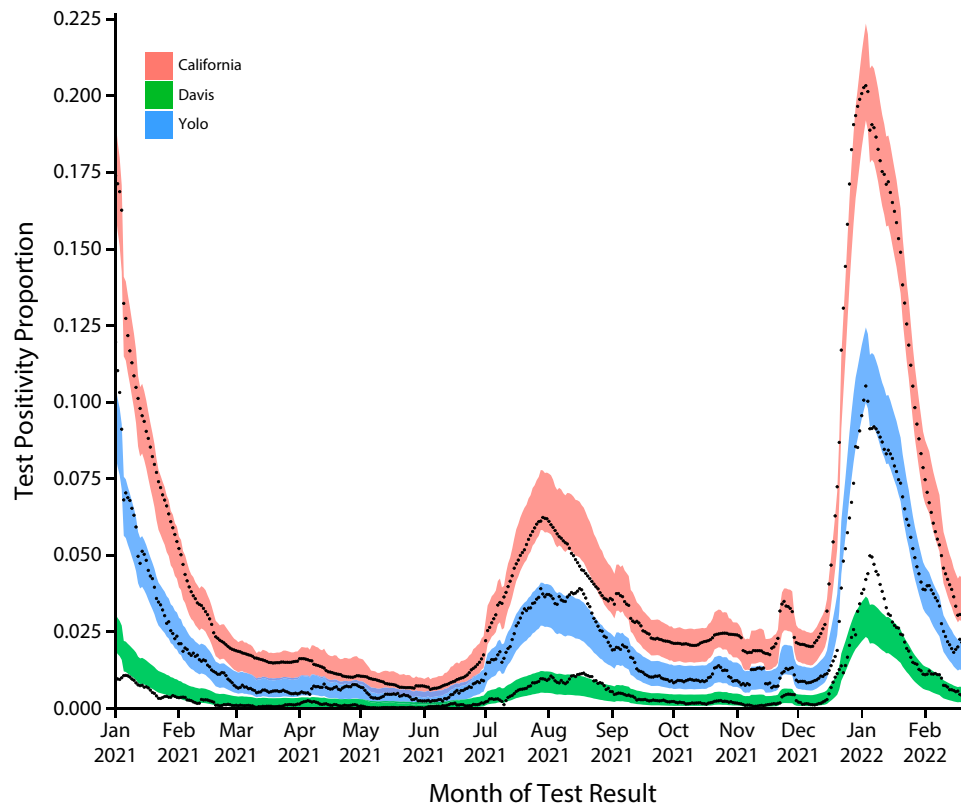


FIGURE 2— Comparison of Test Positivity Proportion for the State of California, Yolo County, and the City of Davis: January 1, 2021, to February 23, 2022

Note. The 95% colored confidence bands were estimated from a beta-generalized linear mixed-effects model regression of seven-day moving average positivity proportions. State of California data exclude all Yolo County residents; however, Yolo County data include Davis residents.

interconnected nature of university and city life. Building partnerships with organizations, government, and key stakeholder groups while combining epidemiological and health behavior change approaches was achievable and likely generalizable to other college towns and to other types of communities. Our multimodal COVID-19 community intervention program resulted in favorable changes in key self-reported health behaviors (e.g., asymptomatic testing and vaccination). Case positivity proportion was much lower in Davis compared with other areas. Building public health infrastructure with such programs may be pivotal in promoting health in the postpandemic era. *AJPH*

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CONTRIBUTORS

B. H. Pollock, T. S. Nesbitt, T. Stoltz, and K. C. Burtis developed the concept and design, helped conduct the study, and contributed to the analysis. M. Nuño and C. L. Bergheimer contributed to the analysis. All authors, including S. R. Belafsky and K. M. Carey, performed interpretation of data, contributed to drafting of article, and provided final approval.

CONFLICTS OF INTEREST

The authors have no conflicts of interest.


HUMAN PARTICIPANT PROTECTION

This study was determined to be exempt from institutional review board review by the UC Davis Office of Research.

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Impact of Massachusetts' Statewide Sales Restriction on Flavored and Menthol Tobacco Products on Tobacco Sales in Massachusetts and Surrounding States, June 2020

Melody Kingsley, MPH, Hannah McGinnes, MPH, Glory Song, MPH, Jacqueline Doane, BS, and Patricia Henley, MEd

In June 2020, Massachusetts implemented a first in the nation statewide law that restricts sales of menthol and other flavored tobacco. Since implementation, sales data indicate high retailer compliance. Drastic decreases were seen in sales of all flavored tobacco. Most neighboring states did not see increases in overall tobacco sales, although New Hampshire saw an initial increase in menthol sales, which was not sustained. We found that menthol restrictions are effective and that federal-level legislation is important, as some cross-border sales highlight. (*Am J Public Health*. 2022;112(8):1147–1150. <https://doi.org/10.2105/AJPH.2022.306879>)

In 2009, federal law banned the sales of all flavored cigarettes except menthol. The exclusion of menthol perpetuated existing inequities in tobacco marketing, tobacco use, and health outcomes among groups historically targeted by the tobacco industry (including Black, LGBTQ [lesbian, gay, bisexual, transgender/-sexual, queer or questioning], and female populations, as well as youths).^{1–3} This ban also led to an increase in availability and youths' use of non-cigarette-flavored tobacco products.⁴ In 2019, youths' tobacco use in Massachusetts reached its highest rate in more than 20 years (Massachusetts Youth Risk Behavior Surveillance System, 2019).

INTERVENTION AND IMPLEMENTATION

In response to the increasing availability of flavored tobacco, in 2014, local

municipalities in Massachusetts began to pass restrictions on its sale. However, these restrictions excluded menthol. In November 2019, resulting in part from local momentum, advocacy coalitions, and youth and community engagement efforts, Massachusetts passed An Act Modernizing Tobacco Control (<https://www.mass.gov/guides/2019-tobacco-control-law>), a first in the nation statewide law that restricts the sales of all flavored tobacco (including menthol) to adult-only smoking bars (for onsite consumption only). This law also includes an excise tax on vape products.

To help ensure compliance, Massachusetts used its rigorous enforcement infrastructure to provide communications (i.e., mailings and media promotion) and educational visits to retailers before and after implementation. Retail scanner data were used to provide

timely surveillance data for monitoring compliance and evaluating policy impact.

PLACE, TIME, AND PERSONS

The new law took full effect June 2020. The availability of menthol and other flavored tobacco was reduced from more than 6000 outlets to fewer than 30.

Before the law, 12% of Massachusetts adults smoked cigarettes, and of those an estimated 37%, or 216 611, smoked menthol cigarettes (63% identified as people of color; Massachusetts Behavioral Risk Factor Surveillance System, 2019). Furthermore, the tobacco industry targeted flavored products at the 847 000 youths (aged 10–19 years) who live in Massachusetts (American Community Survey, 2019). As a result, 37% of Massachusetts high school

students reported current (past 30-day) use of any tobacco product (i.e., cigarettes, cigars or cigarillos, smokeless tobacco, vape products) in 2019 (Massachusetts Youth Risk Behavior Surveillance System, 2019).

PURPOSE

The law took a step toward improving racial and health equity and protecting youths and young adults from industry targeting. Previous research demonstrated that policies that restrict flavored tobacco are effective at reducing the sales and availability of flavored tobacco in the retail environment and at reducing adult and youth tobacco use.⁵⁻⁸

EVALUATION AND ADVERSE EFFECTS

The Massachusetts Tobacco Cessation and Prevention program obtained tobacco product UPC (Universal Product Code) scanner data from the Nielsen Company. We obtained data from three years before the law was implemented

to one year after (June 2017–June 2021) in five state-specific markets: Massachusetts and the neighboring states of New Hampshire, New York, Rhode Island, and Vermont. For each state, we aggregated unit sales of four categories of tobacco (i.e., cigarettes, cigars or cigarillos, smokeless tobacco, and vape products) and stratified them by flavor category (i.e., menthol, other flavor, and unflavored).

We standardized data in accordance with existing methods. One pack of cigarettes, one large cigar, two cigarillos, 20 little cigars, one disposable or rechargeable e-cigarette, one e-cigarette refill or kit, one three-ounce container of chewing tobacco, one 1.2-ounce container of dip or snuff, or one container of snus equaled one unit.^{9,10}

Results suggest that the law was effective in reducing flavored product sales in Massachusetts. In the year after implementation (June 13, 2020–June 12, 2021), overall tobacco sales in Massachusetts decreased from 33 917 494 to 25 315 189 (25.4%) units compared with the previous year (June 2019–June

2020; Figure 1). Sales of unflavored products increased from 22 609 326 to 24 947 827 (10.3%) units, menthol products decreased from 10 355 518 to 3 178 633 (96.9%) units, and sales of other flavored products decreased from 952 650 to 49 499 (94.8%) units compared with the previous year. Trends in Massachusetts across the study period were driven largely by cigarettes, as they make up 77% of total tobacco sales in the state, followed by cigars (12%), vape products (7%), and smokeless tobacco (4%; Figure 2).

We examined sales data from bordering states to assess whether an unintended consequence of the law was Massachusetts residents traveling out of state to purchase tobacco. Altogether, total sales in New Hampshire, New York, Rhode Island, and Vermont decreased by 1.8% in the year after implementation compared with the previous year (from 106 863 560 to 104 937 096 units). Individually, total sales decreased in New York, Rhode Island, and Vermont (from 31 952 666 to 24 896 472 [22.1%] in NY; from

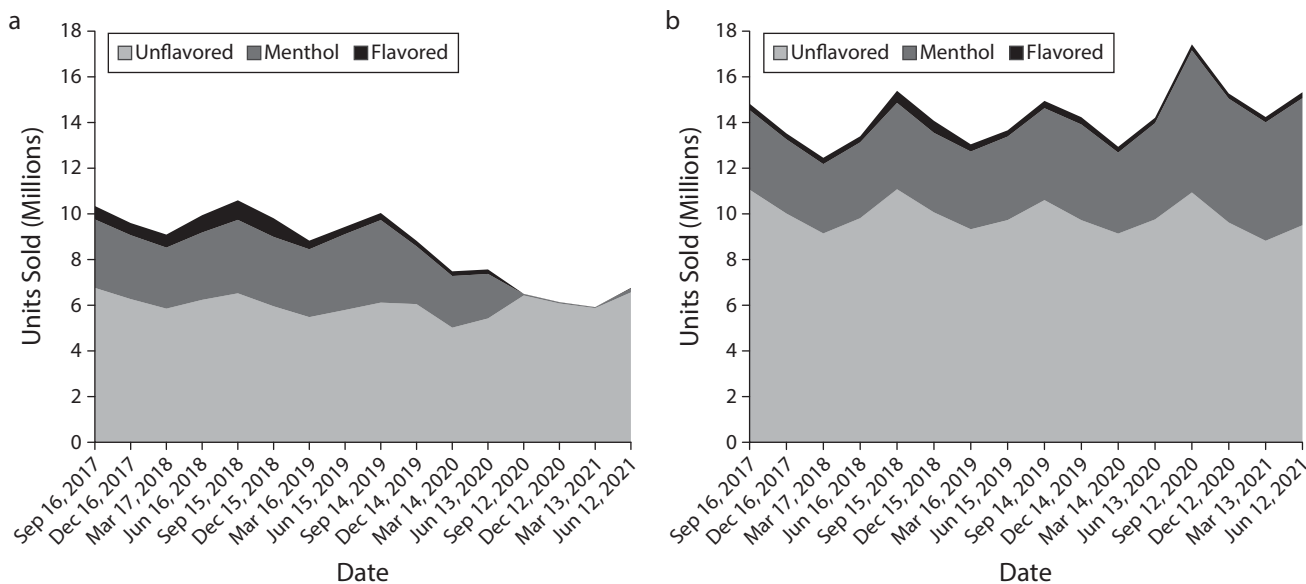


FIGURE 1— Tobacco Sales by Flavor Type for (a) Massachusetts and (b) New Hampshire: 2017–2021

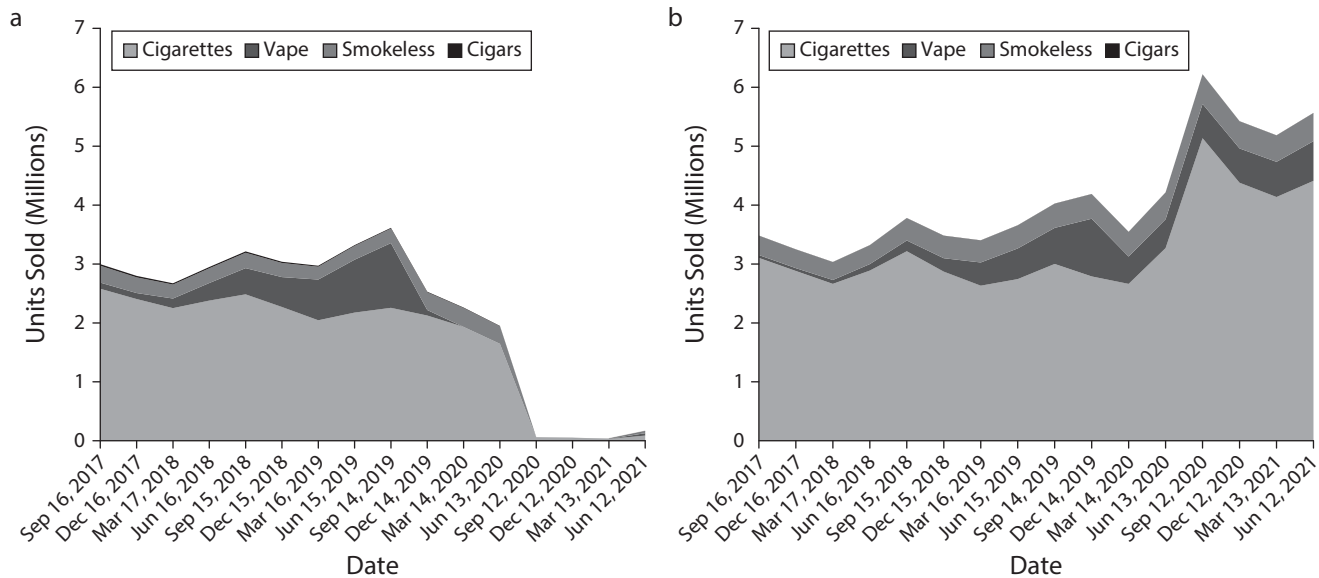


FIGURE 2— Menthol Tobacco Sales by Product Type for (a) Massachusetts and (b) New Hampshire: 2017–2021

12 345 375 to 11 840 564 [4.1%] in RI; and from 6 234 704 to 5 937 620 [4.8%] in VT). In these states, most changes in sales of menthol and other flavors were also decreases. However, small increases occurred in Vermont and Rhode Island: menthol sales increased from 1 582 520 to 1 595 765 (0.8%) units in Vermont, and other flavored sales increased from 427 341 to 479 624 (12.2%) units in Rhode Island (Figure A, available as a supplement to the online version of this article at <http://www.ajph.org>).

In New Hampshire, tobacco sales increased in the year after implementation compared with the previous year, but only by 5 931 624 (10.5%) units. Sales of unflavored products decreased 338 498 (0.9%) units, sales of menthol products increased 6 417 808 (40.2%) units, and sales of other flavored products decreased 147 686 (13.1%) units during this period (Figure 1). Although overall tobacco sales initially increased 22.6% in the three months after law implementation (compared with three months before law implementation), menthol sales then decreased in the

following six months (September 2020–March 2021). Furthermore, when comparing changes in menthol sales in New Hampshire and Massachusetts in the year after implementation, we saw a net decrease in menthol sales.

Some limitations exist. We did not include Connecticut, another state bordering Massachusetts. Nielsen captures only large chain retailers and convenience stores (e.g., big box supermarkets, drug stores, and dollar stores), so only a quarter of retailers in Massachusetts are represented. In addition, sales data are a proxy for availability and use; an increase in New Hampshire sales does not necessarily indicate a widespread increase in menthol cigarette availability or sustained or increased rates of menthol cigarette use among Massachusetts residents. Finally, any increases seen in tobacco sales may have been driven in part by increased adult substance use during COVID-19 (data not shown). Massachusetts will continue to monitor trends in sales as well as additional data directly capturing tobacco access and use behaviors to assess how

the new law affects Massachusetts tobacco users in the longer term.

SUSTAINABILITY

We saw that, with rigorous outreach and enforcement, retailer compliance with the law in Massachusetts was high and that other states did not have substantial increases in tobacco sales. We saw a marginal increase in Massachusetts' menthol sales from April through June 2021. We will continue to monitor sales data to assess whether compliance continues in the longer term. In New Hampshire, although we saw an initial increase in the proportion of menthol tobacco sales three months after the law was implemented, seasonal trends in sales may partially account for this increase, and we will monitor data over time to assess whether sales return to the rates before the law was implemented. Preliminary data from July through September 2021 suggest that menthol sales in New Hampshire are trending downward. Furthermore, historical New Hampshire cigarette stamp

data indicate an initial increase in cigarettes stamped immediately after Massachusetts increased its cigarette sales tax in 2013, but this increase was not sustained (New Hampshire Department of Revenue).

In geographically smaller states like Massachusetts, many tobacco users can drive across state lines, for example, into New Hampshire and Rhode Island, to obtain products.⁶ The price of a pack of menthol cigarettes in New Hampshire is on average \$2.39 to \$4.23 cheaper than in Massachusetts and surrounding states (NY, RI, VT).¹¹ Therefore, removing these products from the market entirely would maximize the public health benefit of flavored tobacco restriction policies. This study demonstrates the importance of federal legislation.

PUBLIC HEALTH SIGNIFICANCE

Reducing the availability of flavored tobacco may lead to decreased tobacco use and smoking-attributable mortality. Researchers estimate that from 1980 to 2018, menthol cigarettes were responsible for 10.1 million additional smokers, 3 million life-years lost, and 378 000 premature deaths.¹² In addition, these policies may help protect youths from a lifetime of nicotine addiction; recent research provides promising evidence that flavored tobacco restrictions can curb youths' tobacco use.^{5,6} Furthermore, given industry targeting of menthol to people of color, policies that reduce the availability of menthol products may have a direct impact on reducing racial inequities in smoking-attributable mortality. **AJPH**

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M. Kingsley and H. McGinnes led study design, drafted the article, and contributed equally to the article. H. McGinnes analyzed the data. G. Song contributed to study design and article development. All authors reviewed and revised the article.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to disclose.

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The (Im)precision of Life Expectancy Numbers

James A. Hanley, PhD

Life expectancy figures for countries and population segments are increasingly being reported to more decimal places and used as indicators of the strengths or failings of countries' health and social systems. Reports seldom quantify their intrinsic statistical imprecision or the age-specific numbers of deaths that determine them.

The SE formulas available to compute imprecision are all model based. This note adds a more intuitive data-based SE method and extends the jackknife to the analysis of event rates more generally. It also describes the relationships between the magnitude of the SE and the numbers of person-years and deaths on which it is based. These relationships can help quantify the statistical noise present in published year-to-year differences in life expectancies, as well as in same-year differences between or within countries.

Agencies and investigators are encouraged to use one of these SEs to report the imprecision of life expectancy numbers and to tailor the number of decimal places accordingly. (*Am J Public Health*. 2022;112(8):1151–1160. <https://doi.org/10.2105/AJPH.2022.306805>)

Some countries have begun to report national sex-specific life expectancy (LE) at birth to 2 decimal places, whereas international organizations use at most 1. Two authors¹ have recently taken issue with the absence of margins of error in these reports and with the false precision conveyed by these undue numbers of decimal places. On the basis of several models that allowed them to relate accuracy (they used the width of a 95% confidence interval) to population sizes and mortality levels, they concluded that “even if death registration and population counts were perfect, the accuracy of LE would not reach a year for 30% of all countries, 0.1 years for 63% of all countries, and 0.01 years for any country, even China or India.”

Methods to calculate a statistical margin of error for an LE have been available for 80 years and have been

described in demography textbooks.² Thus, it is surprising that national LE figures are seldom accompanied by a measure (or appreciation) of the intrinsic statistical (im)precision of such figures or a mention of the age-specific numbers of deaths that determine them. A few national statistical agencies, such as Statistics Canada,³ publish margins of error for their LEs and document how they were calculated. British agencies make reference to ways to compute them⁴ but do not publish them. US agencies do so when presenting LEs based on decennial life tables^{5,6} but not for other life tables.

One possible explanation for not reporting margins of error might be that there is no “sampling” involved.⁵ In this thinking, the LE derived from the mortality rates for the population or subpopulation of a certain city or country in 2018 is no different than the

heating degree days for a city or the average birthweight for those born during 2018. Although this perspective is understandable, it does not communicate how fragile or stable the LE number is (i.e., how much higher or lower it might have been if the number of deaths was one more or one fewer or the year was determined with the Gregorian or fiscal calendar). Because of this fragility, the reported LE for a single calendar year in the Statistics Iceland Web site is “the mean of that year and the year before.”

Admittedly, the 3 available SE formulas of Wilson,⁷ Chiang,⁸ and Silcocks et al.,⁹ from 1938, 1960, and 2001, respectively, are model-based formulas derived from calculus and are not very intuitive or easy to explain, even to those who are comfortable with simple SEs involving a unit variance, a “sample size,” and a square root. Thus, here I

introduce a new and more intuitive SE method. It retains the attempt by the earliest developer to give an intuition behind—and the insights provided by the components of—the SE formula but avoids the differential calculus. Also, using several sex-specific, calendar year-specific, and country-specific data sets, I report the empirical relationships between the magnitude of the SE and the numbers of person-years and deaths on which it is based.

The SE helps quantify how much statistical noise is present in published year-to-year differences in LEs, as well as in same-year differences between countries. It thus highlights how many decimal places, if any, are meaningful, even when there are no other sources of error. The empirical relationships can also be used to project the approximate magnitude of the SE to be computed from a smaller, not yet examined data set.

I proceed by first reviewing how life tables are calculated, indicating where the statistical uncertainties come from, and explaining how the 3 existing model-based formulas convert these age bin-specific uncertainties into SEs for the LEs derived from the fitted life table. I then show how the jackknife method provides a simple and intuitive way to appreciate how statistically fragile or stable the fitted LE is and which deaths influence it the most. I end by examining the empirical relationships between the magnitude of the SE and the numbers of person-years and deaths on which it is based.

FROM OBSERVED MORTALITY RATES TO LIFE EXPECTANCIES

The observed data (the “inputs”) used to show the basic LE calculations are

given in the first 2 columns of Table 1. The first contains the reported age-specific numbers of deaths (D_s) of Canadian females in 105 1-year age bins in the year 2011. The corresponding amounts of population time (PT ; here measured in units of woman-years but more generally person-years [PY]) in each of these bins were calculated as the reported numbers of women in these age bins in mid-2011 multiplied by the width (1 year) of each age bin.

The focus here is on LEs to the age of 105 years to avoid noise from small observed numbers of deaths at ages beyond this age. Three derived columns of numbers must be calculated to arrive at these LEs. The first is the column of observed (or, if they are unstable, smoothed) death rates, derived in the usual way as $m = D/PY$. From this, one derives the column (q) of (here 1-year) conditional probabilities of dying within the age interval in question. These probabilities refer to a hypothetical cohort. Formerly, when the exponential function was not easily accessible, the column entries were computed arithmetically as explicit fractions, but it now makes more sense to use the exponential formula linking rates and risks, namely $\hat{q} = 1 - \exp[-m \times 1 \text{ year}]$. The “hats” on the qs are used to emphasize that they are based on empirical ms and thus are as reliable or as fragile as these ms .

Next is the l column, the also hypothetical “proportions still alive” (“living”) at the beginning of each interval. Just as in medical life tables, these proportions are computed as the products of successive conditional “survival” probabilities; for example, at the second birthday of the fictional cohort (i.e., at $a = 2$), the surviving fraction is $\hat{l} = (1 - \hat{q}_1) \times (1 - \hat{q}_2)$. As with medical life tables, it

helps if the “radix” is taken to be $l_0 = 1$ rather than, for instance, $l_0 = 10\,000$.

The third is the \hat{L} column, the numbers of person-years lived in the various intervals by this “cohort.” Traditionally, \hat{L} calculations involve a hypothetical \hat{d} (numbers of deaths) column formed by successive subtractions of \hat{ls} and the portions of the interval those who would have died are assumed to have lived. Here a more direct way is used that inverts the relationship $m = q/L$ to obtain $\hat{L} = \hat{q}/m$ (or 1 full year if, whenever D is zero, m is also zero). The sum of all of the $\hat{L}s$ represents e_0 , the hypothetical LE at birth. The other e entries—those for subsequent birthdays—are obtained by dividing the partial sums of the $\hat{L}s$ by the corresponding \hat{ls} . In what follows, the birthday subscript is omitted.

THREE MODEL-BASED SE[e] FORMULAS

Perhaps because of his several articles and textbooks devoted to the life table, the SE method of Chiang⁷ is much better known than a very similar one introduced earlier by Wilson.⁸ Surprisingly, neither of these methods are mentioned in the article⁹ that introduces the Silcocks version. As shown subsequently, all 3 methods have a common structure and differ only in how they address the sampling variability of the qs . Because Wilson provided the most comprehensive and most comprehensible justification for his derivation, and because his heuristic approach ties in with the approach introduced in the next section, my description begins with his version and is limited to the SE for the estimate of e_0 . In Wilson’s words, this e_0 is

deduced by a mathematical calculation from the age specific death

TABLE 1— Data, Derived Life Expectancies, and SE[e₀] Calculations

(0) ^a	(1) ^b	(2) ^c	(3) ^d	(4) ^e	(5) ^f	(6) ^g	(7) ^h	(8) ⁱ	(9) ^j
a	D	PY	m	q	l	L	e	Δe ₀	D × (Δe ₀) ²
0	790	183 826	4.3	0.0043	1.0000	0.9979	83.555	0.000452	0.000161
1	43	185 297	0.232	0.0002	0.9957	0.9956	82.913	0.000443	0.000008
2	25	186 394	0.134	0.0001	0.9955	0.9954	81.932	0.000435	0.000005
3	23	184 328	0.125	0.0001	0.9953	0.9953	80.943	0.000434	0.000004
4	17	180 064	0.0944	0.0001	0.9952	0.9952	79.953	0.000439	0.000003
14	27	201 104	0.134	0.0001	0.9944	0.9943	70.018	0.000344	0.000003
24	74	229 764	0.322	0.0003	0.9919	0.9917	60.179	0.000258	0.000005
34	124	228 521	0.543	0.0005	0.9883	0.9880	50.379	0.000216	0.000006
44	278	244 580	1.14	0.0011	0.9815	0.9810	40.687	0.000161	0.000007
54	778	254 182	3.06	0.0031	0.9634	0.9620	31.341	0.000117	0.000011
64	1 390	189 386	7.34	0.0073	0.9218	0.9184	22.505	0.000107	0.000016
74	2 034	110 355	18.4	0.0183	0.8226	0.8150	14.538	0.000105	0.000022
84	4 101	71 652	57.2	0.0556	0.5970	0.5802	7.884	0.000062	0.000016
94	2 896	14 206	204	0.1844	0.1919	0.1736	3.595	0.000042	0.000005
99	996	2 810	354	0.2984	0.0528	0.0445	2.298	0.000035	0.000001
100	736	1 870	394	0.3254	0.0371	0.0306	2.076	0.000032	0.000001
101	480	1 126	426	0.3471	0.0250	0.0204	1.851	0.000031	0.000000
102	327	728	449	0.3618	0.0163	0.0132	1.589	0.000026	0.000000
103	225	424	531	0.4118	0.0104	0.0081	1.227	0.000020	0.000000
104	129	232	556	0.4265	0.0061	0.0047	0.767	0.000009	0.000000
Sum	120 883	17.2 million				83.5554			0.001091

Note. SE(e₀) based on Eqn. 1, with:

Wilson⁸: $\text{Var}(\hat{q}_y) = (q/m)^4 \times m(1-m)/PY$ $0.001063^{1/2} = 0.033$.

Chiang⁷: $\text{Var}(\hat{q}_y) = q^2(1-w)/D$ $0.001089^{1/2} = 0.033$.

Silcocks⁹: $\text{Var}(\hat{m}) = D/p^2$ $0.001149^{1/2} = 0.034$.

Jackknife SE(e₀) $0.00000001091^{1/2} = 0.033$.

Source. Data were obtained from the Human Mortality Database.¹⁰

^a(0): a = the beginning age of each 1-year wide interval; only 20/105 intervals shown

^b(1): D = Observed no. of deaths in interval

^c(2): PY = No. of person years in interval, estimated as (midyear population) × (1 y)

^d(3): m = observed mortality rate, D / PY

^e(4): q = (conditional) hypothetical probability of death within interval, $1 - \exp[-m]$

^f(5): l = proportion alive at beginning of interval, $\prod_0^a(1-q)$

^g(6): L = years lived in interval, calculated here as $l \times (q/m)$

^h(7): e = life expectancy (years) from age a to 105, calculated as $\left\{ \sum_a^{104} L \right\} / l_a$

ⁱ(8): Δe₀ = increase in e₀ if there (could) be 1 fewer observed death in age interval

^j(9): Age – specific contributions to Jackknife Variance of e₀

rates; by definition it is the average number of years lived after birth by a birth cohort of l_0 persons, i.e., $l_0 \times e_0$ is the total number of years lived by the birth cohort.^{8(p705)}

Instead of using the brevity afforded by calculus, he continues as follows^{8(p705)}:

Now, if in some particular age interval y to $y + 1$, the value of q_y , the chance of dying between those ages, should perchance be decreased by δq_y , the number of deaths would be decreased by $l_y \times \delta q_y$ and the years lived would be increased in that age interval by $(1/2) \times l_y \times \delta q_y$ and in all ages above $y + 1$ by $l_y \times e_{y+1} \times \delta q_y$.

Thus the expectation of life e_0 would be changed by

$$\delta e_0 = l_y \times (1/2 + e_{y+1}) \times \delta q_y.$$

To a first order of approximation, regarding δq as infinitesimal, the total change in e_0 from variations δq in different age groups would be the sum of the individual changes, where

the summation extends over all intervals, from birth on to the end of the life table. As the variations δq are supposed to be those of random sampling they must be assumed to be uncorrelated and the square of the standard deviation of e_0 is therefore

$$(1) \text{Var}(e_0) = \sum_{y>0} [l_{y>0} \times (1/2 + e_{y+1})]^2 \times \text{Var}[\hat{q}_y]$$

As is shown in the notes of Table 1, each of the 3 calculus-derived versions of the SE formula incorporates a different expression for each $\text{Var}[\hat{q}_y]$. Wilson treated the number of person-years as numbers of persons and considered the random variable m as having the binomial-form variance $\text{Var}[m] = m(1 - m)/PY$. Because he derived q from m using the traditional formula $\hat{q} = f(m) = \frac{m}{1+m/2}$, he multiplied $\text{Var}[m]$ by the scaling factor (f').² For ease of computing, he expressed this factor in terms of q and m , that is, as $(q/m)^4$. Chiang, instead, treated \hat{q} as a binomial proportion based on an “unknown” number of persons, N , and thus as having variance $q(1 - q)/N$. He back-calculated the N as $\hat{N} = D/q$ to arrive at $\text{Var}(\hat{q}) = q(1 - q)\hat{N} = q^2(1 - q)/D$.

Silcocks et al. used different notation than the demographers do: L , A , r , and N rather than l , L , D , and PT , respectively. He used the more modern exponential form to derive \hat{q} from m but calculated L via the trapezium rule rather than as \hat{q}/m . Because he considered the m s as the random components in equation 1, he calculated each variance component as a Poisson-based variance, that is, as D/PT^2 . As one can see, the 3 calculated SEs in the worked example are quite close to each other. The reason for the slightly larger Silcocks SE is that he used the (slightly

larger) Poisson, rather than binomial, variance components.

A MORE TRANSPARENT STANDARD ERROR CALCULATION

Of the 3 authors, Wilson provided the least technical and most readable description of the calculus-based derivation of the variance of a complicated nonlinear function of (in the present example) 105 random D s in the 105 amounts of population time. Moreover, his verbal explanation, starting with the sentence containing the word “per-chance,” can be seen as a specific example of a related but simpler and empirical (rather than model-based) variance-calculation approach.¹¹ It was formalized 2 decades later¹² and named the “jackknife.” The appendix (available as a supplement to the online version of this article at <http://www.ajph.org>) provides a worked example of the jackknife SE for the mean of a sample of 5 values and a Poisson count and illustrates the versatility that led John Tukey to name the “leave-one-out” approach the jackknife.

To apply the jackknife to the current life table in Table 1, one might (for the sake of using “rounder” numbers) consider the 17.2 million person-years of data as 150 trillion person-intervals, each just under 1 hour in duration. Some 120 883 of these person-intervals involve a death. (Of course, these time units are arbitrary.) Then, imagine a particular interval “per-chance” omitted and a new LE calculated, along with the quantity ΔLE and how much it differs from the LE based on all n units. Imagine repeating this process for each for the n person-intervals in turn. Despite the very large n , all but 120 883 of the ΔLE s are zero.

The 120 883 nonzero differences take on the 105 values shown in column 8 with the frequencies shown in column 1. Thus, the jackknife variance, namely the sum of the squares of the 150 trillion ΔLE s, reduces to the sum given at the foot of column 9. The jackknife gives just about the same SE as the existing calculus-derived methods, another example of the versatility and transparency of this tool.

Over the more than 600 LEs calculated from the sex-specific, calendar year-specific, and country-specific data considered in the next section, the jackknife SEs were from 1.008 to 1.016 times the Wilson SEs, from 1.003 to 1.009 times the Chiang SEs, and from 0.97 and 0.98 times the Silcocks SEs.

Figure 1 shows the age-specific contributions to the variance of the LE. The results from the 3 existing (calculus-derived) methods show a high level of agreement. This is not surprising given that the formulas differ only in the distributional assumptions they incorporate for the rightmost term in equation 1: the differences become visible only from the age of 70 years onward, when q and m and the associated binomial and Poisson variances begin to diverge, but even then they remain small and inconsequential. The jackknife method is purely data driven and calculates contributions without any assumptions beyond those used in calculating the LE itself.

With greater clarity than equation 1, Figure 1 also highlights which age bins contribute most to the variance of the LE. Not surprisingly, the 790 deaths in the first year of life contribute 15% of the variance, although they represent fewer than 1% of all deaths. The 43 in the second year, the 778 in the 55th year, and the 4895 in the 90th year contribute approximately 1% each.

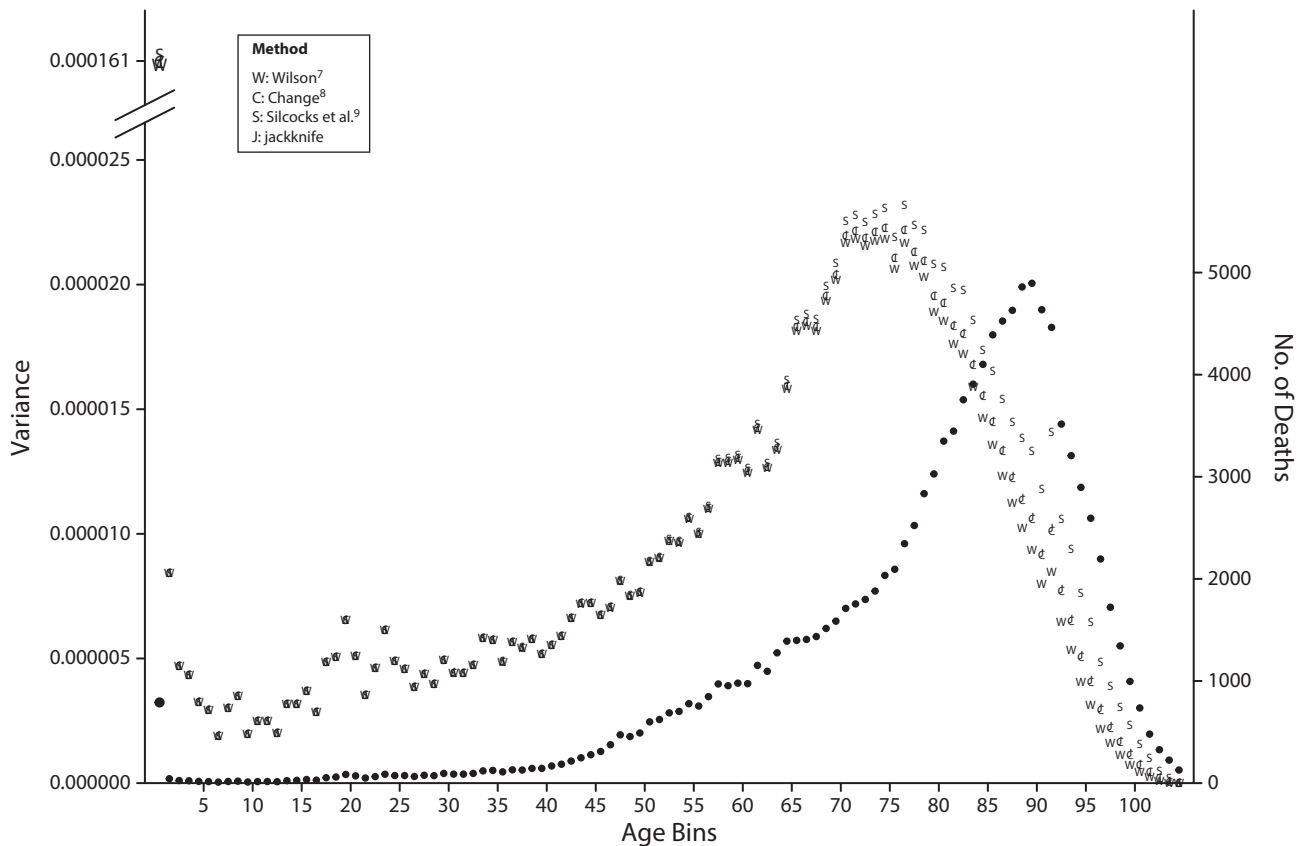


FIGURE 1— Age Bin-Specific Contributions to the Overall Variance in Life Expectancy, for Each Method Separately: Canada, 2011

Note. Data are for females. The numbers of deaths per age bin (right vertical axis) are shown as black dots.
Source. Human Mortality Database.

The largest contribution to the variance, 2%, is made by the 2034 deaths in the 75th year.

SE[e_0] MAGNITUDES AND THEIR DETERMINANTS

The SE[e_0]s shown in Figure 2 are from more than 600 actual data sets: 20 countries in the Human Mortality Database, each with up to 16 individual calendar years, for females and males separately. Even if we were to be less stringent and multiply each one by just 2 (rather than by 4 as Li and Tuljapurkar¹ did), none of the resulting “margins of error” would be less than 0.02 years.

Because the Human Mortality Database does not include them, other data

sources^{13–15} were used for SE calculations for females in India and China. The year 2010 was chosen, near the middle of the calendar period in Figure 1. Numbers of deaths were back-calculated through the use of reported 2010 age-specific mortality rates in the case of India and Canadian mortality rates scaled up so as to match the overall death rate in the case of China. The SEs for these Indian and Chinese e_0 s were 0.006 and 0.008 years, so even the “margins of error” (0.012 and 0.016, respectively) were both greater than the resolution of 0.01 years that many smaller countries use to report LEs.

One might also be concerned with the magnitudes of sex-specific SEs

based on data from a single calendar year in a country or population segment with a small population. As a means of studying a range of small data sets, Human Mortality Database information was obtained for 2 countries with populations of fewer than 1 million people: Iceland, whose total population ranged from approximately 320 000 to 340 000 over the period 2000 to 2015, and Luxembourg, whose population ranged from approximately 430 000 to 560 000 over the same period.

The SE[e_0]s for these countries and calendar years are plotted on the left side of Figure 3. The SEs in different colors further to the right of these SE[e_0]s were obtained from reduced versions

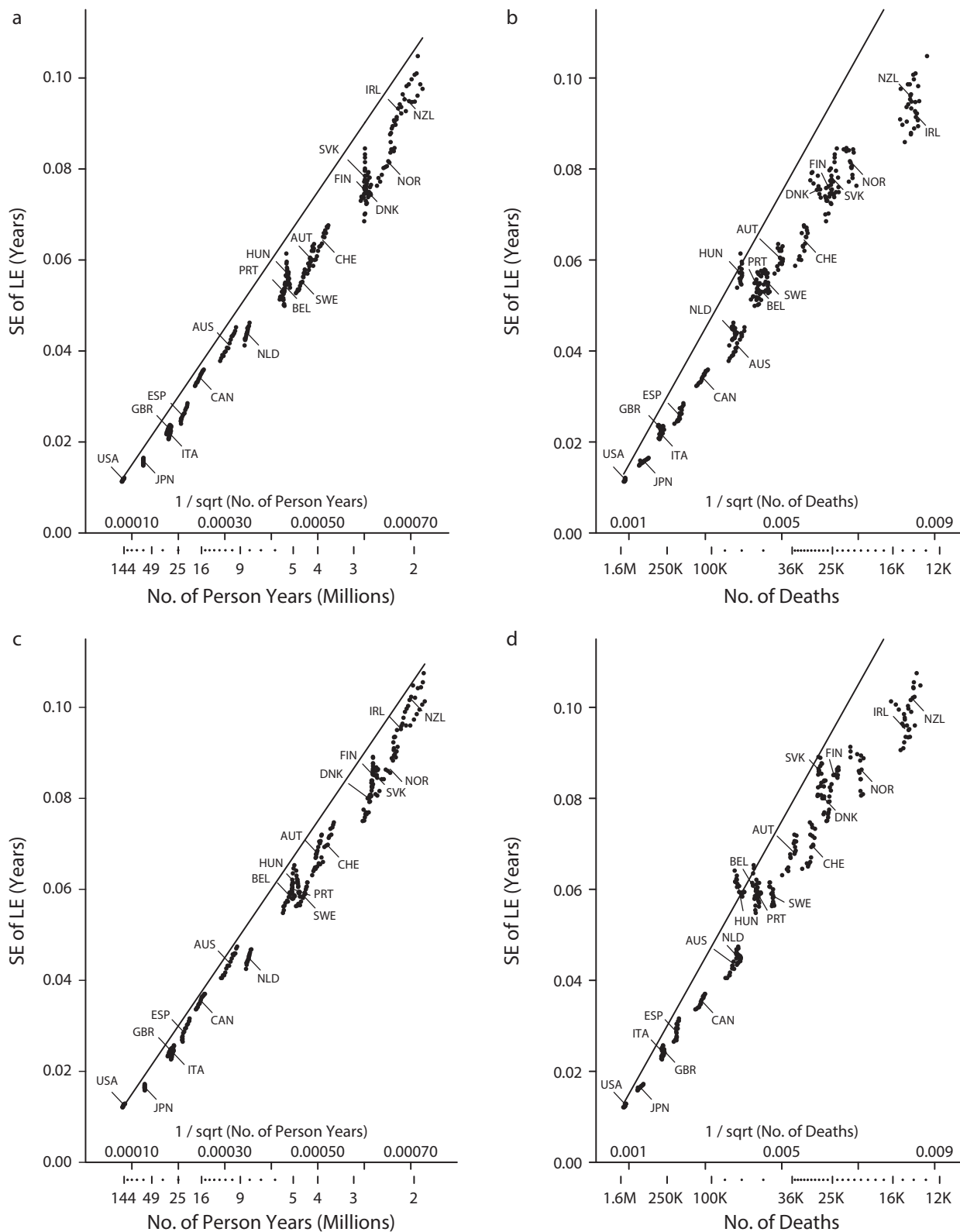


FIGURE 2— How $SE[e_0]$ for Life Expectancy (LE) at Birth Varies With (a and c) the Numbers of Person-Years and (b and d) the Numbers of Deaths on Which the LE Calculation Is Based for (a and b) Females and (c and d) Males, Respectively: 20 Countries, 2000–2015

Note. Each dot is calculated from the data in single-year-of-age age bins for a single calendar year for 1 country. The lines, with slopes of 150 and 15, respectively, are intended as rough upper bounds.

Source. Human Mortality Database.

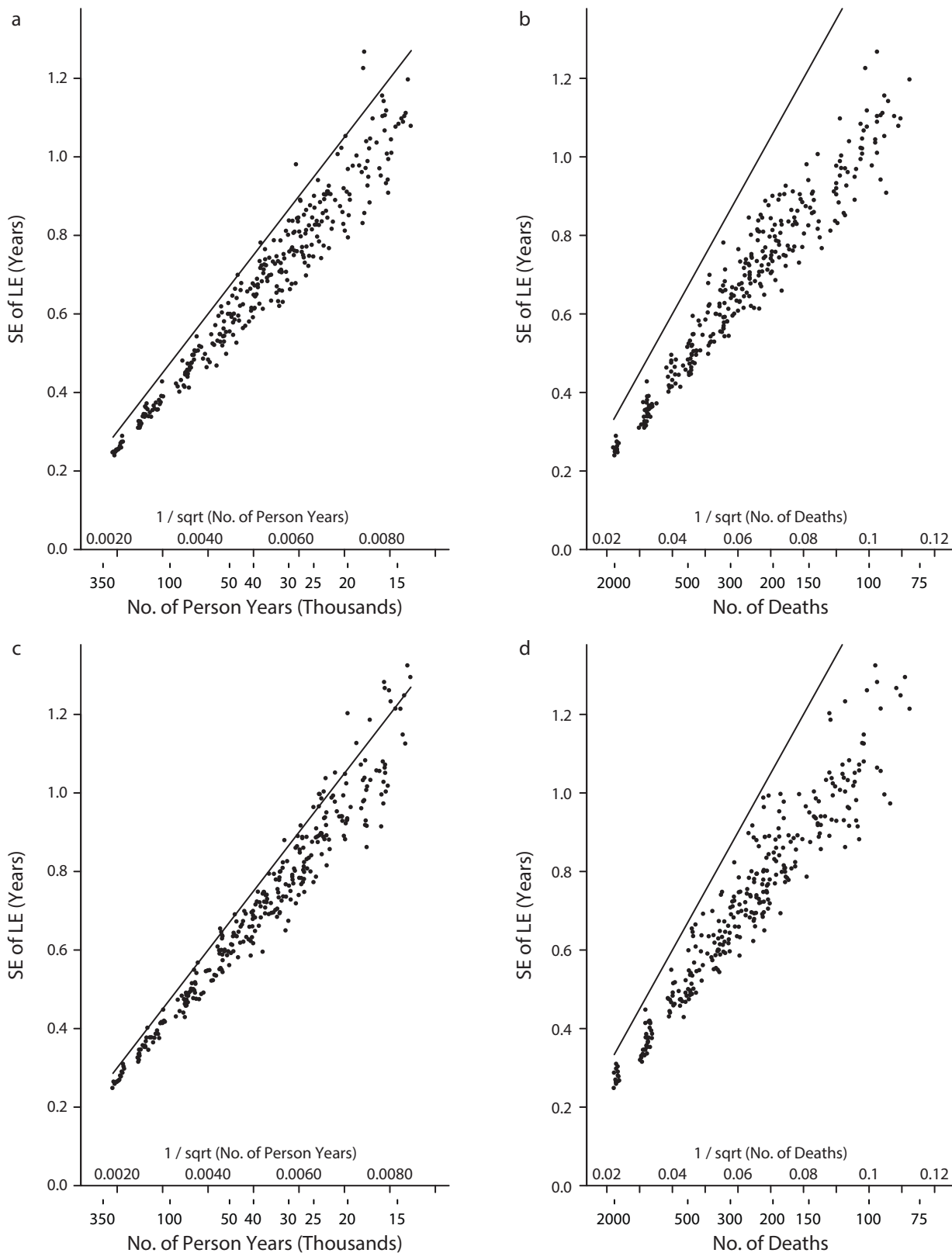


FIGURE 3— How $SE[e_0]$ for Life Expectancy (LE) at Birth Varies With (a and c) the Numbers of Person-Years and (b and d) Numbers of Deaths on Which the LE Calculation Is Based, for (a and b) Females and (c and d) Males, Respectively: Iceland and Luxembourg, 2000–2015

Note. Each dot is calculated from the sex-specific data in single-year-of-age age bins for a single calendar year for 1 country (Iceland or Luxembourg, leftmost 2 sets) or a “country segment” (further to right) that ranges from 1/2 to 1/10th the size of Iceland or Luxembourg.

Source. Human Mortality Database.

of these data sets ranging from 1/2 to 1/10th of the actual experience. As a means of forming these reduced data sets, the actual sex-, year-, and age bin-specific person-years were multiplied by 1/2, 1/3, . . . 1/10th, whereas the corresponding numbers of deaths were sampled from the observed counts with probabilities 1/2, 1/3, . . . 1/10th, respectively.

Although there are some anomalies, the broad patterns in Figures 2 and 3 bear out Li and Tuljapurkar's statement that the SE is roughly inversely proportional to the square root of the reciprocal of each total. One can go a bit further, quantifying the "constants" (slopes) and thus providing a rough empirical rule of thumb by which to gauge the likely magnitude of an SE using either the total number of person-years or the total number of deaths on which the e_0 is based. Instead of going "through" the data-points, the following equations provide lines that in most instances go "somewhat above" the data points from these 20 countries, 2 genders, and 15 or more calendar years:

$$SE[e_0] = \begin{cases} \frac{150 \text{ years}}{\sqrt{\text{Total Number of Person-Years}}} \\ \frac{15 \text{ years}}{\sqrt{\text{Total Number of Deaths}}} \end{cases} \quad (2)$$

The magnitudes of the SEs in the left-most panels of Figure 3 are broadly in line with the patterns seen in Eayres and Williams's Table 2.¹⁶ The standard deviation in Silcocks and colleagues' Figure 2,⁹ with 256 000 person-years, is 0.27 years, whereas equation 2 gives an upper bound of $150/\text{square root}(256000) = 0.3$ years. Across the simulated experiences of 5000 person-years in Eayres and Williams's Figure 3,

the standard deviation was 2 years, whereas the "bound" from equation 2 is $150/\text{square root}(5000) = 2.1$ years.

CONCLUSIONS

The first objective of this article was to illustrate a versatile tool that provides a more intuitive SE for the LE calculated from a current life table. It provides very similar answers to the existing methods, all of which were derived through differential calculus but are seldom used, even for life tables published by national and international statistical agencies. It also makes fewer assumptions as to the sampling distributions of the numbers of events in each age bin and avoids the confusion about binomial versus Poisson when calculating the variance components in the 3 calculus-based methods. Of course, although it may appear that the jackknife approach does not make distributional assumptions, there is an implicit assumption that the population time is divisible into a very large number of very small independent time elements.

The binomial-based Wilson and Chiang formulas treated the denominator inputs to the empirical age-specific mortality rates (the random vector ms , the fundamental column from which the life table is constructed) as numbers of persons. But deaths occur in (arise from) population time, the amount of which is typically estimated by multiplying the width of the calendar time period by the (estimated) midperiod population size.

This "person-years, not persons" principle comes to the fore when deciding how to apply the jackknife to the inputs to life tables: what is the correct choice of the "unit" of data, that is, what is the " n " in the summation and in the

$(n - 1)/n$ in the jackknife variance formula? Unlike a count of persons, population time is infinitely divisible. This divisibility principle is what enables the jackknife approach to yield the same variance as the model-based (Poisson) variance in the (1 age bin) example 2 in the appendix: the PT in the age bin is regarded as a very large number (n) of small time units, some D of which contain 1 death each. Moreover, in the jackknife approach, age bins that contain no deaths do not contribute to the variance in accord with recent findings.¹³

The second objective was to give a broad sense of how the magnitude of the SE for LE at birth varies with the amount of information in the input data set and of how many (if any) decimal places are meaningful. Not all that surprisingly, and as other authors have found, the SE broadly obeys the "reciprocal of the square root" law, both in the amounts of population time and in the numbers of deaths. This report quantifies the constant in this relationship and offers a rough upper bound for the relationship that should apply to data from populations or population segments with age structures similar to those shown in Figures 1 and 2.

If one works with amounts of population time rather than population sizes, data from multiple calendar years enter into the SE calculations in the same way as single-calendar-year data. Naturally, LEs based on k years of data have SEs that are square root(k) times smaller than those based on a single year of data and also guard against wild fluctuations caused by factors such as influenza activity. The (formerly more common) practice of centering multi-year LE calculations on the census year also reduces the effect of inaccuracies in intercensal population estimates on LEs for individual years.

There is increasing interest¹⁷⁻¹⁹ in using the LE as a summary measure for small area mortality levels, and investigators who derive such a summary measure seem quite aware of its imprecision. The relationships shown in [Figure 2](#), which can be seen as extending those in Eayres and Williams's [Table 2](#),¹⁶ should be of help. Although I have used single year-of-age bins throughout, the jackknife SE calculations I have shown will—with the usual modifications—work with bins of any width, and the relationships between the various SEs and the overall numbers of deaths and *PT* should remain similar. Indeed, one can think of broader bins as a form of smoothing. Fitting, say, a Gompertz or a spline model to *D*s and *PT*s is another way to deal with sparse counts in the early and late ages and also allows the possibility of using the variance covariance matrix for the parameters to obtain a resampling confidence interval via the parametric bootstrap.

The extensive sets of SEs in [Figures 2](#) and [3](#) reinforce the remarks of earlier authors about the overly precise LEs being reported by national statistical agencies. Because many national LEs are the same (“tied”) when rounded to an integer or to 1 decimal place, LE “league table” rankings based on mortality rates in a single year should not be taken too seriously.

I end with general remarks on the shape of the sampling distribution of the LE statistic. Some authors were surprised at how Gaussian it is, even when based on seemingly small samples. This Gaussian-ness is a reflection of the central limit theorem, which applies also to nonlinear functions of independently (but not necessarily identically) distributed random variables. Just as in the case of Kaplan–Meier and model-based survival estimates, the

applicability of the central limit theorem to fitted LEs is governed by the total number of events as opposed to the number in any one age or time bin.

Those who still do not trust in the central limit theorem will not be comfortable computing symmetric confidence intervals based on 1 of the 3 existing SEs or the jackknife SE and would prefer a bootstrap CI. But how to bootstrap an LE? The infinite divisibility principle discussed earlier suggests a way. In the case of the data in [Table 1](#), bootstrap the $n = 150$ billion person-hours that, between them, contain the 120 883 events; then calculate an LE from each bootstrap sample and do this enough times to obtain a sufficiently smooth sampling distribution from which to estimate the required, say, 2.5% and 97.5% percentiles.

If one thinks through what this process involves, one will realize that the same estimated sampling distribution can be obtained by treating each *D* as the expected value, μ , of a Poisson random variable; using a random draw from each of these Poisson distributions; calculating a bootstrap LE using the actual amounts of *PT* and the randomly sampled numbers of deaths, and repeating the preceding steps enough times to have a sufficiently smooth estimated sampling distribution from which to measure the required percentiles. When one applies this procedure to the *D*s and *PT*s in [Table 1](#), one finds that the estimated sampling distribution of the bootstrapped LEs is quite Gaussian, and the standard deviation is 0.033 years, just as it was with the methods considered earlier.

When I bootstrapped the various versions of the Iceland data (samples of females in the year 2000), the LE sampling distributions were still quite

Gaussian, even when the sample contained just 100 deaths. This and earlier investigations suggest that bootstrap confidence intervals are not needed and, if they were, that the considerable imprecision would render the results uninformative. Thus, an SE based on 1 of the 3 existing methods—or on the jackknife—can be used to form symmetric confidence intervals. **AJPH**

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CONFLICTS OF INTEREST

The author reports no conflicts of interest.

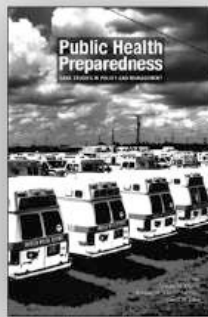
HUMAN PARTICIPANT PROTECTION

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

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The Missing COVID-19 Demographic Data: A Statewide Analysis of COVID-19–Related Demographic Data From Local Government Sources and a Comparison With Federal Public Surveillance Data

Angel Aliseda-Alonso, MPP, Sara Bertran de Lis, PhD, Adam Lee, Emily N. Pond, MPH, Beth Blauer, JD, Lainie Rutkow, JD, PhD, MPH, and Jennifer B. Nuzzo, DrPH, SM

Objectives. To collect and standardize COVID-19 demographic data published by local public-facing Web sites and analyze how this information differs from Centers for Disease Control and Prevention (CDC) public surveillance data.

Methods. We aggregated and standardized COVID-19 data on cases and deaths by age, gender, race, and ethnicity from US state and territorial governmental sources between May 24 and June 4, 2021. We describe the standardization process and compare it with the CDC's process for public surveillance data.

Results. As of June 2021, the CDC's public demographic data set included 80.9% of total cases and 46.7% of total deaths reported by states, with significant variation across jurisdictions. Relative to state and territorial data sources, the CDC consistently underreports cases and deaths among African American and Hispanic or Latino individuals and overreports deaths among people older than 65 years and White individuals.

Conclusions. Differences exist in amounts of data included and demographic composition between the CDC's public surveillance data and state and territory reporting, with large heterogeneity across jurisdictions. A lack of standardization and reporting mechanisms limits the production of complete real-time demographic data. (*Am J Public Health.* 2022;112(8):1161–1169. <https://doi.org/10.2105/AJPH.2022.306892>)

The impact of the COVID-19 pandemic in the United States has not been equal across different demographic groups. Multiple studies have shown that US racial and ethnic minority populations have a proportionally higher number of COVID-19 cases,^{1,2} higher mortality rates,^{3–6} and lower access to testing.^{7,8} Also, studies

from other countries have shown that although the prevalence of COVID-19 is similar between males and females, males have higher mortality rates.^{9–11} Advanced age is a significant risk factor for severe illness and death, with adults older than 65 years accounting for 75% of all COVID-19 deaths in the United States.¹²

Most epidemiological studies of demographic characteristics of cases, hospitalizations, and deaths rely on data from death certificates³ or specific populations from metropolitan areas,^{1,5,7} hospitals and health systems with high-quality data,^{4,9} or data from foreign countries.^{10,11,13} These data sources are informative but incomplete. They may

be limited to specific populations, may lack subnational representativeness, and may not be updated rapidly enough to adopt mitigation measures in specific populations.¹⁴

At the state and local levels, hospitals, health care providers, and laboratories report individualized data to health departments through a mandatory process known as “case reporting.”¹⁵ Using case reports, local health departments have created public-facing dashboards, data repositories, or Web sites with COVID-19 aggregated counts and demographic data. However, all public-facing dashboards are different, varying considerably in the availability and presentation of data. Therefore, comparing and tracking these data require that they be collected from different sites, organized, standardized, and concentrated in a single data repository.

By contrast, the US Centers for Disease Control and Prevention (CDC) collects deidentified patient-level data, including demographic characteristics, through a reporting mechanism called “case notification.”¹⁵ Using these patient-level data, the CDC produces the COVID-19 Case Surveillance Public Use Data with Geography data set. This data set contains 19 different characteristics for each COVID-19 case shared with the CDC, including demographics and geography (state and county), exposure history, and disease severity indicators. However, case notification is slower, voluntary, and less complete, as it depends on each jurisdiction’s reportable conditions. Moreover, the CDC follows a privacy protection review protocol that redacts specific information—including demographic characteristics—to reduce the risk of reidentification.¹⁶

Several independent efforts to gather and publish comprehensive race and

ethnicity data from each jurisdiction’s health department in a single publicly available aggregator have also emerged outside CDC sources. Examples of these efforts include the COVID Racial Data Tracker from the COVID Tracking Project and the Boston University Center for Antiracist Research,¹⁷ The Color of Coronavirus project from the APM Research Lab,¹⁸ and the COVID-19 Vaccine Monitor Dashboard from the Kaiser Family Foundation.¹⁹ However, those efforts concluded in March 2021.

Despite the many advantages of having COVID-19 demographic data to mitigate disparities,²⁰ it is not well understood how various public sites reporting demographic data compare. Moreover, it is unclear whether demographic data are complete and timely and whether they show consistent trends. To understand the impact of COVID-19 across different demographic groups at the state and territorial levels, the Johns Hopkins Coronavirus Resource Center (CRC) started collecting, processing, and publishing demographic data related to COVID-19 outcomes from state and territorial sources in April 2021.²¹ The CRC has been working since to routinely gather and standardize data that allow compilation—in a comprehensive, accurate, and uniform manner—of the diverse, publicly available data from all US states and territories.

As part of this effort, we sought to understand how these data from public-facing state and territorial Web sites compare with the national aggregation published regularly by the CDC. Here we describe the methods used to collect and standardize COVID-19 demographic data from various local sources and compare the standardized data set with a similar publicly available data set from the CDC, focusing on the

demographic composition of cases and deaths and the proportion of missing data.

METHODS

The CRC collects, standardizes, and publishes demographic data from official and publicly available state and territorial data sources related to the ongoing COVID-19 pandemic. The CRC demographic data set includes information on cases, deaths, testing, and vaccination reported by health departments from the 50 states, the District of Columbia, Puerto Rico, Guam, and the US Virgin Islands. The demographic categories included in the data set are age group, gender or sex, race, ethnicity, and race and ethnicity combined where available. Furthermore, each category contains different demographic groups (e.g., 20–29 years old, female, Hispanic or Latino, Asian, non-Hispanic White). Finally, some mixed demographic categories, such as ethnicity by age group and age group by gender, are not included in the CRC’s data collection effort because they are not widely available.

Standardization Process for CRC Demographic Data

The CRC follows a standardization process to produce common demographic groups across all states and territorial sources for the aforementioned demographic categories. This standardization process produces comparable demographic groups across all states and territories that are also comparable with demographic groups used in external data sources from the CDC and the US Census Bureau. In addition, it incorporates methods previously used in different race and ethnicity

data analyses, including analyses of COVID-19 outcome data.^{22,23}

First, we aligned the race and ethnicity groups reported by local health authorities with the groups established in the Office of Management and Budget's Standards for the Classification of Federal Data on Race and Ethnicity.^{24,25} Second, given that the Hispanic or Latino group comprises different races and some local health authorities do not disaggregate according to race and ethnicity, we kept race and ethnicity combined when the jurisdiction in question did so.

In addition, we calculated the ethnicity category in a manner similar to the California Department of Finance's "Hispanic hierarchical" approach.²⁶ We classified all self-reported Hispanic or Latino individuals as such, regardless of reported race, and categorized all self-reported non-Hispanic respondents claiming more than 1 race as "Two or More Races." Also, we aggregated all gender and sex categories into 3 large groups: female, male, and other.

To standardize all age groups available across sources, we re-binned the age distributions to match the American Community Survey's specific age categorization. We initially assumed uniform distributions for each original bin, then transformed the state-specific age ranges to 5-year age bins, and finally aggregated them, assuming that the upper limit of the 85 years old and older group was 100 years.²⁷ In addition, we combined any missing or unreported data, data under investigation, or unavailable data into the "unknown" group for all demographic categories.

After this process, we generated a data set with all of the data collected from the source and a standardized data set. The original and the standardized data sets, the documentation, and

the most up-to-date data sources can be accessed in a public repository (https://github.com/govex/COVID-19/tree/master/data_tables/demographic_data).

CDC Public Demographic Data and COVID-19

To compare how demographic data for cases and deaths from states and territorial sources differ from CDC public data, we used CRC demographic data, after standardization, collected from May 24 through June 4, 2021. With respect to CDC data, we used the June 23, 2021, update of the CDC's COVID-19 Case Surveillance Public Use Data with Geography. We aggregated the CDC Case Surveillance Public Use Data with Geography data set for age, sex, race, and ethnicity from the patient to the state level. In addition, we created a new combined race and ethnicity category.

After standardizing and processing CRC demographic data and CDC Case Surveillance Public Use Data with Geography, we compared the proportion of each demographic group's share of the total cases or deaths from both sources, including unknowns. Next, we compared the proportions of the groups' shares of total cases and deaths to evaluate the demographic composition of cases and deaths from the CDC's publicly available data and state and territorial sources. Finally, we performed a 2-proportion Z test to evaluate the statistical significance of the difference in proportions between the 2 data sets by demographic group, category, and state or territory. R version 4.0.3 (R Foundation, Vienna, Austria) was used in conducting all of our analyses.

RESULTS

There was significant variation in demographic categories across different sources and considerable heterogeneity in how similar demographic groups were named among local sources. Data by age were available from the majority of state and territorial sources. Table 1 shows that age data were available in 92.6% of the states and territories for cases, 88.9% for deaths, and 85.2% for vaccines. Ethnicity data were less frequently available across states (in only 48.1% of states and territories for vaccines, only 40.7% for deaths, and only 44.4% for cases). Testing data were least available across all COVID-19 outcomes; 9 states or territories (16.7%) had testing data by age, and only 3 (5.6%) had such data by ethnicity or race. We could not find a shared demographic group present in any of the 54 states and territories included in the data collection process for any COVID-19 outcome.

In addition to data availability, standardization of demographic groups across data sources was a challenge. We identified 402 different demographic groups across all demographic categories through the data collection process. Some of these differences were a result of semantic differences in how each source names similar groups. For example, Black or African American is referred to as Black in some jurisdictions such as Mississippi, whereas other jurisdictions such as the District of Columbia match the CDC's categorization scheme. However, other differences were more profound and implied demographic groups that cannot easily be compared with others. For example, Asian is aggregated with Native Hawaiian or Pacific Islander in Michigan but only with Pacific Islander in North

TABLE 1— US Jurisdictions With Available Demographic Categories, by COVID-19 Outcome, Through June 2021

Demographic Category	Jurisdictions Where the Demographic Category Is Available (n = 54), No. (%)
Cases	
Age	50 (92.6)
Ethnicity	24 (44.4)
Gender or sex	51 (94.4)
Race	30 (55.6)
Race and ethnicity	24 (44.4)
Deaths	
Age	48 (88.9)
Ethnicity	22 (40.7)
Gender or sex	48 (88.9)
Race	26 (48.1)
Race and ethnicity	25 (46.3)
Tests	
Age	9 (16.7)
Ethnicity	3 (5.6)
Gender or sex	8 (14.8)
Race	3 (5.6)
Race and ethnicity	6 (11.1)
Vaccines	
Age	46 (85.2)
Ethnicity	26 (48.1)
Gender or sex	41 (75.9)
Race	29 (53.7)
Race and ethnicity	20 (37.0)

Carolina. It is also included in the “other” category in certain jurisdictions such as Indiana.

As shown in Table A of the appendix (available as a supplement to the online version of this article at <http://www.ajph.org>), we recoded and aggregated 230 source-specific groups for gender or sex, race, ethnicity, and race and ethnicity. For age groups, we re-binned 134 source-specific groups into bins ranging from 0 to 9 years old to 85 years old and older. After the standardization process, we produced a data set that contained 8745 data points across 10 age groups, 3 ethnicity groups, 4 gender or sex groups, 8 race groups,

and 23 race and ethnicity groups, including an “unknown” group for every category.

Moreover, we compared the demographic composition of the CDC Case Surveillance Public Use Data with Geography data set across specific demographic groups using the CRC standardized demographic data set as a benchmark separately for cases and deaths. In addition, we performed a 2-proportion Z test to evaluate whether differences were statistically significant at a 95% confidence level. This CDC data set incorporates patient-level data for more than 27.1 million COVID-19 cases. It includes demographics such

as age, sex, ethnicity, race, state and county of residence, and underlying medical conditions (e.g., diabetes, cardiovascular disease).

We were able to join and compare 745 unique state and demographic group pairs for cases and 595 for deaths. We joined only state and demographic groups present in both data sets and excluded pairs in which there were no cases or deaths in either data set. Also, we manually excluded deaths by race for Montana and deaths by gender and race for Pennsylvania as a result of incomplete data for most groups.

When comparing specific demographic groups, we found that some groups are consistently overreported and others are consistently underreported in the CDC data set. For example, Figure 1 shows that deaths among people older than 65 years are overreported across states. The number of deaths among people older than 65 years in Louisiana is 23.1 percentage points ($P < .001$) higher in the CDC data set than in the CRC demographic data. The difference is similar in Utah, where the number of deaths among people older than 65 years is 21.5 percentage points ($P < .001$) higher in the CDC data set.

By contrast, we found that the proportion of cases and deaths in the Hispanic or Latino population is consistently underreported in the CDC data set. For example, Figure 2 shows that cases and deaths among Hispanic or Latino individuals are underreported compared with CRC demographic data across all states and territories with the exception of cases in Missouri. In addition, in an extreme example, 45.3% of California's total cases are among people who identified as Hispanic or Latino in the CRC demographic data set. The

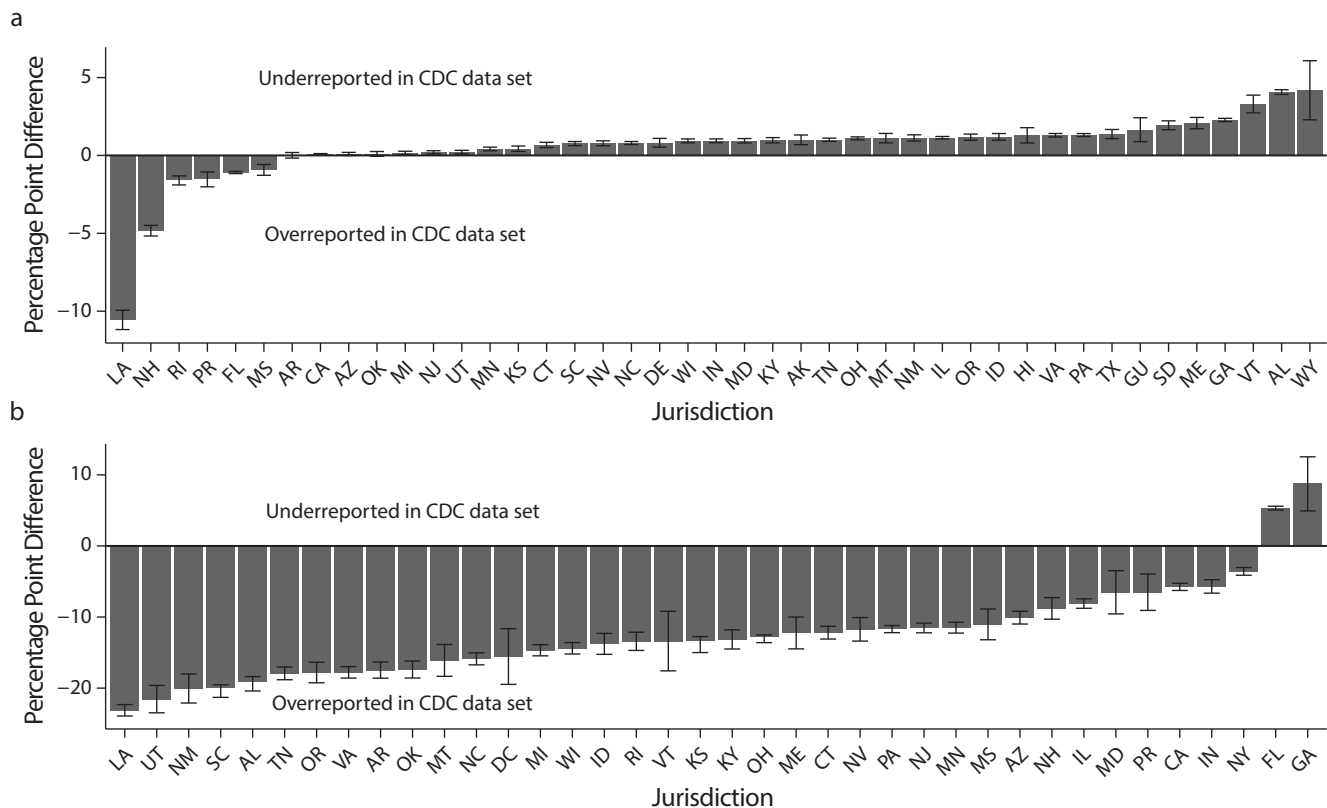


FIGURE 1— Differences in the Proportions of (a) Cases and (b) Deaths Among People Aged 65 Years and Older in the CDC and CRC Data Sets, by US State or Territory, Through June 2021

Note. CDC = Centers for Disease Control and Prevention; CRC = Coronavirus Resource Center. Whiskers indicate 95% confidence intervals.

CDC data set reports only 16.3%, a difference of 29 percentage points. Moreover, Oregon reported that 23.5% of total cases correspond to Hispanic or Latino individuals, whereas the CDC reported only 2.4%.

Also, some demographic groups (e.g., females) are underreported in cases but overreported in deaths in the CDC data set. Figure A (available as a supplement to the online version of this article at <http://www.ajph.org>) shows that of the 44 states where we could compare both data sets, the CDC underreports cases among females in 40 states or territories with a statistically significant difference. However, in 18 of the 32 states or territories with available data, the CDC overreports the proportion of deaths in this demographic group.

Furthermore, we found that the CDC data set underreports the proportion of cases and deaths among Black or African American individuals for most jurisdictions. For instance, cases among Black or African American individuals are 13 percentage points ($P < .001$) lower in Georgia and 6.8 percentage points ($P < .001$) lower in North Carolina in the CDC data set than in the CRC's demographic data (Figure B, available as a supplement to the online version of this article at <http://www.ajph.org>). For deaths, the differences increase to 30.7 percentage points ($P < .001$) in Georgia and 15.1 percentage points ($P < .001$) in North Carolina. However, not all race groups are consistently underreported in the CDC data set. For example, White individuals

are overreported in deaths in 16 of 20 states and territories with available data (Figure C, available as a supplement to the online version of this article at <http://www.ajph.org>).

Finally, we examined 2 ways in which missing data in the CDC data set could be driving the differences we previously identified. First, we compared the total number of COVID-19 cases and deaths in both data sets to check for the overall completeness of the CDC data set by state and territory. We used the total number of COVID-19 cases and deaths from the CRC data set as the benchmark; this data set contains cumulative totals collected from official public sources and represents one of the most up-to-date sources for COVID-19 cases and deaths.²⁸

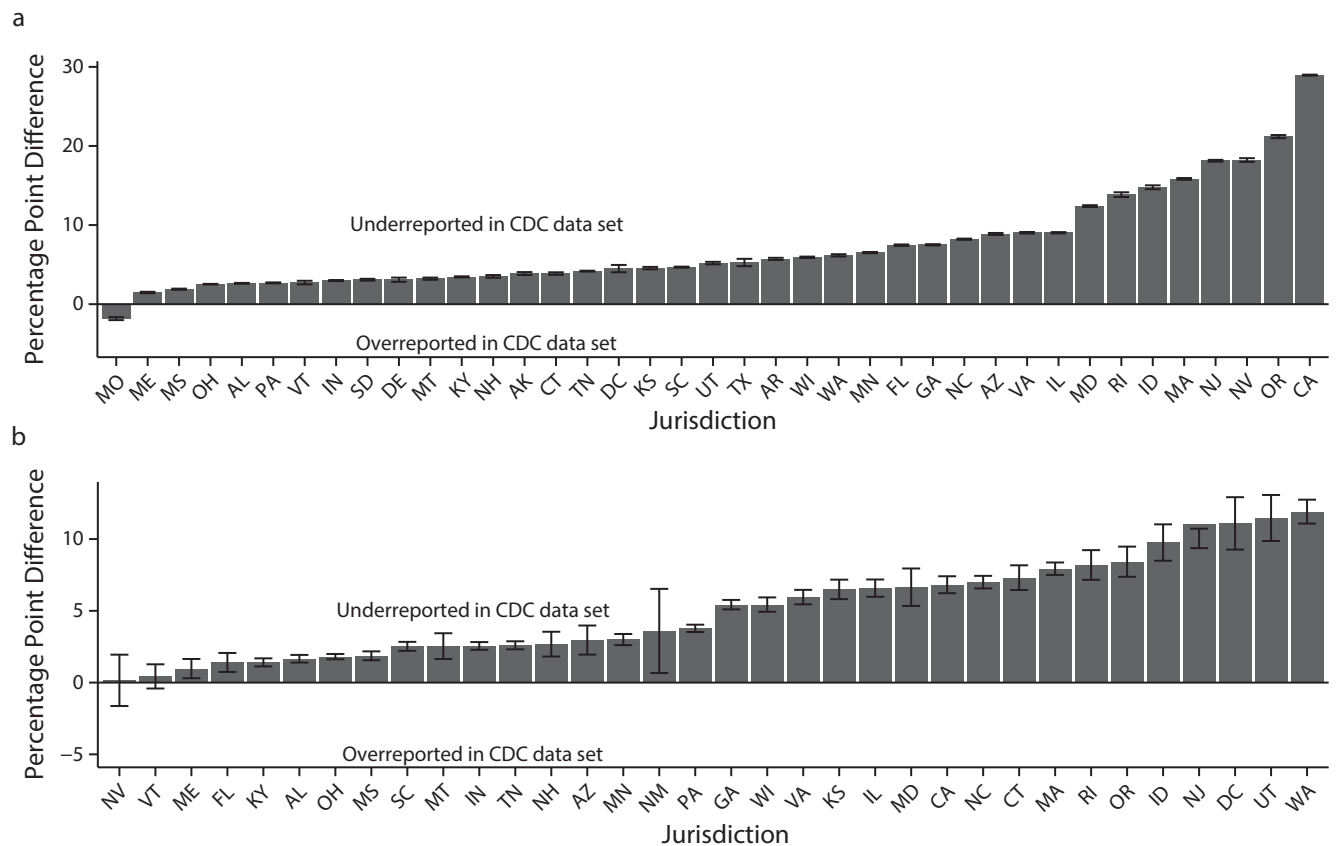


FIGURE 2— Differences in the Proportions of (a) Cases and (b) Deaths Among Hispanic or Latino Individuals in the CDC and CRC Data Sets, by US State or Territory, Through June 2021

Note. CDC = Centers for Disease Control and Prevention; CRC = Coronavirus Resource Center. Whiskers indicate 95% confidence intervals.

The CDC Case Surveillance Public Use data set includes 80.9% of all COVID-19 cases registered in the United States. However, it contains only 46.7% of all reported COVID-19 deaths, with considerable heterogeneity across states (Figure 3). For cases, most states and territories have reported the majority of their patient-level data to the CDC, or they even update the CDC more frequently than their local public reporting. For example, the CDC data set includes more than 100% of all cases registered in the CRC data set for New York (103.33%) and New Jersey (103.9%). However, 5 states have reported less than 10% of their total case data to the CDC: Wyoming (2.1%), Texas (2.73%), Louisiana (4.14%),

West Virginia (5.44%), and Missouri (9.73%).

In addition, death data are incomplete overall. There are 11 states or territories that do not report patient-level data on COVID-19 deaths to the CDC. These jurisdictions are Alaska, Delaware, Guam, Hawaii, Missouri, Nebraska, South Dakota, Texas, the US Virgin Islands, West Virginia, and Wyoming. Massachusetts (95.96%) and Illinois (88.23%) report the most significant amounts of patient-level data for deaths.

Second, we compared the overall proportion of cases and deaths with unknown demographics between the 2 data sets for all demographic categories and performed a 2-proportion Z test. We found that the overall

proportion of cases and deaths with unknown demographics is larger in the CDC data set than the CRC data set for all demographic categories (Table B, available as a supplement to the online version of this article at <http://www.ajph.org>). For example, the number of cases with unknown race and ethnicity is 24.2 percentage points higher in the CDC data set than in the CRC data set. Similar results were observed in most states and territories with available data.

DISCUSSION

The results of our analysis reveal considerable heterogeneity in how jurisdictions present demographic data on

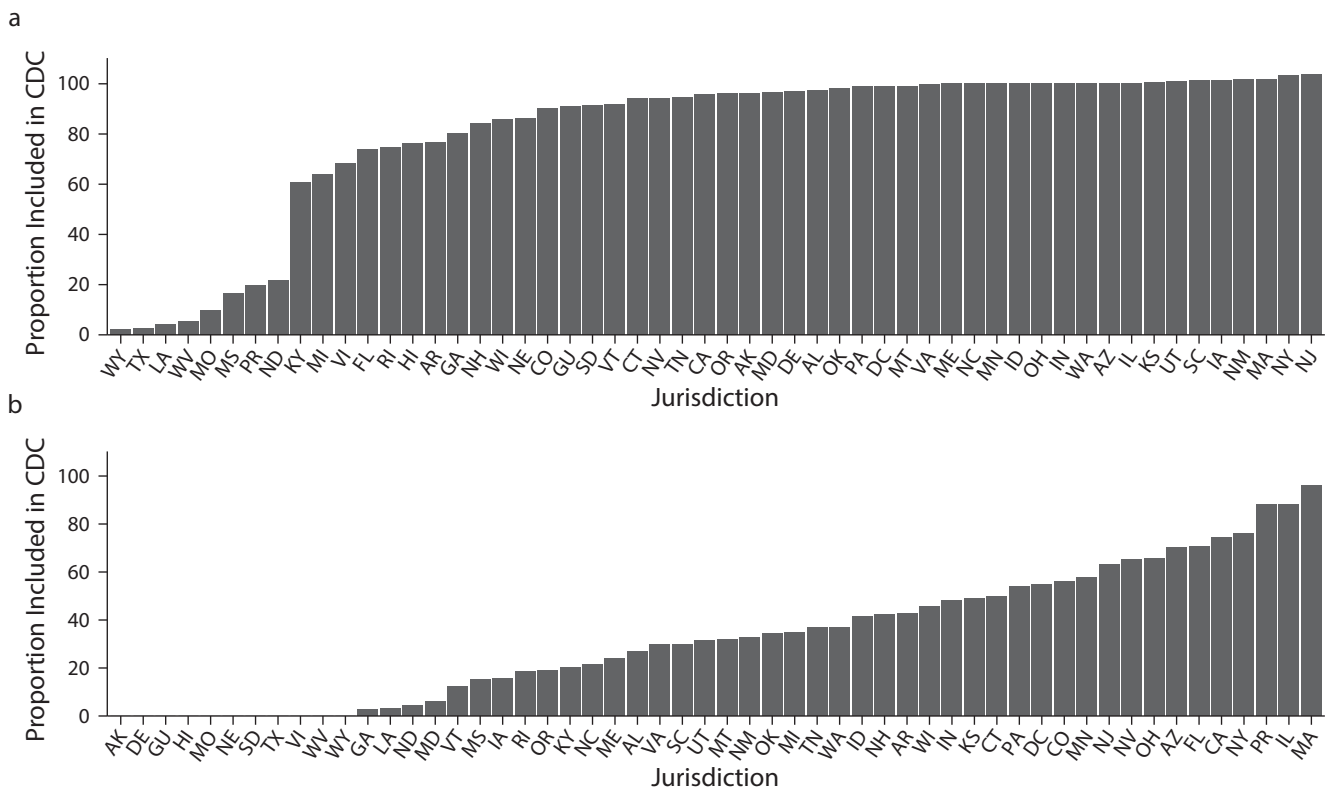


FIGURE 3— Proportions of Total COVID-19 (a) Cases and (b) Deaths Included in the CDC Case Surveillance Public Use Data With Geography Data Set, by US State or Territory, Through June 2021

Note. CDC = Centers for Disease Control and Prevention.

COVID-19 outcomes. Differences were found both across and within jurisdictions for different COVID-19 outcomes, which complicates comparisons across states. To overcome this challenge, we developed a standardization process that recategorized these groups, reducing the number of groups to a smaller number of common categories across states and territories. After a semantic alignment process and a re-binning process for age groups, we reduced the number of unique categories from 402 to 48. This standardization process produced a data set with demographic data by state or territory for common demographic groups in all states where sufficient data were available.

There are several limitations to our approach stemming from the lack of patient-level data from states. First,

there were not enough data available to produce all demographic groups for all jurisdictions. Second, some states or territories do not report certain demographic categories or present data from different demographic groups aggregated into a single large group. Finally, the age re-binning process assumes a uniform distribution within a bin, which is problematic when a state reports a wide age bin. Enhanced data reporting standards across all jurisdictions could help ensure that states employ consistent categories, which might allow for more comparable and complete demographic data.

Our analysis revealed differences in size and demographic composition between patient-level demographic data from the CDC's public COVID-19 data set and state and territory

reporting. We found that the CDC data contain fewer COVID-19 cases and deaths and a larger proportion of unknown or missing demographics for cases and deaths, with significant variation across states and territories. Overall, the CDC data set includes 80.9% of all COVID-19 cases publicly reported by state and territorial health departments. For deaths, the CDC data set includes less than half of all deaths reported in the United States by state and territorial authorities. In addition, information for COVID-19-related deaths from 11 jurisdictions is completely missing from CDC reporting.

Moreover, the 2 data sets seem to present different demographic compositions of COVID-19 patients, especially with respect to deaths. For example,

cases and deaths among Hispanic or Latino and Black or African American populations, and cases among females, are consistently underreported across the vast majority of states and territories in the CDC reporting. By contrast, deaths among those aged 65 years and older and White individuals are consistently overreported in CDC data relative to state and territorial sources.

It is unclear how data supply and processing might be affecting the demographic composition of these different sources. Further research is needed to understand how data reporting mechanisms might contribute to these differences. Additional research is also needed to assess the extent to which privacy protection rules limit the completeness of the CDC demographic data and whether such limitations could partially explain the differences in state and territory reporting.

Throughout this analysis, we have indicated that lack of standardization and ineffective data reporting mechanisms limit the ability to aggregate complete real-time demographic data at the national level. At best, discrepancies between data reported by states and those reported by the CDC may create confusion. At worst, there may be systematic bias in reporting of demographic data on the part of either states or the CDC. To ensure transparency and data quality, it is important that the causes of these discrepancies be investigated, understood, and, if necessary, adjudicated. However, these discrepancies may also deepen distrust, leading to hesitancy and noncompliance with mitigation strategies such as social distancing, masking, and vaccination.

Having accurate and timely demographic data may also help government agencies make data-informed decisions on how to target resources

and allow the scientific community to understand the spread and impact of the virus in the most at-risk populations. For example, in the short run, health authorities could use COVID-19 demographic data to identify where to increase targeted vaccination efforts, how current and future variants will affect different communities and age groups, and which communities are being excluded from access to testing. In the long run, COVID-19 demographic data should influence decisions on where to increase clinical support to treat patients with post-COVID-19 conditions, which communities lack sufficient access to health care resources, and how COVID-19 affects educational outcomes and school dropout rates.

In conclusion, there is a need to improve the current US public health data landscape by modernizing data reporting mechanisms between health care providers, local health authorities, and the CDC. This will require significant policy and funding changes that should also affect the current standards for reporting demographic data. Nevertheless, having complete, accurate, and timely demographic data will help in efforts to deploy proper mitigation strategies in the short term and improve the ability of academics and governments to study how social determinants affect the population's health. *AJPH*

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CONTRIBUTORS

All authors conceptualized the article, provided critical feedback, and discussed the findings. A. Aliseda-Alonso, A. Lee, and E. N. Pond collected the data. A. Aliseda-Alonso, S. Bertran de Lis, and A. Lee performed the analysis. A. Aliseda-Alonso led the writing and draft revisions with input from the other authors. S. Bertran de Lis, B. Blauer, L. Rutkow, and J. B. Nuzzo supervised the project.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

HUMAN PARTICIPANT PROTECTION

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

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Tuberculosis Outbreaks in State Prisons, United States, 2011–2019

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 See also Chang, p. 1084.

Objectives. To understand the frequency, magnitude, geography, and characteristics of tuberculosis outbreaks in US state prisons.

Methods. Using data from the National Tuberculosis Surveillance System, we identified all cases of tuberculosis during 2011 to 2019 that were reported as occurring among individuals incarcerated in a state prison at the time of diagnosis. We used whole-genome sequencing to define 3 or more cases within 2 single nucleotide polymorphisms within 3 years as clustered; we classified clusters with 6 or more cases during a 3-year period as tuberculosis outbreaks.

Results. During 2011 to 2019, 566 tuberculosis cases occurred in 41 state prison systems (a median of 3 cases per state). A total of 19 tuberculosis genotype clusters comprising 134 cases were identified in 6 state prison systems; these clusters included a subset of 5 outbreaks in 2 states. Two Alabama outbreaks during 2011 to 2017 totaled 20 cases; 3 Texas outbreaks during 2014 to 2019 totaled 51 cases.

Conclusions. Only Alabama and Texas reported outbreaks during the 9-year period; only Texas state prisons had ongoing transmission in 2019. Effective interventions are needed to stop tuberculosis outbreaks in Texas state prisons. (*Am J Public Health.* 2022;112(8):1170–1179. <https://doi.org/10.2105/AJPH.2022.306864>)

The inherent social vulnerability of incarcerated individuals entitles them to certain protections.¹ Protecting them from harmful pathogens is both a public health and social justice issue.^{2,3} Because weekly turnover is above 50% in local jails,⁴ the incidence of infectious diseases in jails largely derives from background community epidemiology. In contrast, an average state prison sentence is 2.6 years.⁵ For the approximately 1.2 million individuals currently incarcerated in US state prison systems,⁶ this longer sentence duration means that the natural history of an infectious disease—from initial exposure to illness onset—is more likely to occur during incarceration.

Following the 1980s-to-1990s sharp increase in the number of incarcerated individuals in the United States, which co-occurred with the onset of the HIV/AIDS epidemic,⁷ multiple tuberculosis (TB) outbreaks in correctional facilities were documented.^{8–11} Few state prison TB outbreaks appeared in the subsequent literature,^{12–15} but each one involved *Mycobacterium tuberculosis* spread beyond the prison and into the broader community, including correctional officers and children. The recent dearth of articles describing TB outbreaks in state prisons could be a result of a true decline in such outbreaks. However, before the analysis described here, the nationwide incidence of TB

outbreaks in state prisons was unknown. In this analysis, we used established national TB surveillance and next-generation whole-genome sequencing methods to estimate the frequency and magnitude of TB outbreaks in state prisons, describe their geographic distribution, and summarize characteristics of individuals associated with those outbreaks.

METHODS

Public health departments report all verified cases of TB in the United States to the National Tuberculosis Surveillance System.¹⁶ Each case report includes demographic, clinical, and programmatic

variables such as whether a patient was diagnosed with TB while incarcerated and, if so, the incarceration facility type (federal, state, local, juvenile, other, or unknown). Case reports also include employment type, which facilitates identification of TB cases among correctional workers. *M. tuberculosis* isolates from culture-confirmed cases are routinely genotyped.

We included all verified TB cases that the 50 US states reported during 2011 to 2019 as occurring in a person incarcerated in a state prison at the beginning of the diagnostic evaluation that led to the TB diagnosis. Data on incarceration length and history were unavailable. To generate annual TB incidence in state prisons, we used each state's year-end estimates from the US Bureau of Justice Statistics as denominators.^{5,17,18}

To identify TB cases that might represent *M. tuberculosis* transmission within state prison facilities, we first identified all clusters of 3 or more TB cases in a single state prison system during any 3-year period from 2011 to 2019 that involved 2-locus or fewer differences on spacer oligonucleotide typing (spoligotyping) and 24-locus mycobacterial interspersed repetitive unit-variable number tandem repeat typing results; these clusters represented the top 10% of cluster sizes in our data set. Then, to increase our molecular resolution, we performed whole-genome sequencing for all isolates from cases in those initially identified clusters. We used whole-genome single nucleotide polymorphism comparisons to measure the genetic distance between isolates. A conservative threshold of 2 or fewer single nucleotide polymorphisms was used to define cases as closely related (i.e., signifying evidence of recent transmission).

Only the initially identified clusters with 3 or more closely related cases

during a 3-year period remained in the analysis; we added other cases in the same state prison system from other years during 2011 to 2019 if those other cases' isolates were within 2 single nucleotide polymorphisms of an isolate from a case in the cluster. Finally, we classified the subsets of clusters with 6 or more closely related cases during a 3-year period as TB outbreaks.^{19,20}

We compared demographic, programmatic, and clinical characteristics of cases among incarcerated individuals in clusters ("clustered cases") with cases among incarcerated individuals who were not in clusters ("nonclustered cases") of 3 or more cases and cases for which a cluster designation could not be made ("nondesignated cases"; i.e., nongenotyped cases, cases for which an isolate could not be analyzed, and cases in a cluster with less than 3 cases with an analyzable sequence). Demographic characteristics included sex, age, race/ethnicity, and country of birth. Programmatic characteristics included elements of the standard diagnostic evaluation for TB (e.g., chest radiograph performed and sputum smear examined) and identification of known risk factors (e.g., whether the patient was documented as having had an infectious TB exposure in the past 2 years). Clinical characteristics included acid-fast bacilli sputum smear and chest radiograph results, drug resistance, and patient outcome (e.g., treatment completion, death).

We used SAS version 9.4 (SAS Institute Inc, Cary, NC) to conduct our analysis. All data were collected as part of routine TB surveillance activities.

RESULTS

Of the 85 161 verified TB cases reported to the National Tuberculosis Surveillance

System during 2011 to 2019, 566 (0.66%) occurred among individuals who were incarcerated in a state prison at the time of diagnosis. The total number of TB cases in state prisons nationally ranged from 107 cases in 2011 to 41 cases in 2019 (a national annual median of 59 cases).

Per state, a median total of 3 TB cases occurred in state prisons during 2011 to 2019. Iowa, Maine, Montana, Nebraska, New Hampshire, Utah, Vermont, West Virginia, and Wyoming reported no cases in state prisons; 10 states reported only 1 case in a state prison during the 9-year period (Table 1). Fourteen states reported 8 or more cases (75th percentile), and 3 states reported 48 or more cases (95th percentile): California (48 cases), Florida (61 cases), and Texas (201 cases).

TB incidence among people incarcerated in state prisons ranged from 7.7 cases per 100 000 individuals in 2011 to 3.1 cases per 100 000 in 2017 (median = 5.0 cases per 100 000), as compared with 3.4 per 100 000 and 2.7 per 100 000 in 2011 and 2019, respectively, in the general US population. Seven states had a median incidence of more than 5 cases per 100 000 individuals in state prisons during 2011 to 2019 (Table 1): Alabama (6.5), Alaska (19.7), Arkansas (5.6), Georgia (5.6), Mississippi (5.2), North Carolina (8.2), and Texas (14.0).

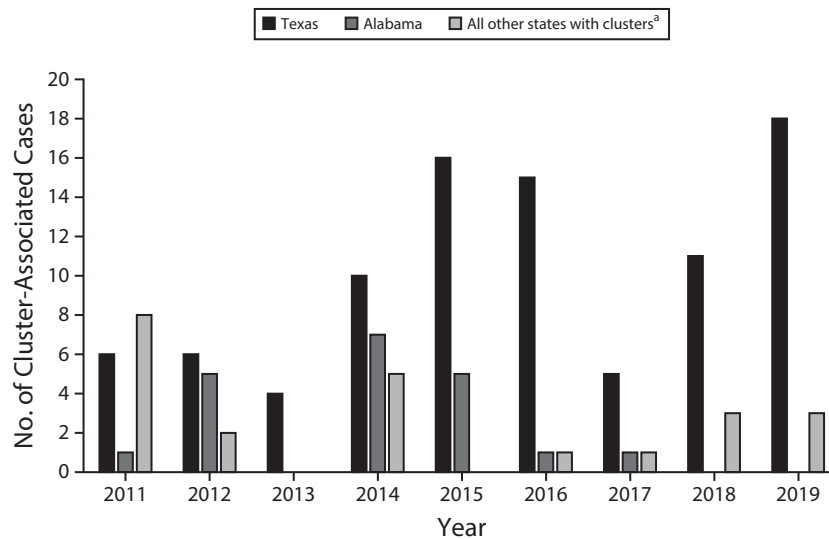
A cluster designation could be made for 422 (74.6%) of the 566 cases among individuals incarcerated in a state prison at diagnosis. Among those, we identified a total of 19 TB clusters comprising 134 cases (Figure 1). States with TB clusters of 3 or more cases in state prisons included Alabama (2 clusters), Florida (2 clusters), Georgia (1 cluster), Indiana (1 cluster), North Carolina (2 clusters), and Texas (11 clusters; Figure 1).

TABLE 1— Tuberculosis (TB) Cases, Median Incidence, and Clusters Among Individuals Incarcerated in a State Prison at the Time of Diagnosis: United States, 2011–2019

State ^a	No. TB Cases	Median TB Incidence ^b	No. Clusters With ≥ 3 TB Cases
Texas	201	14.0	11
Florida	61	4.9	2
California	48	3.8	0
Alabama	39	6.5	2
Georgia	39	5.6	1
North Carolina	20	8.2	2
Oklahoma	13	3.6	0
Louisiana	12	2.7	0
Arizona	11	2.4	0
Indiana	10	3.7	1
Missouri	9	0.0	0
South Carolina	9	0.0	0
Arkansas	8	5.6	0
New Jersey	8	4.9	0
Alaska	7	19.7	0
Illinois	7	2.2	0
Massachusetts	7	0.0	0
Mississippi	7	5.2	0
Kentucky	6	0.0	0
New York	4	0.0	0
Tennessee	4	0.0	0
Virginia	4	0.0	0
Delaware	3	0.0	0
Hawaii	3	0.0	0
Minnesota	3	0.0	0
New Mexico	3	0.0	0
Idaho	2	0.0	0
North Dakota	2	0.0	0
Ohio	2	0.0	0
Oregon	2	0.0	0
Washington	2	0.0	0
Colorado	1	0.0	0
Connecticut	1	0.0	0
Kansas	1	0.0	0
Maryland	1	0.0	0
Michigan	1	0.0	0
Nevada	1	0.0	0
Pennsylvania	1	0.0	0
Rhode Island	1	0.0	0
South Dakota	1	0.0	0
Wisconsin	1	0.0	0

^aStates without any TB cases in a state prison system during 2011 to 2019 are excluded (Iowa, Maine, Montana, Nebraska, New Hampshire, Utah, Vermont, West Virginia, Wyoming).

^bMedian TB incidence per 100 000 individuals incarcerated within state prisons.



State	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
Texas	6	6	4	10	16	15	5	11	18	91
Alabama	1	5	0	7	5	1	1	0	0	20
Florida	1	1	0	2	0	1	1	3	0	9
North Carolina	2	1	0	0	0	0	0	0	3	6
Georgia	5	0	0	0	0	0	0	0	0	5
Indiana	0	0	0	3	0	0	0	0	0	3
Total	15	13	4	22	21	17	7	14	21	134

FIGURE 1— Cluster-Associated Cases of Tuberculosis Among Individuals Incarcerated in a State Prison System at the Time of Diagnosis, by State: United States, 2011–2019

^aIncludes a combined count of clustered cases in Georgia, Florida, Indiana, and North Carolina. The table portion shows cluster-associated case counts by state and year of diagnosis.

Clustered cases (i.e., all 134 cases in 19 clusters in 6 states) occurred predominantly among US-born (98.5%) and non-Hispanic Black (56.7%) individuals. As a comparison, nonclustered cases ($n = 288$) were associated with proportionately fewer US-born (78.8%) and non-Hispanic Black (39.2%) individuals (Table 2). Pulmonary TB percentages were similar among individuals who were (80.6%) and were not (83.7%) part of a cluster, as was the prevalence of acid-fast bacilli smear-positive disease in cases among people reported as receiving a sputum smear examination (51.1% and 53.0%, respectively). However, sputum smear examinations were reported less frequently in surveillance data for TB cases among individuals diagnosed within the Texas state prison system

(56.2%) than for cases among incarcerated individuals in the remainder of the United States (mean = 92.9%); this incomplete reporting of a clinical evaluation element primarily affected people who were part of clusters (data not shown).

HIV coinfection was present among fewer incarcerated individuals who were part of clusters (1.5%) than among those who were not (10.4%). The 4 individuals with multidrug-resistant TB that occurred in state prisons were not part of clusters.

Of the 19 TB clusters, 5 clusters in 2 state prison systems met the outbreak definition of 6 or more cases: both clusters in Alabama and 3 of the 11 clusters in Texas. Case counts for the 5 outbreaks ranged from 9 to 32 cases in these 2 states. No additional cases occurred in

the 2 Alabama outbreaks after 2017, but all 3 outbreaks in Texas continued to accumulate cases through 2019.

All outbreak-associated cases in Alabama and 72.5% of outbreak-associated cases in Texas were reporting as having pulmonary involvement. All of Alabama's 20 outbreak-associated cases had a chest radiograph performed and sputum smear examination reported. In Texas, 49 (96.1%) of the total 51 outbreak-associated cases had a chest radiograph performed, and 30 (58.8%) had a sputum smear result reported (Table 3).

Compared with 65% of outbreak-associated cases among incarcerated persons in Alabama, relatively few (5.9%) of the outbreak-associated cases among incarcerated persons in Texas were reported as recent contacts of infectious

TABLE 2— Characteristics of Individuals Incarcerated in a State Prison When Diagnosed With Tuberculosis (TB), by Cluster Status: United States, 2011–2019

Characteristic	Nondesigned Cases ^a (n = 144), No. (%)	Nonclustered Cases (n = 288), No. (%)	Clustered Cases (n = 134), No. (%)
Male sex	136 (94.4)	274 (95.1)	134 (100.0)
US-born	125 (86.8)	227 (78.8)	132 (98.5)
Age group, y			
15–24	12 (8.3)	31 (10.8)	10 (7.5)
25–44	68 (47.2)	132 (45.8)	71 (53.0)
45–64	52 (36.1)	104 (36.1)	47 (35.1)
≥ 65	12 (8.3)	21 (7.3)	6 (4.5)
Race/ethnicity			
Hispanic	32 (22.2)	84 (29.2)	35 (26.1)
Non-Hispanic Black	67 (46.5)	113 (39.2)	76 (56.7)
Non-Hispanic White	32 (22.2)	66 (22.9)	23 (17.2)
Non-Hispanic other	13 (9.0)	25 (8.7)	0 (0.0)
Social characteristics ^b			
Excessive alcohol use	15 (10.4)	47 (16.4)	2 (1.5)
Injection drug use	8 (5.6)	20 (7.0)	3 (2.2)
Noninjection drug use	25 (17.4)	55 (19.2)	12 (9.0)
Homelessness	10 (6.9)	21 (7.3)	1 (0.8)
Known TB risk factors			
Previous episode of TB	6 (4.2)	15 (5.2)	3 (2.2)
Incomplete treatment of latent TB infection	6 (4.2)	19 (6.6)	2 (1.5)
Documented TB exposure in past 2 y	18 (12.5)	30 (10.4)	22 (16.4)
Method of diagnosis			
Culture, NAAT, or acid-fast bacilli smear	51 (35.4)	288 (100.0)	134 (100.0)
Clinical or provider diagnosis	93 (64.6)	0 (0.0)	0 (0.0)
Chest radiograph performed	138 (95.8)	270 (93.8)	123 (91.8)
Clinical characteristics			
Lung cavity visible on chest radiograph ^c	36 (30.8)	64 (23.7)	26 (21.1)
Pulmonary TB involvement	116 (80.6)	241 (83.7)	108 (80.6)
Sputum smear tested for acid-fast bacilli	122 (84.7)	236 (81.9)	94 (70.2)
Positive acid-fast bacilli smear ^d	21 (14.6)	125 (53.0)	48 (51.1)
HIV coinfection	13 (9.0)	30 (10.4)	2 (1.5)
Multidrug-resistant TB	0 (0.0)	4 (1.5)	0 (0.0)
Patient outcome ^e			
Treatment completed ^f	104 (85.3)	207 (88.1)	87 (89.7)
Deceased ^g	10 (7.9)	12 (5.0)	3 (3.0)

Note. NAAT = nucleic acid amplification test.

^aCharacteristic counts and percentages for 144 cases in which a cluster designation could not be made.

^bCounts and percentages are for presence of a risk factor and are based on self-report of the risk factor during the 12 months before diagnosis.

^cPercentages are based on individuals with chest radiographs performed.

^dPercentages are based on cases reported to surveillance as involving a sputum smear test. After rereviewing medical records during 2021, the Texas Department of State Health Services and the Texas Department of Criminal Justice identified sputum smear results for 13 additional cases initially reported to surveillance during 2015–2019 as not involving a smear test.

^eNumbers and percentages are based on cases with complete data on patient outcome and 2 years of follow-up (i.e., cases reported during 2011–2017) so that patient outcome could be documented in the 2011–2019 data set.

^fDenominators exclude 53 nonclustered cases and 37 clustered cases with incomplete data on treatment outcome.

^gDenominators exclude 47 nonclustered cases and 35 clustered cases with incomplete data on death during treatment. An additional 2 nonclustered cases among patients who died before diagnosis were also excluded because they were reported during 2018–2019.

TABLE 3— Characteristics of Individuals Associated With the 5 Tuberculosis (TB) Outbreaks in State Prison Systems, by State: United States, 2011–2019

Characteristic	Alabama (n = 20), No. (%) or Median (Range)	Texas (n = 51), No. (%) or Median (Range)
Age, y	37.5 (22–71)	35 (19–70)
US-born	20 (100.0)	50 (98.0)
Race/ethnicity		
Hispanic	0 (0.0)	20 (39.2)
Non-Hispanic Black	14 (70.0)	24 (47.1)
Non-Hispanic White	6 (30.0)	7 (13.7)
Documented TB exposure in past 2 y	13 (65.0)	3 (5.9)
Social characteristics ^a		
Excessive alcohol use	0 (0.0)	2 (3.9)
Injection drug use	0 (0.0)	3 (5.9)
Noninjection drug use	1 (5.0)	7 (13.7)
Clinical characteristics and disease evaluation		
Chest radiograph done	20 (100.0)	49 (96.1)
Lung cavity visible on chest radiograph ^b	6 (30.0)	10 (20.4)
Pulmonary TB involvement	20 (100.0)	37 (72.5)
Sputum smear tested for acid-fast bacilli	20 (100.0)	30 (58.8)
Positive acid-fast bacilli smear ^c	11 (55.0)	15 (50.0)
HIV coinfection	0 (0.0)	0 (0.0)
Patient outcome ^d		
Completed treatment ^e	20 (100.0)	25 (78.1)
Deceased	0 (0.0)	0 (0.0)

^aCounts and percentages are for presence of the risk factor and are based on self-report of the risk factor during the 12 months before diagnosis.

^bPercentages are based on individuals with chest radiographs done.

^cPercentages are based on cases reported to surveillance as involving a sputum smear test. After rereviewing medical records during 2021, the Texas Department of State Health Services and the Texas Department of Criminal Justice identified sputum smear results for 13 additional cases initially reported to surveillance during 2015–2019 as not involving a smear test.

^dNumbers and percentages are based on cases with complete data on patient outcome and 2 years of follow-up (i.e., cases reported during 2011–2017) so that patient outcome could be documented in the 2011–2019 data set.

^eDenominator excludes 19 Texas cases with incomplete data on treatment outcome.

TB cases in surveillance data. Of the outbreak-associated cases among incarcerated individuals with the opportunity to complete treatment by the end of the surveillance monitoring period, 25 (78.1%) of 32 in Texas and all 20 in Alabama involved completion of treatment.

Although not included in TB case counts involving incarcerated people, there was 1 case in a correctional employee for each outbreak-associated genotype: 2 correctional employees in

Alabama and 3 correctional employees in Texas.

DISCUSSION

In this first national analysis of TB clustering in US state prisons, we found that outbreaks of TB are rare. Two states reported 5 outbreaks of 6 or more cases during 2011 to 2019. In Alabama, the last outbreak-associated case was reported in 2017. In Texas, all 3 identified outbreaks continued to add

new outbreak-associated cases through the end of 2019.

In contrast to TB outbreaks in correctional settings in the 1990s,^{8,10,12} multidrug-resistant TB, HIV coinfection, and deaths did not characterize any of these outbreaks. The momentous strides in management and treatment of HIV have made this dangerous coinfection relatively infrequent.¹⁶ None of the outbreak-associated cases among incarcerated individuals in this analysis involved HIV coinfection, demonstrating

that HIV is no longer fueling TB outbreaks in US state prisons. Conversely, 10.4% of cases among incarcerated individuals who were not part of a genotype cluster involved HIV coinfection, indicating that this strong risk factor for progression from *M. tuberculosis* infection to TB²¹ may have contributed to TB incidence among individuals in state prisons who were not part of a cluster.

The Centers for Disease Control and Prevention's guidance on TB control in correctional facilities²² focuses on the importance of testing people for both latent TB infection and TB disease at the time of admission and at least annually thereafter if they remain incarcerated. Individuals who have signs or symptoms suggestive of TB should be housed separately in an airborne infection medical isolation room until a TB diagnosis has been excluded or treatment has rendered them noninfectious. Newly admitted individuals with latent TB infection benefit from treatment that prevents later progression to TB.

Short-course regimens for latent TB infection have demonstrated better treatment completion rates²³ and decreased costs²⁴ for correctional facilities than the older 9-month isoniazid regimen. As a result of these logistical advantages, the Federal Bureau of Prisons uses the 12-week, once-weekly dosing regimen of isoniazid and rifampine as the standard treatment of latent TB infection.²⁵ Latent TB infection identified before progression to TB can be treated for approximately \$500.²⁶ By contrast, the direct treatment cost for a single case of drug-susceptible TB in 2020 was approximately \$20 000.^{27,28} State prison systems that implement treatment protocols similar to that of the Federal Bureau of Prisons could decrease costs, both

in facilities and in the communities where people return upon release.

Any evidence of person-to-person transmission within correctional facilities also warrants additional investigation and interventions.²² To prevent widespread and ongoing waves of *M. tuberculosis* transmission, there should be rapid and thorough contact investigations of potentially infectious TB whenever there is a suspected or confirmed case of pulmonary, laryngeal, or pleural disease. Sputum smear and chest radiograph results can help determine the patient's infectiousness, location of disease, and the extent of the contact investigation. For this reason, every patient with suspected TB, including those with suspected extrapulmonary TB only, should undergo a chest radiograph and provide sputum for acid-fast bacilli smears and cultures. However, surveillance records documented sputum smear results for 58.8% (i.e., 30 of 51) of Texas's outbreak-associated cases (Table 3). The reasons for incomplete reporting—which could lead to underascertainment of pulmonary TB status and underestimation of patient infectiousness—are unknown but should be addressed.

Contact investigations can be accomplished effectively as a collaborative process with state or local health departments.²² Contacts at highest risk should be screened first. Early detection of additional cases is an important TB control aspect of contact investigations, particularly in congregate settings; initiating treatment not only benefits the individual contact but also halts infectiousness to other incarcerated individuals and correctional employees, breaking the chain of transmission and potentially averting an outbreak.

Reporting new cases as recent contacts of an infectious individual demonstrates that epidemiological links

between incarcerated people are known, which can facilitate interventions for interrupting transmission. In Alabama, 65% of individuals associated with outbreaks were listed as known recent contacts, suggesting that these outbreaks were effectively halted through active case finding (i.e., enabling early detection and treatment). In Texas, less than 10% of outbreak-associated cases were reported this way. Whether this was the result of incomplete contact investigations or incomplete reporting is unknown. When contact investigations are inadequate, opportunities to break the chain of transmission are lost, and cluster growth is expected.

Many of the challenges associated with executing effective contact investigations outside correctional settings, such as obtaining names of potentially exposed and infected individuals, locating them, and arranging for testing and treatment, are negated by the fixed and detained position of incarcerated individuals. Therefore, identifying and halting transmission in a prison should be a swift and obtainable objective. Prisons that experience ongoing transmission should review their administrative infection control and contact investigation policies and procedures. Health service staff in correctional facilities should work closely with their local or state health department to investigate potential transmission as soon as a diagnosis of TB in a congregate setting is suspected and to stop outbreaks when they occur.

Outbreaks in correctional settings are not only detrimental to the health of incarcerated populations, they also threaten the health of correctional workers and the surrounding community.^{12–15,29,30} According to estimates from a previous report, approximately one third of new *M. tuberculosis*

infections among prison employees are due to occupational exposures.²⁹ Not all corrections institutions, however, require TB testing of employees,³¹ so the extent of this occupational risk is difficult to ascertain. Each of the 5 outbreak-associated genotypes in our analysis involved at least one diagnosed TB case in a correctional employee. Although beyond the scope of our study, other reports have shown substantial circulation of outbreak strains in the community in the years following an outbreak in a correctional institution.^{10,12–15,30}

Furthermore, *M. tuberculosis* transmission in correctional facilities hampers progress toward the national goal of TB elimination. Worldwide, the fraction of TB in the general population that can be attributed to exposure in prisons has been estimated as 8.5%.³² Although it is difficult to draw conclusions from an international systematic review that includes both high- and low-burden TB countries, a US-based analysis in an urban area also revealed substantial overlap between incarceration and TB: 46% of US-born adults with TB had documented histories of being incarcerated in a jail or a prison, including 16% during the year before diagnosis.³³ According to our analysis, if Texas state prisons reduced TB clustering to match clustering levels in other state prison systems (i.e., typically 0, but at most 2, rather than 11 clusters of 3 or more closely related cases), their overall TB case counts would be reduced by up to 45%, and the national total number of TB cases among people incarcerated in state prisons each year would decrease by about 15%.

Finally, and importantly, preventing transmission of infectious diseases among prisoners is an ethical and

social justice obligation.^{2,3} The United States has one of the highest incarceration rates in the world.³⁴ The loss of autonomy associated with confinement uniquely compromises incarcerated people's ability to protect themselves¹ from airborne diseases. Responsibility for the health and safety of state prisoners belongs to the state's department of corrections (or equivalent organization), with opportunities for additional resources from and interventions by state government officials when current procedures are inadequate to prevent outbreaks from occurring or persisting.

Strengths and Limitations

In this study, we used established national surveillance data and next-generation whole-genome sequencing methods to describe *M. tuberculosis* transmission and TB outbreaks in state prisons in the United States. Strengths of our analysis include its unique national scope, with 9 years of data and the specificity of the outbreak classification used (i.e., a conservative threshold of 2 or fewer single nucleotide polymorphisms with whole-genome sequencing methods). However, we likely undercounted the number of cases associated with recent *M. tuberculosis* transmission in state prisons. This underestimate would be a result of not only the high specificity of our whole-genome sequencing approach but also our inability to include nongenotyped cases. We also lacked information about previous incarceration, so any matching cases diagnosed among individuals after release from prison would have been excluded.

Another limitation is our inability to determine disease timing relative to duration of incarceration; individuals

who were infected just prior to incarceration (e.g., by the same state prison strain circulating in the community) may have been misclassified as part of a prison cluster. In addition, although using surveillance data facilitated a standard approach to state prisons throughout the United States, we may have mischaracterized outbreaks if actual patient characteristics were different than those reported to surveillance (e.g., sputum smear results reported to surveillance as not available when smear tests were in fact performed with results documented elsewhere).

Finally, standard surveillance records provide an incomplete characterization of factors associated with transmission and outbreaks in state prisons. Reviews of entry screenings, infectious periods, diagnostic delays, sentence lengths, epidemiological links, and infection control policies and procedures in affected facilities would be needed to provide better targeted recommendations.

Public Health Implications

This first nationwide analysis describing the epidemiology of TB outbreaks in US state prisons demonstrates that TB transmission and outbreaks were rare in most state prison systems during 2011 to 2019. Given the numerous case reports of TB outbreaks in correctional settings in the 1990s,^{8–11} this finding is reassuring and affirms the effectiveness of TB prevention and control practices²² in most state prisons. However, the large and ongoing outbreaks in Texas state prisons warrant additional investigation. A better understanding of policies and practices facilitating transmission is needed to inform the targeted public health actions needed to stop these outbreaks,

reduce morbidity in a vulnerable population, and substantially reduce the TB burden in the Texas state prison system. *AJPH*

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CONTRIBUTORS

R. J. Stewart and K. M. Raz contributed equally to this work. R. J. Stewart, K. M. Raz, J. S Kammerer, M. B. Haddad, B. J. Silk, and J. M. Wortham conceptualized the project. R. J. Stewart, K. M. Raz, and M. B. Haddad drafted the article, and R. J. Stewart and K. M. Raz conducted the data analysis. S. Burns conducted the next-generation whole-genome sequencing on isolates. All of the authors contributed to writing and revising the article.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

HUMAN PARTICIPANT PROTECTION

All data were collected as part of routine tuberculosis surveillance activities. As such, the Centers for Disease Control and Prevention determined that this analysis did not constitute research involving human participants and was not subject to institutional board review.

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Workplaces Most Affected by COVID-19 Outbreaks in California, January 2020–August 2021

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 See also Hawkins, p. 1081.

Objectives. To describe which industries have the highest burden of COVID-19 outbreaks in California.

Methods. We assigned US census industry codes to COVID-19 outbreaks reported to the California Department of Public Health (CDPH) from January 1, 2020, to August 31, 2021, and determined numbers of outbreaks, numbers of outbreak-associated cases, and outbreak incidence levels by industry. We determined characteristics of outbreak-associated cases using individual case data linked to COVID-19 outbreaks.

Results. Local health departments reported 19 893 COVID-19 outbreaks and 300 379 outbreak-associated cases to CDPH. The most outbreaks (47.8%) and outbreak-associated cases (54.8%) occurred in the health care and social assistance sector, where outbreak incidence levels were highest in skilled nursing facilities and residential care facilities (1306 and 544 outbreaks per 1000 establishments, respectively). High proportions of outbreaks also occurred in the retail trade (8.6%) and manufacturing (7.9%) sectors. Demographics of outbreak-associated cases varied across industries.

Conclusions. Certain California industries, particularly in the health care, manufacturing, and retail sectors, have experienced a high burden of COVID-19 outbreaks during the pandemic.

Public Health Implications. Tracking COVID-19 outbreaks by industry may help target prevention efforts, including workforce vaccination. (*Am J Public Health.* 2022;112(8):1180–1190. <https://doi.org/10.2105/AJPH.2022.306862>)

Work-related exposures and risk factors play an important role in COVID-19 disease transmission. Workers in certain industries, such as health care, agriculture, manufacturing, and transportation, have been found to be at increased risk for COVID-19 infection and mortality.^{1–3} In addition, overrepresentation of certain racial and ethnic groups in higher risk occupations and industries may contribute to the disproportionate burden of COVID-19 morbidity and mortality experienced by those groups.^{2,4}

COVID-19 outbreak data can provide additional information about which

workers may be at higher risk for exposure and infection. Although COVID-19 outbreaks have been well documented in certain industries, including health care, corrections, and meat processing,^{5–8} less information is available about outbreaks in other types of potentially high-risk workplaces, and limited comprehensive information is available about which types of workplaces have been most affected by COVID-19 outbreaks. This type of information could help direct prevention efforts such as workplace-specific guidance, nonpharmaceutical interventions, and workplace- or industry-targeted vaccination campaigns.

In California, home to both the largest population and the highest total number of COVID-19 cases of any US state,⁹ employer reporting of workplace COVID-19 outbreaks is mandated under a state law that became effective January 1, 2021. The law also requires the California Department of Public Health (CDPH) to publicly report numbers of outbreaks and outbreak-associated cases by industry.¹⁰ Using these statewide data on COVID-19 outbreaks, as well as outbreak data reported by local health departments in 2020, we sought to describe which industries have experienced the highest burden

of COVID-19 outbreaks during the pandemic. We also sought to describe temporal trends in COVID-19 outbreaks and characterize demographics of outbreak-associated cases.

METHODS

We analyzed all confirmed COVID-19 outbreaks reported to CDPH as of September 27, 2021, in which onset occurred between January 1, 2020, and August 31, 2021.

Outbreak Definitions and Reporting

Outbreak definitions vary by setting. In non-health care workplaces, CDPH defines an outbreak as 3 or more probable or confirmed COVID-19 cases within a 14-day period among people who are epidemiologically linked in the setting, are from different households, and are not identified as close contacts of each other in any other case investigation.¹¹ Separate definitions apply to health care workplaces; for example, in long-term care facilities, an outbreak is defined as 1 or more facility-acquired cases in a resident.¹²

Potential outbreaks are reported to local health departments (LHDs) by employers or facilities; LHDs may also identify outbreaks via individual case investigations and contact tracing. During 2020, requirements for employers to report outbreaks to LHDs varied by type of workplace and jurisdiction. Since January 1, 2021, however, California law has required non-health care employers to report to their LHD when they identify 3 or more cases of COVID-19 among workers in a workplace within a 14-day period; separate reporting requirements apply to health care facilities.

Once notified by an employer, LHDs investigate to determine whether the reported cases constitute an outbreak according to the specified CDPH outbreak definitions. LHDs then report confirmed outbreaks to CDPH via established electronic reporting systems, as required by existing California regulations.¹³

Outbreak reports also include numbers of associated cases. Outbreak-associated cases may include workers as well as nonworkers present at the worksite, such as residents or patients in congregate residential or health care settings or students in educational settings. LHDs are asked to link patient records for outbreak-associated cases to outbreak reports in electronic reporting systems, although not all LHDs consistently do so. For outbreak-linked cases for which data were available, we analyzed demographic variables such as sex, age, and race/ethnicity. Because nonworker cases cannot be reliably distinguished from worker cases on the basis of information submitted by LHDs, we analyzed these demographic variables across all outbreak-associated cases reported to CDPH, including cases among both workers and nonworkers.

Industry Assignments and Incidence Calculations

A CDPH team trained in industry coding reviewed available information for individual outbreaks reported to CDPH, including location name, address, and LHD outbreak descriptions, and assigned each outbreak a 2012 US census 4-digit industry code.¹⁴ Each individual industry is also part of a larger industry sector (e.g., hospitals are an individual industry that is part of the health care and social assistance sector). Total numbers of

reported outbreaks and outbreak-associated cases were calculated for each individual industry as well as each industry sector. Outbreak incidence by sector and individual industry was calculated by dividing numbers of reported outbreaks by numbers of establishments in each industry or sector. If a single facility reported more than 1 outbreak during the study period, each outbreak was counted separately (i.e., a single facility could be responsible for more than 1 outbreak in the data set).

Numbers of establishments were obtained from the California Employment Development Department's Quarterly Census of Employment and Wages and were calculated as the average numbers of establishments from the first through fourth quarters of 2020; 6-digit North American Industrial Classification System codes used by the Employment Development Department to classify establishments were crosswalked to US census industry codes. For a limited number of US census industry codes (0590, 0690, 1290, 2990, 3290, 3875, 3980, 4590, and 5590), no North American Industrial Classification System code is available that crosswalks directly to the specific 2012 US census industry code; these industries were therefore excluded from outbreak incidence calculations. (A total of 120 outbreaks and 1476 outbreak-associated cases occurred in these excluded industries. Among them, the "not specified food industries" category [census code 1290] included the most reported outbreaks [56] and outbreak-associated cases [1017].)

We also ranked industries according to their prevention indexes. The prevention index is a tool that can be used, alongside other considerations, to prioritize occupational health and safety interventions. As described elsewhere, we calculated prevention indexes by

ranking industries according to outbreak count and outbreak incidence and dividing the sum of the count and incidence ranks by 2; this produced a prevention index for each industry, with lower prevention indexes corresponding to a higher priority for intervention.¹⁵ We rank ordered individual industries by prevention index values (with rank 1 as the highest priority).

RESULTS

Local health departments reported to CDPH 19 893 COVID-19 outbreaks and 300 379 outbreak-associated cases in

which onset occurred between January 1, 2020, and August 31, 2021; this corresponded to an incidence of 12.2 outbreaks per 1000 establishments. An additional 489 outbreaks were reported to CDPH but were excluded because of insufficient information to assign an industry code (281) or because they occurred in homeless encampments, a nonoccupational setting (208). Outbreak-associated cases represented 7.0% of COVID-19 cases reported in California during this period.

A total of 9513 outbreaks (47.8%) and 164 659 outbreak-associated cases (54.8%) were reported in the health care

and social assistance sector (Table 1). Other sectors with high percentages of outbreaks included retail trade (8.6%), manufacturing (7.9%), and accommodation and food services (7.3%). The sector with the highest overall incidence of reported outbreaks (78.1 outbreaks per 1000 establishments) was public administration, which includes correctional facilities and public safety establishments such as police and fire services.

Among individual industries in the health care and social assistance sector (Table 2), percentages and outbreak incidence values were highest in residential care facilities (22.8% of all

TABLE 1— COVID-19 Outbreaks and Outbreak-Associated Cases, by Industry Sector: California, January 2020–August 2021

Industry Sector ^a	No. of Reported Outbreaks (%)	No. of Outbreak-Associated Cases (%)	Mean No. of Outbreak-Associated Cases per Outbreak	Outbreak Incidence (per 1000 Establishments)
Health care and social assistance	9 513 (47.8)	164 659 (54.8)	17.3	14.8
Retail trade	1 706 (8.6)	16 201 (5.4)	9.5	15.9
Manufacturing	1 576 (7.9)	22 570 (7.5)	14.3	35.7
Accommodation and food services	1 461 (7.3)	9 423 (3.1)	6.4	16.4
Educational services	1 224 (6.2)	10 333 (3.4)	8.4	35.1
Public administration	954 (4.8)	41 218 (13.7)	43.2	78.1
Transportation and warehousing	689 (3.5)	13 356 (4.4)	19.4	21.7
Construction	499 (2.5)	3 874 (1.3)	7.8	5.7
Other services, except public administration	447 (2.2)	3 451 (1.1)	7.7	4.5
Wholesale trade	305 (1.5)	3 463 (1.2)	11.4	4.7
Professional, scientific, and technical services	263 (1.3)	1 598 (0.5)	6.1	1.6
Real estate and rental and leasing	256 (1.3)	1 751 (0.6)	6.8	4.2
Administrative and support and waste management services	218 (1.1)	1 553 (0.5)	7.1	3.8
Agriculture, forestry, fishing, and hunting	215 (1.1)	2 679 (0.9)	12.5	13.3
Finance and insurance	187 (0.9)	1 109 (0.4)	5.9	3.5
Arts, entertainment, and recreation	176 (0.9)	1 744 (0.6)	9.9	5.8
Utilities	85 (0.4)	450 (0.1)	5.3	52.4
Information	69 (0.3)	470 (0.2)	6.8	2.3
Management of companies and enterprises	31 (0.2)	313 (0.1)	10.1	6.5
Mining, quarrying, and oil and gas extraction	15 (0.1)	88 (0.0)	5.9	19.1
Military	4 (0.0)	76 (0.0)	19.0	25.3
Total	19 893	300 379	15.1	12.2

^aIndustry sectors are listed in descending order of number of reported outbreaks.

TABLE 2— COVID-19 Outbreaks and Outbreak-Associated Cases in the 25 Industries With the Highest Numbers of Outbreaks: California, January 2020–August 2021

Industry	US Census Industry Code	No. of Reported Outbreaks ^a	No. of Outbreak-Associated Cases	No. of Industry Establishments ^b	Outbreak Incidence (per 1000 Establishments)	Prevention Index Ranking ^c
Residential care facilities, except skilled nursing facilities	8290	4518	52410	8300	544.4	2
Skilled nursing facilities	8270	2585	91120	1979	1306.4	1
Restaurants and other food services	8680	1291	7821	78935	16.4	32
Elementary and secondary schools	7860	963	6137	16086	59.9	9
Justice, public order, and safety activities	9470	696	39166	3357	207.3	5
Community food and housing and emergency services	8380	654	5508	1538	425.0	3
Hospitals	8190	581	8486	1422	408.6	4
Grocery stores	4970	501	3772	10782	46.5	18
Construction	0770	499	3874	87451	5.7	61
Child day care services	8470	474	2604	8789	53.9	16
Warehousing and storage	6390	327	7828	2308	141.7	7
Automobile dealers	4670	267	2342	3452	77.3	8
Department stores and discount stores	5380	266	2834	978	272.0	6
Outpatient care centers	8090	262	1583	5949	44.0	20
Real estate	7070	222	1570	54104	4.1	71
Colleges, universities, and professional schools, including junior colleges	7870	217	3858	4999	43.4	25
Individual and family services	8370	215	1691	531624	0.4	124
Religious organizations	9160	193	1611	3087	62.5	15
Building material and supplies dealers	4870	179	1813	4030	44.4	21
Crop production	0170	169	2126	8568	19.7	36
Traveler accommodation	8660	141	1322	6399	22.0	33
Miscellaneous general merchandise stores	5390	135	2482	2949	45.8	24
Other amusement, gambling, and recreation industries	8590	135	929	9283	14.5	43
Medical equipment and supplies manufacturing	3960	127	1487	1811	70.1	14
Bus service and urban transit	6180	118	891	1503	78.5	10

Note. The 25 industries shown here represented 79.1% of all outbreaks and 85.0% of all outbreak-associated cases.

^aIf a single facility reported more than 1 outbreak during the study period, each outbreak was counted separately (i.e., a single facility might be responsible for more than 1 outbreak in the data set).

^bData on numbers of establishments by industry were obtained from the California Employment Development Department Quarterly Census of Employment and Wages and calculated as the average number of establishments from the first through the fourth quarter of 2020.

^cPrevention indexes were calculated as the average of the count rank and the incidence rank; the numbers shown here represent prevention index rankings among all individual industries. A lower numeric prevention index ranking indicates an industry with a higher priority for intervention.

outbreaks; 544 outbreaks per 1000 establishments), skilled nursing facilities (13.0%; 1306 per 1000), community food and housing and emergency services, including homeless shelters (3.3%; 425 per 1000), and hospitals (2.9%; 409 per 1000). Among individual retail industries, outbreak percentages were highest in grocery stores (2.5% of all outbreaks; 47 per 1000) and department and discount stores (1.3%; 272 per 1000). Restaurants, part of the accommodation and food services sector, had the third-highest percentage of outbreaks of any individual industry (6.5%; 16 per 1000).

Seventy-three percent of outbreaks involved 10 or fewer associated cases; the median was 5 cases per outbreak (interquartile range = 3–11). Although most outbreaks were small, 389 (2%) involved more than 100 associated cases. Larger outbreaks were observed in certain congregate living settings where cases occurred among workers as well as residents, as evidenced by higher mean numbers of outbreak-associated cases in those settings. Examples include the justice, public order, and safety activities industry, which includes correctional facilities (mean of 56.3 cases per outbreak), and skilled nursing facilities (35.3 cases per outbreak). Mean numbers of cases per outbreak were also high in certain manufacturing industries such as ship and boat building (55.7 cases per outbreak), cut and sew apparel manufacturing (33.0 cases per outbreak), and animal slaughtering and processing (32.5 cases per outbreak).

The 5 industries with the highest prevention index rankings were skilled nursing facilities, residential care facilities, community food and housing and emergency services, hospitals, and justice, public order, and safety

activities (Table 2). Several manufacturing industries not included in Table 2 because of lower total numbers of outbreaks had high prevention index rankings as a result of their higher outbreak incidence levels; these industries included animal slaughtering and processing (182 per 1000; prevention index rank = 11), aerospace products and parts manufacturing (555 per 1000; rank = 12), fruit and vegetable preserving and specialty food manufacturing (134 per 1000; rank = 13), and seafood and other miscellaneous foods manufacturing (70 per 1000; rank = 17).

Case-level information was available for 162 207 (54.0%) outbreak-associated cases. The availability of case-level data varied across industry sectors and was lowest in the information (32.6%), wholesale trade (32.9%), and construction (34.8%) sectors and highest in the public administration sector (82.4%).

Among outbreak-associated cases with available information, 84 653 of 159 351 (53.1%) cases occurred among men and 82 523 of 162 104 (50.9%) among individuals 18 to 49 years of age (Table A, available as a supplement to the online version of this article at <http://www.ajph.org>). Race/ethnicity information was missing for 24.8% of cases with available case-level data and 59.4% of cases overall. Among cases with available information, the distribution by race and ethnicity varied across industry sectors (Table 3; Figure A, available as a supplement to the online version of this article at <http://www.ajph.org>); for example, Latino people were most highly represented in the agriculture sector (84.2% of cases), whereas Asian people were most highly represented in the real estate sector (16.6%) and Black people in the public administration sector (13.2%).

The largest numbers of reported outbreaks occurred during November 2020 to January 2021, coinciding with California's winter 2020–2021 COVID-19 surge; the highest monthly number (21.0% of all outbreaks) was reported in December 2020. Outside of the winter surge, the highest numbers of monthly outbreaks during the study period were seen in July and August 2021 (5.7% and 6.9% of all outbreaks, respectively), coinciding with an increase in overall COVID-19 cases associated with the Delta variant.

During most months, the highest numbers of outbreaks were reported in residential care facilities and skilled nursing facilities; however, reported outbreaks were highest in elementary and secondary schools in April (34.8%) and May (30.5%) 2021 and in August 2021 (34.9%) (Figure 1; Table B, available as a supplement to the online version of this article at <http://www.ajph.org>). Overall, the percentage of outbreaks reported in the health care and social assistance sector decreased in 2021 (40.5%) relative to 2020 (52.0%); the percentages of outbreaks remained stable in most other sectors with the exception of educational services, which increased from 2.9% of reported outbreaks in 2020 to 11.8% in 2021 (Table C, available as a supplement to the online version of this article at <http://www.ajph.org>).

DISCUSSION

We identified nearly 20 000 COVID-19 outbreaks reported in California from the beginning of the pandemic through August 2021. These outbreaks occurred across industry sectors, with the most outbreaks and outbreak-associated cases reported in the health care and social assistance sector, which includes

TABLE 3— Race/Ethnicity of Individuals With Outbreak-Associated COVID-19 Cases, by Industry Sector: California, January 2020–August 2021

Industry Sector	Latino, No. (%)	White, No. (%)	Asian, No. (%)	Black, No. (%)	Other, ^a No. (%)	Unknown, No. (%)
Health care and social assistance (n = 85 766)	16 066 (18.7)	27 158 (31.7)	9 477 (11.0)	5 389 (6.3)	8 643 (10.1)	19 033 (22.2)
Public administration (n = 33 954)	7 868 (23.2)	4 627 (13.6)	545 (1.6)	2 274 (6.7)	1 830 (5.4)	16 810 (49.5)
Manufacturing (n = 8 228)	4 339 (52.7)	973 (11.8)	1 063 (12.9)	153 (1.9)	793 (9.6)	907 (11.0)
Retail trade (n = 7 491)	3 587 (47.9)	1 707 (22.8)	476 (6.4)	242 (3.2)	787 (10.5)	692 (9.2)
Educational services (n = 5 303)	1 598 (30.1)	2 029 (38.3)	261 (4.9)	236 (4.5)	575 (10.8)	604 (11.4)
Transportation and warehousing (n = 5 203)	2 505 (48.1)	784 (15.1)	421 (8.1)	336 (6.5)	606 (11.6)	551 (10.6)
Accommodation and food services (n = 5 008)	2 469 (49.3)	1 275 (25.5)	247 (4.9)	147 (2.9)	439 (8.8)	431 (8.6)
Other services, except public administration (n = 2 390)	919 (38.5)	762 (31.9)	214 (9.0)	53 (2.2)	232 (9.7)	210 (8.8)
Agriculture, forestry, fishing, and hunting (n = 1 521)	1 134 (74.6)	88 (5.8)	36 (2.4)	4 (0.3)	85 (5.6)	174 (11.4)
Construction (n = 1 349)	687 (50.9)	350 (25.9)	33 (2.4)	26 (1.9)	113 (8.4)	140 (10.4)
Arts, entertainment, and recreation (n = 1 333)	580 (43.5)	376 (28.2)	98 (7.4)	33 (2.5)	142 (10.7)	104 (7.8)
Wholesale trade (n = 1 141)	684 (59.9)	156 (13.7)	43 (3.8)	14 (1.2)	120 (10.5)	124 (10.9)
Administrative and support and waste management services (n = 844)	532 (63.0)	101 (12.0)	34 (4.0)	34 (4.0)	68 (8.1)	75 (8.9)
Real estate and rental and leasing (n = 792)	298 (37.6)	179 (22.6)	118 (14.9)	60 (7.6)	56 (7.1)	81 (10.2)
Professional, scientific, and technical services (n = 739)	257 (34.8)	226 (30.6)	79 (10.7)	17 (2.3)	72 (9.7)	88 (11.9)
Finance and insurance (n = 514)	196 (38.1)	137 (26.7)	30 (5.8)	12 (2.3)	59 (11.5)	80 (15.6)
Utilities (n = 245)	90 (36.7)	76 (31.0)	4 (1.6)	12 (4.9)	31 (12.7)	32 (13.1)
Information (n = 153)	80 (52.3)	31 (20.3)	13 (8.5)	7 (4.6)	14 (9.2)	8 (5.2)
Management of companies and enterprises (n = 137)	71 (51.8)	23 (16.8)	8 (5.8)	3 (2.2)	12 (8.8)	20 (14.6)
Military (n = 60)	8 (13.3)	9 (15.0)	1 (1.7)	1 (1.7)	1 (1.7)	40 (66.7)
Mining, quarrying, and oil and gas extraction (n = 36)	15 (41.7)	11 (30.6)	0 (0.0)	0 (0.0)	1 (2.8)	9 (25.0)

Note. Information is shown for all outbreak-associated cases for which case-level data were available (54% of cases); the percentage of cases with case-level data available varied by sector. See Figure A for data visualization.

^aIncludes Native Hawaiian and other Pacific Islander, American Indian/Alaska Native, other, and multirace.

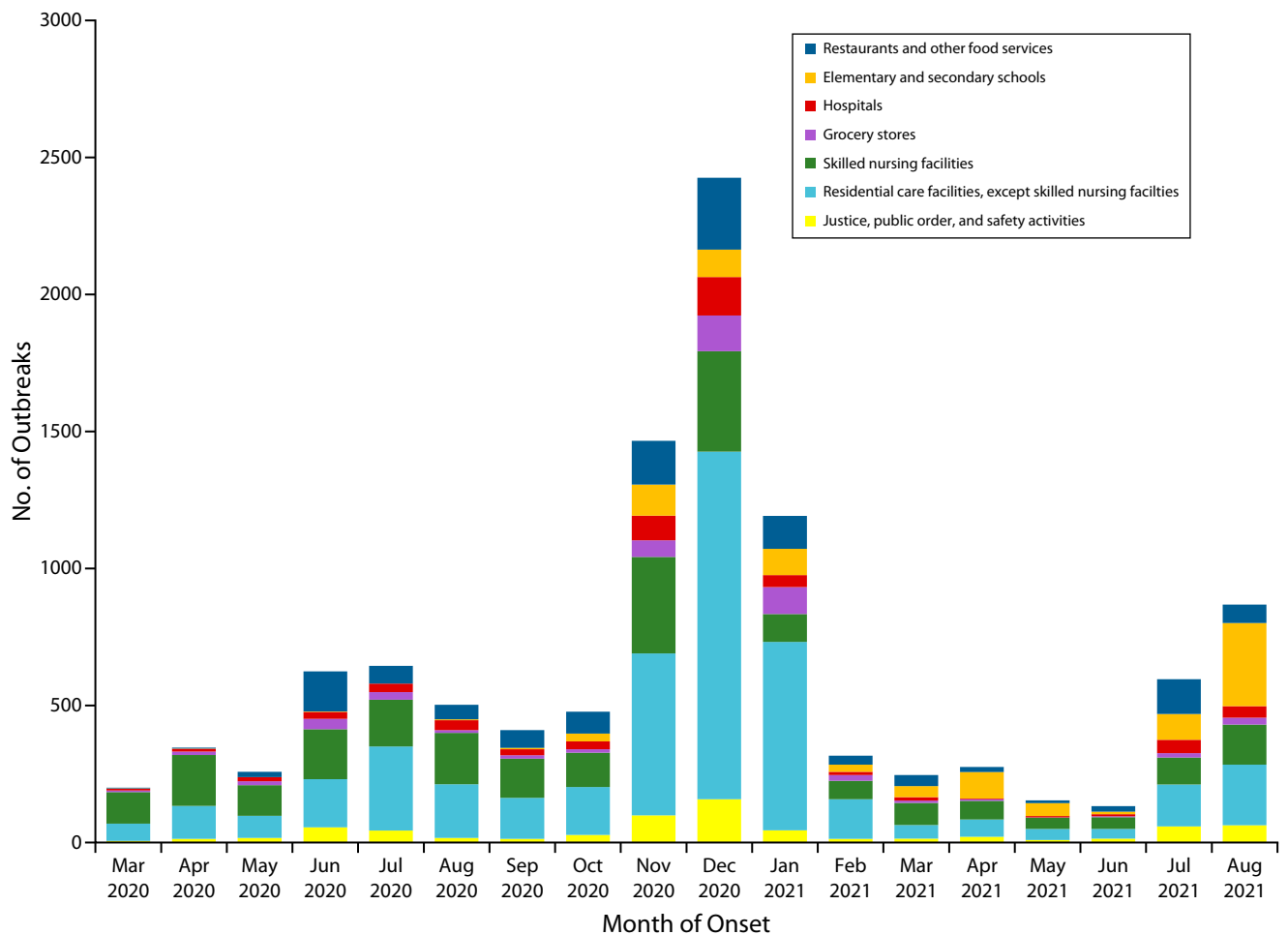


FIGURE 1— COVID-19 Outbreaks in Top Industries Over Time: California, March 2020–August 2021

Note. Shown are the 7 industries with the highest total numbers of outbreaks. See Table B (available as a supplement to the online version of this article at <https://www.ajph.org>) for the data underlying this figure. Data for January and February 2020 are excluded because of low numbers of outbreaks (9 reported outbreaks with onset in January and 4 reported outbreaks in February).

residential care facilities and skilled nursing facilities. These known high-risk settings have been the focus of significant public health interventions during the COVID-19 pandemic, including setting-specific guidance and consultation, an emphasis on personal protective equipment and other protective measures, and early prioritization for vaccination.

However, our study also highlights additional industries with high counts and a high incidence of COVID-19 outbreaks such as restaurants and retail and manufacturing industries, where

employees continued to report to work during the pandemic and had public-facing roles or worked in close proximity to others. Although these industries may have received less attention, their elevated burden of COVID-19 outbreaks merits intervention, including development of industry-specific strategies for outbreak prevention and response; specific outreach to workers and labor unions, employers and trade associations, and local health departments in areas where these industries are concentrated; and targeted vaccination campaigns.

Residential care facilities, skilled nursing facilities, and correctional facilities ranked highly in terms of both outbreak counts and incidence in California and require ongoing public health attention and intervention. These settings are known to involve a high risk of COVID-19 outbreaks owing to their vulnerable resident populations, frequent close contact between residents and staff, movement of residents and staff between facilities, and other factors.¹⁶ These are also congregate settings where nonworkers are present and often account for a significant proportion of cases. Although high

outbreak case counts in these settings may therefore overestimate COVID-19 incidence rates among workers, they nonetheless likely result in an increased occupational risk of COVID-19 exposure. Health care facilities have also been subject to outbreak reporting mandates since early in the pandemic and have lower thresholds in terms of the number of cases required to be considered an outbreak; both of these factors may have led to increased numbers of reported outbreaks in these settings relative to others.

In addition to the known high-risk settings just discussed, we also identified other industries with high proportions of reported outbreaks. Given that prevention strategies are likely to differ across industries, such industries may require both additional prevention efforts and additional investigation of which interventions may be most effective in those specific settings. One such industry is the restaurant industry, which had the third-highest outbreak count of any individual industry. This corresponded to a relatively low outbreak incidence, likely as a result of the high number of establishments in this industry, but the large number of workers and workplaces potentially affected nonetheless warrant prioritization. In addition, many restaurants were closed for in-person dining in California during portions of the pandemic, which may have contributed to lower outbreak rates. As restaurants reopen, workers remain vulnerable to COVID-19 exposure from coworkers as well as from members of the public.

Several additional industries and sectors had high outbreak counts and incidence levels. The manufacturing and retail trade sectors each represented around 8% of all outbreaks reported to CDPH. These sectors have also been

identified as high risk in other jurisdictions; in reports from Utah, Wisconsin, and Los Angeles, both manufacturing and retail ranked highly in numbers of COVID-19 outbreaks among non-health care, noncongregate settings during portions of 2020.^{4,17,18} Within the retail trade sector in California, several individual industries had high outbreak counts, incidence levels, and prevention index rankings, including grocery stores, department and discount stores, and automobile dealers, all workplaces where employees are likely to come into close, frequent contact with other employees as well as with members of the public.

Within the manufacturing sector, fewer individual industries ranked highly in outbreak counts, likely because of smaller industry sizes, but many had high outbreak incidence levels and prevention index rankings. Examples include several food processing industries such as animal slaughtering and processing, fruit and vegetable preserving, and seafood manufacturing, which have been documented settings of large COVID-19 outbreaks in numerous jurisdictions.^{8,19} High outbreak incidence levels were also seen in some nonfood manufacturing industries, in particular the aerospace manufacturing industry, which had the third-highest outbreak incidence of any individual industry.

Unlike workers in retail industries, workers in manufacturing industries are typically not public facing; most of these workers did, however, continue to report to work throughout the pandemic, typically in high-density workplaces where the risk of exposure to other workers with COVID-19 may be higher. Another industry with similar risk factors is the warehousing and storage industry, which had high outbreak counts, incidence levels, and prevention index rankings.

Outbreak-associated cases reported to CDPH represented 7% of COVID-19 cases in California; this finding was comparable to the percentage of cases associated with outbreaks in a Seattle report (5%) but lower than the percentage identified as outbreak associated in Utah (12%) and Wisconsin (18%).^{4,18,20} The true number of outbreak-associated cases is likely higher than the number reported to CDPH, as not all cases associated with an outbreak are identified as such and additional cases identified after the initial outbreak report are not consistently reported to CDPH.

Some demographic groups—in particular, communities of color and those of lower socioeconomic status—have been disproportionately affected by the COVID-19 pandemic, and the overrepresentation of these groups in certain essential industries and occupations may play a role in these disparities.^{21,22} In Utah, for example, Hispanic and non-White individuals represent 24% of the state's workforce but were found to make up 73% of workplace outbreak-associated cases.⁴ In our outbreak data, the distribution of outbreak-associated cases among racial and ethnic groups was similar to the overall distribution of the state's population; however, there were variations in the distribution of outbreak-associated cases by race and ethnicity across industry sectors.

For instance, in several sectors with high numbers of outbreaks, including manufacturing, retail, accommodation and food services, and transportation and warehousing, more than 50% of outbreak-associated cases with race/ethnicity information available involved Latino individuals. Given that Latino people have been disproportionately represented among COVID-19 cases and fatalities in California,^{21,23} these findings highlight occupational factors

and enhanced workplace protections as a potential avenue for addressing disparities.

These demographic trends in our outbreak-associated case data should, however, be interpreted with caution. Race and ethnicity information was missing or unknown for nearly 60% of cases, and the amount of missing data varied across industry sectors. In addition, outbreak-associated cases included workers as well as nonworkers, so the demographic trends described here may not represent demographic trends among workers, particularly in certain settings with larger numbers of nonworkers present such as health care, correctional, and educational settings. Nonetheless, our findings as well as those of earlier reports indicate that public health interventions should continue to target industries with high proportions of workers from disproportionately affected groups and should be culturally and linguistically appropriate and informed by worker demographics. In addition, efforts should be made to improve collection and reporting of key demographic variables in outbreak data.

Numbers of reported outbreaks over time over time largely paralleled overall trends in COVID-19 cases in California, with the highest numbers of outbreaks seen during California's winter 2020–2021 COVID-19 surge and a July and August 2021 increase in outbreaks alongside an overall increase in cases associated with the Delta variant. For the most part, the distribution of COVID-19 outbreaks across industries remained stable over time. One exception was elementary and secondary schools, which experienced few outbreaks in the early months of the pandemic, when they remained largely closed, but were responsible for a larger proportion of outbreaks during periods

of 2021 when many California schools reopened for in-person learning.

Limitations

This report is subject to several additional limitations. Although a statewide requirement for non–health care employers to report outbreaks to LHDs has been in place since January 1, 2021, prior to that reporting requirements differed by local jurisdiction and by type of setting, which may have led to differential reporting across settings. The proportion of outbreaks reported in non–health care settings relative to health care settings increased from 2020 to 2021, which might suggest an increase in reporting following implementation of the statewide requirement; however, the proportions of outbreaks reported in most individual non–health care sectors, with the exception of educational services, remained relatively stable in 2020 and 2021. This year-to-year comparison should also be interpreted in the context of other changes over time; for example, closures in schools and other non–health care settings in 2020 and earlier availability of vaccination in health care and congregate settings may have led to fewer outbreaks in those settings relative to others.

In addition, although employers are required by law to report COVID-19 outbreaks, some may be unaware of or non-compliant with this requirement, which would lead to underestimation of outbreak incidence; it is also possible that consistency in reporting differs across industries. Furthermore, work arrangements in certain industries—for instance, industries with mobile or temporary workforces such as transportation or agriculture—might be less conducive to outbreak identification, which could lead to outbreak underreporting in those

industries. CDPH outbreak data also rely on reports received from LHDs, and these local departments may have had limited resources to report outbreaks. Such limitations may have led to underestimated outbreak counts and incidence levels, particularly during COVID-19 surges.

We assigned industry codes on the basis of available information submitted by LHDs; misclassification may have occurred as a result of missing or inaccurate information. In addition, although many of the outbreaks included in our analysis occurred in settings where workers were present, some may have been nonoccupational; we were unable to distinguish workers from nonworkers in our outbreak data. This limitation precluded calculation of outbreak-associated case incidence levels among workers; because our outbreak incidence estimates did not account for numbers of workers per establishment, they may overestimate or underestimate the relative impact of workplace COVID-19 outbreaks on workers in industries with particularly large or small establishment sizes. Although prevention indexes incorporate data on burden of disease as well as disease risk, they do so with limited precision and should be used in the context of additional information and tools to prioritize interventions.

Finally, although outbreaks in our data set were classified by industry, we were unable to analyze COVID-19 incidence according to worker occupation. It is possible that increased risk of COVID-19 among certain occupational groups was not captured in our industry-based analysis.

Public Health Implications

Individual case investigations and contact tracing have formed the backbone

of the response to COVID-19 in the United States but may not represent the most timely or complete methods for identifying COVID-19 workplace outbreaks, as workplace information is not always collected during individual case investigations and mechanisms may not exist for linking individual cases identified in the same workplace.²⁰ Furthermore, during the current phase of the pandemic, as public health departments transition away from universal case investigation and contact tracing,²⁴ employer reporting of workplace outbreaks can provide a mechanism for health departments to continue to identify higher-risk settings and target interventions.

An outbreak reporting mandate such as California's may help ensure that such reporting happens more consistently and enable more systematic tracking of where COVID-19 outbreaks are taking place. The resulting outbreak data can be used to categorize outbreaks by industry, as we have done in this report, and identify settings with high numbers and incidence levels of outbreaks and outbreak-associated cases. The use of outbreak data to direct prevention efforts, including workforce vaccination, can play an important role in the ongoing effort to combat the COVID-19 pandemic and in planning for future pandemic responses to protect the workers who are most at risk. **AJPH**

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CONTRIBUTORS

A. Heinzerling, A. Nguyen, B. Materna, and S. Jain conceptualized the study. A. Nguyen, M. Frederick, E. Chan, K. Gibb, A. Rodriguez, and J. Wong prepared the data for analysis, and A. Heinzerling and A. Nguyen conducted the analysis. All of the authors contributed to interpretation of the analysis. A. Heinzerling drafted the article, and all authors provided critical feedback.

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CONFLICTS OF INTEREST

The authors do not report any conflicts of interest.

HUMAN PARTICIPANT PROTECTION

This study was determined by the California Health and Human Services Committee for the Protection of Human Subjects to be public health practice as opposed to research and was exempt from institutional review board review.

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Our Communities Our Sexual Health

Awareness and Prevention for African Americans

Edited By: Madeline Sutton, MD, MPH;
Jo A. Valentine, MSW; and
William C. Jenkins, PhD, MS, MPH

This groundbreaking book provides a comprehensive historical prospective of the disproportionate burden of HIV and other sexually transmitted infections (STIs) among African Americans. Chapters that follow explore the context of HIV and STIs in African American communities and include discussions of sexuality and the roles of faith and spirituality in HIV and STI prevention efforts. Additional chapters provide insight into strategies, e.g., HIV testing, condom distribution and marketing campaigns, parent-child communication, effective clinical care and support, and partnerships, for addressing HIV and other STI-related health disparities within these communities. The book is a valuable resource for practitioners, scholars, clinicians, educators, providers, policy makers and students.



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Community Health Worker Activities in Public Health Programs to Prevent Violence: Coding Roles and Scope

Colleen Barbero, PhD, MPPA, Abdul Hafeedh Bin Abdullah, CHW, BA, Noelle Wiggins, EdD, MSPH, Mariana Garrettson, PhD, Dean Jones, CHW, MSW, Angie S. Guinn, MPH, Candace Girod, MPH, Joivita Bradford, BA, and Ashley Wennerstrom, PhD, MPH

In multiple and related forms, violence is a serious public health issue with lasting impacts on health and wellness in the United States. Community health workers (CHWs) are frontline public health workers and trusted members of communities.

We aimed to analyze recent examples of CHW activities in violence prevention public health programs with a goal of informing future programs and research. We collected more than 300 documents published between 2010 and 2020 to identify public health programs to prevent violence including CHW activities. We used an iterative process to develop and apply a coding scheme to the CHW activities.

We identified 20 public health programs to prevent violence which included CHW activities. CHWs most often addressed community violence, youth violence, and family violence and played an average of 8 of 10 core roles per program. Fewer than a third (i.e., 6 programs) reported community-focused CHW activities to address upstream and structural determinants of health inequities. This first examination, to our knowledge, of the intersection of the CHW and violence prevention literature shows that CHWs have played many of their core roles in public health programs to address multiple forms of violence. (*Am J Public Health*. 2022;112(8):1191–1201. <https://doi.org/10.2105/AJPH.2022.306865>)

In the United States, violence, in multiple, related forms, is a public health issue with lasting impacts on health and wellness.^{1,2} Social and structural marginalization can also position certain populations and communities to experience greater exposure to and risk of violence.³ For example, homicide is the leading cause of death for African American males aged 15 to 34 years.⁴ In addition, a study of Chicago neighborhoods in 2013 showed that Hispanic and Black youths were 74% and 112% more likely to be exposed to violence than White youths, respectively.⁵

Violence prevention can include intervention to avert violent events,⁶ as well as addressing the risk and protective

factors (e.g., adverse childhood experiences, such as experiencing violence in the home or community) that contribute to multiple forms and intergenerational transmission of violence.^{7,8} Violence prevention also requires a focus on addressing the upstream and structural and intermediary determinants of inequities.⁹ According to the World Health Organization's (WHO's) *Framework for Action on Social Determinants of Health*, upstream determinants of health inequities include

structural mechanisms that generate stratification and social class divisions in the society and that define individual socioeconomic position

and are rooted in the key institutions and processes of the socioeconomic and political context.^{9(p5)}

The intermediary determinants of inequities derive from the upstream and structural determinants and include factors such as material circumstances, psychosocial and behavioral factors, and the health and social service system.⁹ Lastly, the cross-cutting determinants (e.g., social cohesion and capital) are related to collective efficacy to modify upstream and structural determinants of inequities,¹⁰ such as structural racism,¹¹ and to prevent the inequities created by existing hierarchies.⁹

As a workforce with the recognized potential to promote health equity,¹² community health workers (CHWs) played a critical role during the COVID-19 pandemic,¹³ with the Centers for Disease Control and Prevention (CDC) and Health Resources and Services Administration investing more than \$480 million in programs to engage CHWs in pandemic response efforts.^{14,15} The development of a national infrastructure to support CHW engagement in the public health response to COVID-19, along with an increased national focus on addressing violence,^{16,17} has created a window of opportunity to support the natural extension of CHW roles to include violence prevention.

CHWs have existed in the United States since the 1950s, but they have been receiving increased attention as the workforce has become more professionalized.¹⁸ In 2009, just before federal policy included CHWs as a strategy for improving health outcomes, CHWs led the American Public Health Association (APHA) in creating a standard definition for a CHW that is widely accepted now in the field:

A community health worker is a frontline public health worker who is a trusted member of and/or has an unusually close understanding of the community served. This trusting relationship enables the worker to serve as a liaison/link/intermediary between health/social services and the community to facilitate access to services and improve the quality and cultural competence of service delivery. A community health worker also builds individual and community capacity by increasing health knowledge and self-sufficiency through a range of activities such as outreach, community education, informal

counseling, social support, and advocacy.¹⁹

During the past decade, CHWs' organizing and advocacy at the local, state, and national levels have further established a CHW professional identity, including creation of a national CHW association, and advanced workforce development through the development of core roles.^{20,21}

The CDC has supported CHW programs and research related to chronic disease prevention and management for more than a decade.¹² Systematic reviews during this time have also provided support for interventions engaging CHWs to prevent and manage chronic diseases.²² However, to date, the peer-reviewed literature has given little attention to the intersection of the topics of CHWs and violence prevention. We aimed to review recent published literature to identify and analyze examples of CHW activities related to violence prevention, including CHW activities to address upstream and structural and intermediary determinants of health inequities. We use gaps and limitations from our review to identify potential next steps for supporting CHW leadership in programs and research to prevent violence.

METHODS

In January 2021, our team of 9 authors, including 2 CHWs (A. H. B. A. and D. J.) with experience working in violence prevention, led by the CDC Division of Violence Prevention, consulted with 10 additional subject matter experts to conceptualize the topic, develop search terms, and define a document and program inclusion and exclusion process. We (the author team) searched PubMed, Medline, Scopus, PsycInfo,

and CINAHL for articles in English published between January 1, 2010, and December 31, 2020, by using the following terms: "community health worker," "promotora," "promotor," "community health representative," "violence interrupter," "violence prevention specialist," "violence intervention specialist," "violence prevention professional," "lay health worker," "community outreach worker," "community health advisor," "behavioral health aide," "village-based counselor," "street worker," and "youth worker" and "violence," "child abuse," "child maltreatment," "child neglect," "elder abuse," "elder maltreatment," "elder neglect," and "safety." We included titles of CHWs conducting violence interruption and outreach because subject matter experts reported that these workers have begun to identify with the APHA definition for a CHW and have connected with CHW organizations.

Figure 1 describes our document and program inclusion and exclusion process. After collecting the peer-reviewed literature, 2 authors (C. B. and N. W.) independently reviewed titles and available abstracts to identify documents that (1) described a public health program that had been implemented in the United States, (2) included at least 1 specific form of interpersonal violence prevention as a program focus (excluding treatment alone), and (3) reported at least 1 individual meeting the APHA definition for a CHW¹⁹ conducting activities relevant to the violence-prevention focus. Our focus on interpersonal violence included 8 forms of violence that occur between individuals, as defined by the CDC (Table A, available as a supplement to the online version of this article at <https://ajph.org>), and excluded self-directed violence. After reviewing the list of included documents and

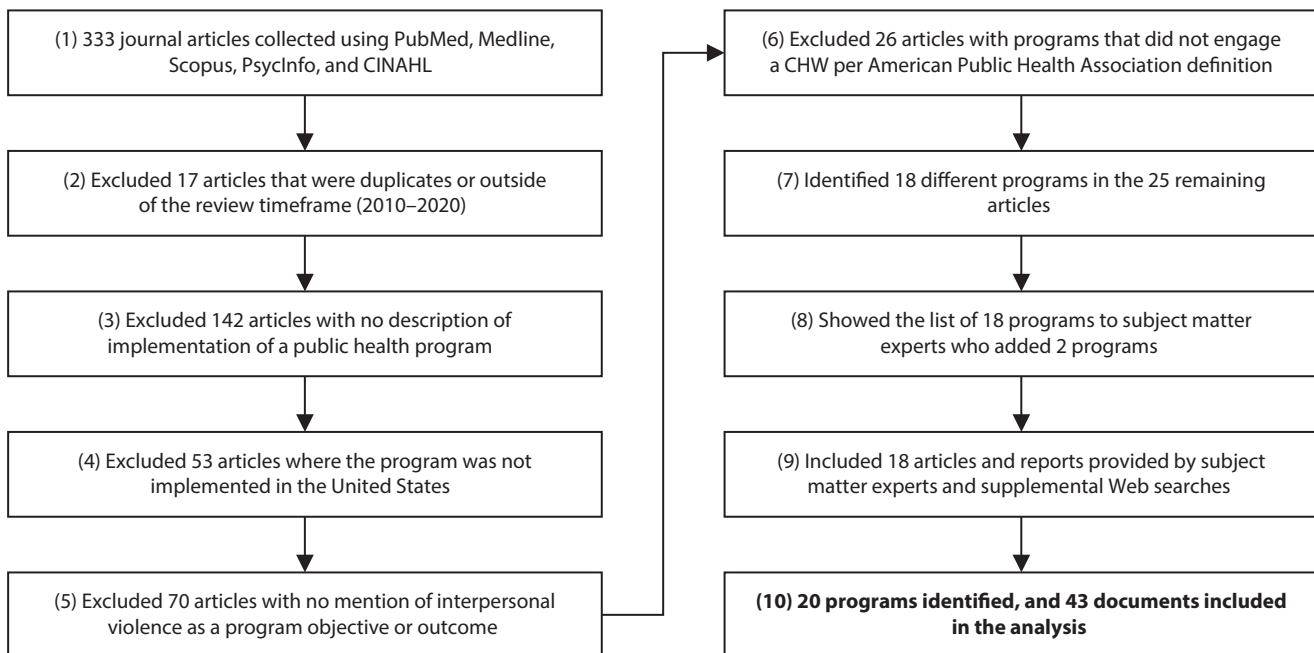


FIGURE 1— Inclusion and Exclusion of Documents and Public Health Programs to Prevent Violence Including Community Health Worker (CHW) Activities

programs, subject matter experts added documents and programs that were not identified through our literature search.

Lastly, we conducted Web searches using Google with the names of the included programs to identify supplemental documents. During this process, we determined that most of the identified programs did not have replications, except for the Cure Violence program. Because CHW activities were similar across these replications, we decided to analyze them as 1 program.²³

Coding Scheme Development

We collaboratively developed a coding scheme that could be applied to each program, using an iterative process to develop, test, and refine the coding scheme and develop consensus on the coding. We developed initial codes based on our review of the included

literature and subject matter expert input. Next, one reviewer coded each program based on associated documents (Table B, available as a supplement to the online version of this article at <https://ajph.org>). At least 1 additional reviewer then examined the same documents and provided edits for the program's coding. The reviewers did not assign codes to programs for CHW activities that were not explicitly described. The first author (C. B.) coordinated communications about the coding among reviewers and ensured that changes to the coding process were applied to all the programs. We met 3 times to refine and review coding results together to ensure consistency and consensus and determine the format for presenting results.

Final Coding Scheme and Definitions

Tables 1 and 2 include the final coding scheme, and Table B includes the final

code definitions. Programs with CHW activities were coded for 8 forms of violence, 5 professional sectors, and 4 focus populations experiencing structural racism and historical trauma. On the basis of previous research,^{20,21} we also coded CHW activities in the programs for 10 CHW core roles, applying additional codes to identify the roles that could be focused on the community (i.e., community-focused activities), in addition to on individuals and families (i.e., community-based activities). Programs with identified community-focused CHW roles were also coded for the focus of these roles on 6 types of upstream and structural and intermediary determinants of health inequities from the WHO Framework.⁹ Because upstream and structural determinants are expected to have the largest public health impact, we also documented program impacts related to upstream and structural determinants. All relevant codes within a category were

TABLE 1— Coding for Forms of Violence Addressed, Focus Populations, and Sectors Connected by Community Health Worker Activities in 20 Public Health Programs to Prevent Violence: January 1, 2010–December 31, 2020

Program	Form(s) of Violence	Focus Population(s)	Sector(s)
<i>Acción para la Salud</i>	Community, family	Hispanic/Latinx	Community, health care, social service
Cambodian Women's Group	Community, family	Asian American	Community, social service
Capital Region Violence Prevention	Community, youth, firearm	Black/African American	Community, health care, social service, justice or legal
Cure Violence	Community, youth, firearm	Black/African American	Community, health care, social service, justice or legal, education
E-Responder	Community, youth, firearm	Black/African American, Hispanic/Latinx	Community
Family Health Advocate	Community, family, intimate partner	Black/African American	Community, health care, social service, justice or legal
Family Spirit	Family, youth, child abuse or neglect	American Indian/Alaska Native	Community, health care, social service, education
Family Wellness Warriors	Community, family, intimate partner, sexual, child abuse or neglect	American Indian/Alaska Native	Community, health care, social service, justice or legal
Interconnections Project	Intimate partner	Black/African American	Community, health care, social service, justice or legal
Lay Health Workers Enhancing Engagement for Parents	Family, child abuse or neglect, intimate partner	Hispanic/Latinx	Community, health care
<i>Líderes</i>	Family, intimate partner	Hispanic/Latinx	Community, social service
Phoenix TRUCE	Community, youth, firearm	Hispanic/Latinx	Community, health care, social service, justice or legal, education
Prescription for Hope	Community, youth, firearm	Black/African American	Community, health care, social service, justice or legal, education
<i>Proyecto Interconexiones</i>	Family, intimate partner	Hispanic/Latinx	Community, health care, social service
Safe Spaces	Family, intimate partner, sexual	Black/African American	Community, health care, social service
SAFER Latinos	Community, youth, firearm	Hispanic/Latinx	Community, social service, education
Special Kids Achieving Their Everything	Family, intimate partner, child abuse or neglect	Hispanic/Latinx	Community, health care, social service, education
Striving to Reduce Violence Everywhere (Multnomah County 2016)	Community, youth, firearm	Black/African American, Hispanic/Latinx	Community, school, social service, health care
We Are Health Movement	Community, youth	Black/African American	Community, social service
Wrap Around Project	Community, youth, firearm	Black/African American, Hispanic/Latinx	Community, social service, health care, justice or legal, education

applied for each program. For example, a program could include CHW activities aimed at addressing multiple forms of violence.

Coding Analysis

To aggregate the coding across programs, we counted the number of

programs with each code and, for each category, averaged the number of codes per program. Program coding results are provided in [Tables 1 and 2](#).

TABLE 2— Coding for Community Health Worker (CHW) Core Roles and Intermediary and Upstream and Structural Determinants of Health Inequities Addressed by CHW Activities in 20 Public Health Programs to Prevent Violence: January 1, 2010–December 31, 2020

Program	CHW Core Role(s)	Intermediary Determinant(s)	Upstream and Structural Determinant(s)
<i>Acción para la Salud</i>	Cultural mediation, health education, social support, capacity (I & C), assessments (I & C), outreach, advocacy (I & C), research and evaluation	Material circumstances, psychosocial or behavioral, health and social systems, collective efficacy	Socioeconomic or political context
Cambodian Women's Group	Cultural mediation, social support, capacity (I & C), assessments (I & C), outreach, research and evaluation	Material circumstances, psychosocial or behavioral, health and social systems, collective efficacy	Socioeconomic or political context
Capital Region Violence Prevention	Cultural mediation, health education, care coordination, social support, capacity (I), direct service, outreach, research and evaluation	None identified	None identified
Cure Violence	Cultural mediation, health education, care coordination, social support, capacity (I & C), direct service, assessments (I & C), outreach, advocacy (I & C), research and evaluation	Material circumstances, psychosocial or behavioral, health and social systems, collective efficacy	Socioeconomic or political context, socioeconomic position
E-Responder	Cultural mediation, health education, social support, capacity (I), direct service, assessments (I), outreach, research and evaluation	None identified	None identified
Family Health Advocate	Cultural mediation, health education, care coordination, social support, capacity (I), direct service, assessments (I), outreach, advocacy (I), research and evaluation	None identified	None identified
Family Spirit	Cultural mediation, health education, care coordination, social support, capacity (I), assessments (I), research and evaluation	None identified	None identified
Family Wellness Warriors	Cultural mediation, health education, social support, direct services, capacity (I & C), outreach, advocacy (I & C), research and evaluation	Psychosocial or behavioral, health and social systems, collective efficacy	Socioeconomic or political context
Interconnections Project	Cultural mediation, health education, care coordination, social support, capacity (I), assessments (I), direct service, research and evaluation	None identified	None identified
Lay Health Workers Enhancing Engagement for Parents	Cultural mediation, health education, social support, capacity (I), assessments (I), direct service, outreach, research and evaluation	None identified	None identified
<i>Lideres</i>	Cultural mediation, health education, social support, capacity (I), outreach, advocacy (I), research and evaluation	None identified	None identified
Phoenix TRUCE	Cultural mediation, health education, care coordination, social support, capacity (I & C), direct service, assessments (I & C), outreach, research and evaluation	Psychosocial or behavioral, collective efficacy	None identified
Prescription for Hope	Cultural mediation, health education, care coordination, social support, capacity (I), assessments (I), direct services, outreach, research and evaluation	None identified	None identified
<i>Proyecto Interconexiones</i>	Cultural mediation, health education, care coordination, social support, capacity (I), direct service, research and evaluation	None identified	None identified

Continued

TABLE 2— Continued

Program	CHW Core Role(s)	Intermediary Determinant(s)	Upstream and Structural Determinant(s)
Safe Spaces	Cultural mediation, health education, care coordination, social support, capacity (I & C), assessments (I & C), outreach, research and evaluation	Material circumstances, psychosocial or behavioral, health and social systems, collective efficacy	None identified
SAFER Latinos	Cultural mediation, health education, care coordination, social support, capacity (I), direct service, assessments (I), outreach, advocacy (I), research and evaluation	None identified	None identified
Special Kids Achieving Their Everything	Cultural mediation, health education, care coordination, social support, capacity (I), direct service, assessments (I)	None identified	None identified
Striving to Reduce Violence Everywhere (Multnomah County 2016)	Cultural mediation, health education, care coordination, social support, capacity (I & C), direct service, assessments (I & C), outreach, advocacy (I & C), research and evaluation	Material circumstances, psychosocial or behavioral, health and social systems, collective efficacy	Socioeconomic or political context, socioeconomic position
We Are Health Movement	Cultural mediation, health education, care coordination, social support, capacity (I & C), direct service, assessments (I & C), outreach, advocacy (I), research and evaluation	Psychosocial or behavioral, collective efficacy	Socioeconomic or political context, socioeconomic position
Wrap Around Project	Cultural mediation, health education, care coordination, social support, capacity (I), direct service, assessments (I), outreach, advocacy (I), research and evaluation	None identified	None identified

Notes. C = community-focused; I = individual- or family-focused.

Table 3 provides results from the analysis of the coding.

RESULTS

From the literature, 18 public health programs to prevent violence including CHW activities were identified (Figure 1). Subject matter experts added 2 programs, for a total of 20 identified public health programs to prevent violence including CHW activities.

Forms of Violence, Sectors, and Populations

Table 1 includes the coding for forms of violence addressed, focus populations, and professional sectors connected by CHW activities for each of the 20 identified programs. Our

analysis of this coding found that CHWs addressed an average of 3 forms of violence, 3 sectors, and 1 population per program (Table 3). In addition, CHWs most often addressed community violence (13 programs), youth violence (10 programs), and family violence (10 programs). Community violence occurs between individuals who are unrelated, generally takes place outside the home, and can include youth violence.¹ Family violence includes a range of violence that can occur in families, including intimate partner violence, child abuse, and elder abuse by caregivers and others.² Table A includes these and other definitions for the 8 forms of violence coded.

CHWs in the identified programs worked most often with the community sector (in all 20 programs), social service sector (18 programs), and health

care sector (15 programs). CHWs in these programs worked with Black/African American (10 programs), Latinx/Hispanic (10 programs), American Indian/Alaska Native (2 programs), and Asian American (1 program) populations (Tables 1 and 3).

Community Health Worker Core Roles

Table 2 includes the coding for CHW core roles and intermediary and upstream and structural determinants of health inequities addressed by CHW activities for each of the 20 programs. Table A also includes a definition for each CHW core role included in Tables 2 and 3. Programs reported an average of 8 of the 10 CHW core roles, with 6 of the 20 programs reporting all 10 roles

TABLE 3— Analysis of Coding for Community Health Worker (CHW) Activities in 20 Public Health Programs to Prevent Violence: January 1, 2010–December 31, 2020

Code	No. of Programs Out of 20
Forms of violence addressed by CHW activities	
Community violence	13
Youth violence	10
Family violence	10
Firearm violence	8
Intimate partner violence	8
Child abuse or neglect	4
Sexual violence	2
Elder abuse or neglect	0
CHW core roles reflected in CHW activities	
Cultural mediation	20
Social support	20
Capacity building	20
Individual ^a	12
Community ^b	8
Research and evaluation	19
Health education	19
Outreach	16
Assessment	16
Individual ^a	9
Community ^b	7
Direct service	15
Care coordination	14
Advocacy	9
Individual ^a	5
Community ^b	4
Sectors involved in the CHW activities	
Community	20
Social service	18
Health care	15
Justice or legal	8
Education	7
Populations that were the focus of CHW activities	
Black/African American	10
Hispanic/Latinx American	10
American Indian/Alaska Native	2
Asian American	1
Upstream and structural and intermediary determinants addressed by community-focused CHW activities	
Intermediary determinants	8
Psychosocial or behavioral	8
Collective efficacy	8
Health and social systems	6

Continued

(Table 3). CHWs' cultural mediation, social support, and capacity building roles were seen in all the programs (Tables 2 and 3). For example, these roles were reported for the Prescription for Hope program, in which culturally familiar support specialists helped to facilitate initiation of social services by accompanying participants to appointments and mentoring youth participants.²⁴ As another example, in the SAFER Latinos program, social *promotores* and peer advocates recruited from the community and schools provided one-on-one support to youths and parents, helped improve communication between families and the school system, and facilitated referrals to academic, job preparation, and other services through the program's "drop-in" community center.²⁵

In addition, CHWs participated in research and evaluation in 19 of the 20 programs (Tables 2 and 3). For example, in the Safe Spaces, *Acción para la Salud*, and Cambodian Women's Group programs, CHWs contributed to program design and measurement through a community-based participatory research approach.^{26–28} CHWs also provided culturally appropriate health education in 19 programs (Tables 2 and 3). For example, in the Family Spirit program, bilingual American Indian paraprofessionals delivered a parenting curriculum to adolescent mothers in their homes.²⁹ CHWs provided assessments, direct services, and care coordination in 16, 15, and 14 of the programs, respectively (Tables 2 and 3). For example, all 3 of these roles were reported for the Wrap Around Project, a hospital-based program in which violence intervention specialists provided violently injured patients with one-on-one case management, based on an initial risk assessment, including

TABLE 3— Continued

Code	No. of Programs Out of 20
Material circumstances	5
Upstream and structural determinants	6
Socioeconomic or political context	6
Socioeconomic position	3

^aCHW activities reflecting this role focused on individuals and families only.

^bCHW activities reflecting this role focused on the community, in addition to individuals and families.

mental health services, employment opportunities, and guidance to other resources.³⁰

The CHW advocacy role was reported the least, by 9 of the 20 programs (Tables 2 and 3). CHW activities involving community-focused capacity building, assessments, and advocacy were reported by 8, 7, and 4 programs, respectively (Table 3). *Acción para la Salud* offers an example of a program reporting all 3 of CHWs' community-focused roles. The CHWs in this program used client encounter forms to assess and identify problems to discuss in community forums, developed and implemented policy action projects that included community coalition building and mobilization, and advocated for community needs with policymakers.²⁷

Intermediary Determinants

Eight of the 20 programs reported that CHWs conducted community-focused activities to address psychosocial or behavioral factors and collective efficacy (Tables 2 and 3). For example, CHWs in the Striving to Reduce Youth Violence Everywhere (STRYVE) Multnomah County program provided training to community members to articulate violence as a public health problem.³¹ In the Cure Violence program, the CHWs facilitated meetings with

community members to help shift community norms around violence.²³ In the We Are Health Movement program, the CHWs participated in consciousness raising, a first step in community advocacy.³²

In 6 of the 20 programs, community-focused activities by CHWs aimed to have an impact on the health and social service system (Tables 2 and 3). For example, a CHW-led coalition focused on strategies for improving intimate partner violence services in the Safe Spaces program.²⁶ Five of the 20 programs reported community-focused activities conducted by CHWs to address the material circumstances in the community (Tables 2 and 3). For example, the CHW facilitating the Cambodian Women's Group engaged community members to develop a community garden.²⁸ As another example, CHWs in the STRYVE Multnomah County program improved the community environment by engaging youths in placemaking activities, including creating murals and peace poles.³¹

Upstream and Structural Determinants

In 6 of the 20 programs, CHWs led community-focused activities that helped to reveal upstream and structural determinants of inequities related

to the socioeconomic or political context (Tables 2 and 3). For example, the CHW facilitator of the Cambodian Women's Group led discussions that identified generation gap, lack of education, unemployment or underemployment, trauma, poverty, and discrimination as key upstream and structural drivers of health and violence issues in the community.²⁸ Three of these 6 programs reported program impacts related to the socioeconomic or political context.^{23,31,33} First, in the Cure Violence program, the focus of programs was shifted from criminal justice to community health by obtaining new funding sources.²³ Second, in the STRYVE Multnomah County program, the CHW who was included in county-level meetings to improve policing in the community helped to identify a subjective and potentially discriminatory policing practice.³¹ The CHW then proposed a policy that would rely on data, which the county adopted.³¹ Third, the statewide implementation of the Family Wellness Warriors program, which is entirely led by the Native people of Alaska (including CHW "natural helpers"), was reported as leading directly to philosophical and policy changes in the health care, social service, judicial, educational, and correctional systems in Alaska.³³

Lastly, 3 of the 20 programs reported CHW community-focused activities and program impacts related to socioeconomic position.^{23,31,32} The We Are Health Movement and STRYVE Multnomah County programs reported that community members who attended the trainings were able to find permanent employment as CHWs.^{31,32} In addition, the Cure Violence program included community partner education efforts that helped lead to employment for community members at high risk for violence.²³

DISCUSSION

This first examination of the intersection of the CHW and violence-prevention literature shows that CHWs have played many of their core roles in public health programs to address multiple forms of violence. We also found examples of CHWs' community-focused roles^{20,21} applied to address upstream and structural determinants of health inequities,⁹ with several programs reporting impact.^{23,31–33}

Our analysis succeeded in revealing key gaps in the recent programmatic literature. While the CHWs in the 20 programs we reviewed most often addressed community, youth, and family violence, we saw that CHW activities reported in these programs less frequently focused specifically on child abuse or neglect, and none of the programs we reviewed provided CHWs with a specific focus on elder abuse or neglect (Tables 1 and 3). Also, despite the potential for community-focused activities to have upstream and structural impacts,^{9,10} most of the programs we identified only included CHWs providing community-based services to individuals and families (Tables 2 and 3). Finally, fewer than a third of the programs (i.e., 6 programs) reported community-focused CHW activities to address upstream and structural determinants of health inequities (Tables 2 and 3).

Limitations

Our review has 3 main limitations. First, we did not code for program outcomes in this analysis because these outcomes could not be directly attributed to the CHW roles and activities we analyzed. This attribution issue is a common limitation in CHW program

evaluations and systematic reviews.²⁰ A second limitation was our collection of mostly published literature. A third limitation is that our search included only the most widely used titles of CHWs, along with titles of the specific community-based violence intervention and prevention workers who we were aware had a preexisting connection with the CHW profession.

Our results and limitations suggest next steps to improve programs and research. The opportunity to combine CHW and community violence prevention is salient given the current context.¹⁵ However, public health programs may currently be missing opportunities for CHWs to address the increases in child and elder abuse and neglect seen during the pandemic.^{34,35} The programs we identified that specifically focused on child abuse and neglect tended to include multigenerational behavioral interventions.^{29,33} Strategies focusing on the primary prevention of adverse childhood experiences through community-focused activities (e.g., affecting policies, cultural norms, and social norms) could also help to prevent child and elder abuse and neglect and other forms of violence.^{7,8}

A logical next step after this review could be a scan and analysis of a wider breadth of unpublished program reports detailing CHW activities. Such an effort may also help to identify more examples of CHWs' community-focused roles and activities to address upstream and structural determinants. It could also be beneficial to examine CHW roles related to preventing self-directed violence (e.g., suicide) and other forms of violence that were not a focus of this review.

In addition, while our review found that CHWs were often included in the research and evaluation of a program

(Tables 2 and 3), equity in researcher or program designer and CHW partnerships might be further advanced by including CHWs as co-researchers and co-program designers. For example, this article is the product of a partnership including CHWs and non-CHW allies. CHWs contributed to the conceptualization of this review and provided input to refine our coding for CHW roles and activities based on their extensive experience developing, implementing, and evaluating violence intervention and prevention strategies in the field. The CHW authors of this article also provided a combination of lived experiences, practice-based wisdom, and previous leadership roles that has proven imperative for determining the vision, scope, purposes, implications, and opportunities to disseminate this work. Going forward, it will be important to fully document partnerships between researchers or program designers and CHWs to share best practices and success stories.

Research is also needed to analyze the outcomes of the promising violence prevention strategies and adaptations that CHWs are developing and leading in the field. For example, in Wilmington, North Carolina, a CHW-led community-wide violence prevention initiative has involved transforming a dormant community asset (i.e., vacant lot and abandoned building) into a community center that aims to build community cohesion and collective efficacy.³⁶ The CHW Common Indicators Project, a national project with CHW leadership,³⁷ is developing process and outcomes measures that could be used in the future to evaluate the impact of CHW activities related to violence prevention. Systematic reviews could be completed once a rigorous evidence base on outcomes has been developed.

Because the impact of violence on health and well-being is established,^{1,2} another next step could be to support CHWs in chronic disease and other health promotion programs to extend their existing roles and activities to include violence prevention. This could involve the development of new tools and partnerships with CHW training programs, which exist in nearly every state.³⁸ In addition, the CHW definition provides an umbrella that could also potentially inform outreach to a wider range of community-based violence-prevention workers (e.g., victim advocates). Identifying more community-based violence prevention positions and developing partnerships with violence prevention programs could help to support more individuals meeting the CHW definition in connecting with the broader profession of CHWs (e.g., through national, state, and local CHW organizations and networks).

Finally, programs and partners may also want to consider how to help advance sustainable financing for CHW roles and activities relevant to violence prevention. For example, Illinois and Connecticut recently passed laws directing Medicaid reimbursement for violence intervention services.³⁹ One potential issue with CHW Medicaid financing relevant to violence prevention is the current gap in financing for CHWs' community-focused activities.^{38,40} New research could help to inform models that could help programs to ensure fidelity across sites and provide evidence in support of sustainable financing mechanisms.

Conclusions

Violence continues to be a serious public health issue that has lasting impacts for individuals, families, and

communities. The examples in this essay help to illustrate CHWs' potential to provide a comprehensive approach to violence prevention that involves reframing violence as a public health issue, changing community norms around violence, helping communities to heal collectively from violence and trauma, and developing community leadership and capacity to initiate change in structural conditions. Supporting CHW leadership in programs and research to prevent violence could have a substantial public health impact, especially if efforts support CHWs in working upstream. *AJPH*

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Note. The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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CONFLICTS OF INTEREST

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HUMAN PARTICIPANT PROTECTION

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Potential Impact of Telemedicine for Medication Abortion Policy and Programming Changes on Abortion Accessibility in the United States

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See also Allsworth, p. 1086, and Kapadia, p. 1107.

Objectives. To quantify the impact of telemedicine for medication abortion (TMAB) expansion or ban removal on abortion accessibility.

Methods. We included 1091 facilities from the 2018 Advancing New Standards in Reproductive Health facility database and Planned Parenthood Web site, among which 241 did not offer abortion as sites for TMAB expansion. Accessibility was defined as the proportion of reproductive-aged women living within a 30-, 60-, or 90-minute drive time from an abortion-providing facility. We calculated accessibility differences between 3 scenarios: (1) facilities offering abortion in 2018 (reference), (2) the reference scenario in addition to all facilities in states without TMAB bans (TMAB expansion), and (3) all facilities (TMAB ban removal). We also stratified by state and urban–rural status.

Results. In 2018, 65%, 81%, and 89% of women lived within a 30-, 60-, or 90-minute drive time from an abortion-providing facility, respectively. Expansion and ban removal expanded abortion accessibility relative to the current accessibility scenario (range: 1.25–5.66 percentage points). Women in rural blocks experienced greater increases in accessibility than those in urban blocks.

Conclusions. TMAB program and policy changes could expand abortion accessibility to an additional 3.5 million reproductive-aged women.

Public Health Implications. Our findings can inform where to invest resources to improve abortion accessibility. (*Am J Public Health.* 2022;112(8):1202–1211. <https://doi.org/10.2105/AJPH.2022.306876>)

Obtaining a wanted abortion is a determinant of psychological, physical, social, and economic well-being among US women and of social and economic well-being among their children.^{1–9} (Not all individuals who seek abortion care identify as women. To date, much of the abortion literature has focused on the experience of “women.” When citing past literature reported as including “women,” we use

that language. Similarly, the US census data we used included the population of US “women.” When referring to people who received abortion care, we use the term “client.”) Furthermore, abortion is legal, safe, and supported by major medical organizations.¹⁰

However, many state-level restrictions on abortion access and provision create barriers to care.^{11–19} Given these barriers, measuring access to

abortion care in the United States is important for public health decision making. One component of access, accessibility (defined by Penchansky and Thomas as “the relationship between the location of supply and the location of clients”^{20(p128)}), is often operationalized as how far people are from health services, regardless of their immediate need for those services. Studies in the United States indicate that implementation of

antiabortion policies can decrease abortion accessibility.^{13,18}

In 2008, to overcome a state-imposed physician medication abortion dispensing regulation, Planned Parenthood of the Heartland in Iowa launched a site-to-site telemedicine for medication abortion (TMAB) care delivery model. Under this model, clients visit a health center where an abortion provider is not physically present and meet with a remote clinician via videoconference. As in an in-person medication abortion visit, the clinician answers the client's questions and may watch as the client is given the first dose of abortion medication. Relative to in-person medication abortion, TMAB is equally or more safe, effective, and acceptable to clients and providers.²¹⁻²³ Furthermore, in comparison with clients seen at this clinic network before TMAB implementation, those seen after implementation traveled slightly shorter distances.²⁴

Although Planned Parenthood has expanded use of TMAB since 2008 to additional states where the service is not banned, as of 2018 nearly half of Planned Parenthood health centers did not offer any abortion services.²⁵ Furthermore, because of the politicization of abortion, use of telemedicine to deliver medication abortion, including via TMAB services, has been banned in 19 US states.²⁶ We sought to expand on the existing literature by quantifying the potential impact of TMAB expansion, or removal of TMAB bans, on abortion accessibility among all US women of reproductive age.

METHODS

Abortion-providing facility addresses were obtained from the 2018 Advancing New Standards in Reproductive Health (ANSIRH) facility database, which

collected data in the same manner as previous databases.²⁷ The database included 925 facilities operating in 2018. We excluded facilities that were not open ($n = 83$). We then abstracted the addresses of all Planned Parenthood health centers operating in 2018, both those providing abortion care and those that did not offer abortion care, from the Planned Parenthood Federation of America Web site²⁵ ($n = 600$). Health centers that did not offer abortion care were included as sites to which TMAB could be expanded in the exposure scenarios described subsequently. After removing duplicate addresses ($n = 351$), we included 1091 facilities.

Outcome

Abortion accessibility was operationalized as the proportion of US women 15 to 44 years of age who lived within a 30-, 60-, or 90-minute drive time of 1 or more abortion-providing facilities. The range of driving times considered here reflects differences in acceptable driving distances across the country owing to geography, rurality, or culture (e.g., abortion stigma or attitudes toward abortion). For example, 30 minutes is commonly used to define network adequacy for primary care,²⁸ and 90 minutes may be more realistic for those living in rural settings or preferable for abortion seekers who prefer to travel further to protect their anonymity.

Initially, we geocoded facilities' addresses using the *ggmap* package in R (R Foundation, Vienna, Austria).²⁹ Before *ggmap* geocoding, all "&" instances were removed from addresses to improve the process.³⁰ All addresses were successfully geocoded. Latitudes and longitudes for all addresses not geocoded at the rooftop level and a random sample of 50 addresses geocoded at

the rooftop level were manually checked with GoogleMaps, and the 3 inaccuracies (none of which were geocoded at the rooftop level) were corrected and geocoding was rerun.

To calculate abortion accessibility, we used R's *osrm* package³¹ to calculate 30-, 60-, and 90-minute drive time isochrones (i.e., polygons created by connecting all points along a road network that were a 30-minute drive time from that facility) for each facility. We assumed no barriers to interstate travel, so isochrones could cross state lines. To identify the population living within a given drive time to an abortion-providing facility, we used census block shape files and block-level population data from the 2010 US census obtained via the IPUMS (Integrated Public Use Microdata Series) National Historical Geographic Information System.³² Census blocks are the smallest geographic unit used by the US census ($n = 11\,078\,297$). For each census block, we calculated the number of women of reproductive age by summing the counts of women in age categories inclusive of the ages 15 through 44 years.

Using the *sf* package in R,³³ we identified the intersection between census blocks and isochrones (i.e., the fraction of each census block's area included within the boundary). For each census block, we calculated the number of women 15 to 44 years of age who lived 30 minutes or less, 60 minutes or less, and 90 minutes or less from at least 1 abortion-providing facility, respectively, by multiplying the intersection fraction by the total number of women 15 to 44 years old residing in that census block (similar to the approach used by Pollini et al.³⁴).

We then determined the fraction of reproductive-aged US women in each state and in the United States overall who lived within the drive times of

interest in each of the 3 scenarios by dividing the number of women 15 to 44 years old within the specified drive time across all census blocks in the area of interest (i.e., country or state) by the total number of women 15 to 44 years old in that area. Accessibility was defined as being within a set drive time of at least 1 abortion-providing clinic (regardless of whether cross-state travel was required). Thus, women who had access only to an abortion clinic in a neighboring state contributed data to the state where they lived.

Exposures

The reference (unexposed) scenario was abortion accessibility based on the ANSIRH facility database and Planned Parenthood health centers that offered abortion care in 2018 (i.e., existing levels of provision; $n = 850$), referred to as the “current” scenario. We examined 2 exposure scenarios: (1) expansion of TMAB services to all Planned Parenthood health centers that did not offer abortion in 2018 in states where TMAB was legal (programmatic change; referred to as the “TMAB expansion” scenario) and (2) removal of all state-level TMAB bans (policy change; referred to as the “TMAB ban removal” scenario).

TMAB expansion assumes that, in 2018, TMAB was expanded in states where it was legal (i.e., the current level of provision along with Planned Parenthood health centers in states that did not have a TMAB ban), for a total of 996 abortion-providing facilities. TMAB ban removal assumes that, in 2018, state-level TMAB bans were removed so that in addition to the current level of provision, all Planned Parenthood health centers in all states offered TMAB (i.e., the TMAB expansion scenario along with all Planned Parenthood health centers in

states with a TMAB ban), for a total of 1091 abortion-providing facilities (i.e., all facilities).

We used publicly available 2018 data on state TMAB bans from the Guttmacher Institute to identify facilities that met these criteria.²⁶ In our analyses, we considered expansions of TMAB care only within the Planned Parenthood network given that site-to-site TMAB has been implemented within that network and there are many existing Planned Parenthood health centers that do not offer abortion care.

Analyses

We calculated the differences in the proportions of US women 15 to 44 years old residing within 30-, 60-, and 90-minute drive times of an abortion-providing facility, respectively, between each exposure scenario and the reference scenario. To assess effect measure modification by population density, we calculated estimates stratified by census block urban versus rural status.³⁵ All geographies were visualized and processed via the North America Albers Equal Area Conic projection, and analyses were conducted in R version 4.0.2.³⁶

RESULTS

Of the 241 health centers operating in 2018 that did not offer abortion care, 95 (39.4%) were located in states that banned TMAB services (Table 1). As shown in Figures 1 through 3 and Table 1, TMAB bans were common in states in the Southeast and the middle portions of the United States (Table A, available as a supplement to the online version of this article at <https://www.ajph.org>).

The drive time isochrones for all 3 drive time measures of accessibility (i.e., 30 minutes or less, 60 minutes or

less, and 90 minutes or less) across the 3 provision scenarios (i.e., current, TMAB expansion, and TMAB ban removal) are depicted in Figures 1 through 3. In the United States in 2018, 65.3%, 80.5%, and 88.9% of women 15 to 44 years old lived within 30, 60, and 90 minutes of an abortion-providing facility, respectively. Under the TMAB expansion scenario, 68.3%, 82.6%, and 90.1% of women lived within a 30-, 60-, and 90-minute drive time, respectively. In the TMAB ban removal scenario, 70.9%, 84.7%, and 91.7% of women lived within a 30-, 60-, and 90-minute drive time, respectively.

Across all scenarios and drive times, a greater proportion of women living in urban census blocks than rural census blocks were within the given drive time (Table A, available as a supplement to the online version of this article at <http://www.ajph.org>). Abortion accessibility across all 3 scenarios and drive times varied widely between states and regions of the country (Figures 1–3 and Table A). For example, in the TMAB expansion scenario for a 30-minute drive time, accessibility ranged from 3.9% in Wyoming to 100% in the District of Columbia.

Both TMAB expansion and ban removal resulted in expanded abortion accessibility among US women 15 to 44 years old relative to the current accessibility scenario. The smallest percentage point increase in accessibility was a 1.25 percentage point difference between the current and TMAB expansion scenarios at a 90-minute drive time, meaning that an estimated 781 556 additional US women 15 to 44 years old who did not live within a 90-minute drive time in the current scenario would live within that drive time given this programming change. The largest percentage point increase in accessibility was 5.66 for the difference between the current

TABLE 1— Percentage Point Changes in Abortion Accessibility Relative to the Current Provision Scenario for the US Population and by Census Block Urban/Rural Status and State for All Drive Times: United States, 2018

Area	Health Centers Not Offering Abortion, 2018, No. (%)	30-Minute Drive Time, Percentage Point Difference		60-Minute Drive Time, Percentage Point Difference		90-Minute Drive Time, Percentage Point Difference	
		TMAB Expansion vs Current	TMAB Ban Removal vs Current	TMAB Expansion vs Current	TMAB Ban Removal vs Current	TMAB Expansion vs Current	TMAB Ban Removal vs Current
United States	241 (22.1)	3.05	5.66	2.03	4.14	1.25	2.81
Urban census blocks	235 (21.9)	2.99	5.63	1.61	3.27	0.84	1.86
Rural census blocks	6 (37.5)	3.38	5.80	4.24	8.65	3.36	7.78
States that do not ban TMAB overall and ordered by percentage point change for TMAB expansion vs current scenario							
Total	146 (16.9)	4.65	4.79	3.00	2.89	1.73	1.90
Alaska	0 (0.0)	0.00	0.00	0.00	0.00	0.00	0.00
Connecticut	0 (0.0)	0.00	0.00	0.00	0.00	0.00	0.00
District of Columbia	0 (0.0)	0.00	0.00	0.00	0.00	0.00	0.00
Georgia	0 (0.0)	0.00	0.00	0.18	0.18	0.01	0.01
Hawaii	0 (0.0)	0.00	0.00	0.00	0.00	0.00	0.00
Rhode Island	0 (0.0)	0.00	0.00	0.00	0.00	0.00	0.00
Wyoming	0 (0.0)	0.00	0.00	0.00	0.00	1.61	1.61
Idaho	0 (0.0)	0.01	0.01	0.67	0.67	1.09	1.09
Virginia	0 (0.0)	0.03	0.03	0.47	0.62	0.03	0.06
Illinois	3 (8.1)	0.11	1.86	0.06	2.88	0.04	0.58
Montana	1 (16.7)	0.14	0.14	0.38	0.38	0.21	0.21
Nevada	1 (10.0)	0.15	0.15	0.48	0.48	0.18	0.18
New Jersey	7 (14.0)	0.34	0.34	0.04	0.04	0.00	0.00
Delaware	1 (20.0)	0.70	0.70	0.00	0.00	0.00	0.00
Colorado	7 (23.3)	0.77	0.77	0.76	0.76	0.59	0.59
Oregon	2 (11.8)	0.87	0.87	0.46	0.46	0.11	0.11
Florida	8 (11.0)	0.96	0.96	0.17	0.17	0.19	0.19
New York	8 (7.1)	1.08	1.08	0.27	0.27	0.00	0.00
California	14 (7.8)	2.69	2.69	1.04	1.04	0.05	0.05
Massachusetts	2 (7.4)	3.33	3.33	0.02	0.02	0.00	0.00
Washington	10 (35.4)	4.71	4.71	2.89	2.89	2.77	2.77
Maryland	4 (14.3)	4.77	4.77	2.09	2.09	0.95	0.95
New Mexico	2 (25.0)	5.20	5.20	5.08	5.08	0.97	0.97
New Hampshire	3 (30.0)	5.77	5.77	2.45	2.45	1.29	1.29
Iowa	3 (30.0)	9.33	9.33	1.31	1.31	1.69	1.69
Maine	3 (13.0)	10.06	10.06	0.59	0.59	0.00	0.00
Kentucky	2 (50.0)	10.61	11.39	18.75	22.38	14.99	20.79
Pennsylvania	14 (38.9)	11.19	11.19	9.63	9.63	5.65	5.65
Ohio	21 (63.6)	18.90	19.21	12.52	12.91	3.60	3.79
Minnesota	17 (73.9)	20.78	20.78	21.09	21.09	19.05	19.05
Vermont	6 (50.0)	27.03	27.03	11.22	11.22	3.56	3.56
Utah	7 (70.0)	44.09	44.09	14.28	14.28	10.88	10.88
States that ban TMAB overall and ordered by percentage point change for TMAB ban removal vs current scenario							
Total	95 (42.2)	0.04	7.31	0.20	5.75	0.33	4.54
Alabama	0 (0.0)	0.00	0.00	0.00	0.00	0.00	0.00

Continued

TABLE 1— Continued

Area	Health Centers Not Offering Abortion, 2018, No. (%)	30-Minute Drive Time, Percentage Point Difference		60-Minute Drive Time, Percentage Point Difference		90-Minute Drive Time, Percentage Point Difference	
		TMAB Expansion vs Current	TMAB Ban Removal vs Current	TMAB Expansion vs Current	TMAB Ban Removal vs Current	TMAB Expansion vs Current	TMAB Ban Removal vs Current
Arkansas	0 (0.0)	0.00	0.00	0.00	0.00	0.00	0.73
Nebraska	0 (0.0)	0.00	0.00	0.00	0.00	0.00	0.00
South Carolina	0 (0.0)	0.00	0.00	0.00	0.03	0.00	0.17
South Dakota	0 (0.0)	0.00	0.00	0.00	0.00	0.00	0.00
Tennessee	0 (0.0)	0.00	0.00	0.00	0.00	0.00	0.00
North Dakota	0 (0.0)	0.07	0.07	0.22	0.22	0.31	0.31
Louisiana	2 (33.3)	0.00	0.50	0.00	0.49	0.00	2.79
North Carolina	4 (19.1)	0.00	0.94	0.00	0.65	0.00	0.08
Kansas	0 (0.0)	0.00	0.96	0.00	2.01	0.00	3.23
Oklahoma	2 (33.3)	0.00	1.56	0.00	2.84	0.00	3.17
Arizona	3 (23.1)	0.00	2.40	0.11	0.34	0.17	0.22
West Virginia	1 (50.0)	0.00	4.47	6.19	8.18	12.79	14.40
Mississippi	1 (50.0)	0.00	4.87	0.00	10.25	0.00	11.71
Michigan	12 (33.3)	0.02	6.60	0.03	5.13	0.00	1.83
Texas	30 (57.7)	0.00	8.86	0.00	4.36	0.00	2.45
Indiana	12 (63.2)	0.02	15.84	1.11	17.25	0.23	10.27
Missouri	10 (83.3)	0.00	27.97	0.00	22.32	0.00	24.58
Wisconsin	18 (75.0)	0.67	29.89	0.42	25.49	1.98	17.75

Note. TMAB = telemedicine for medication abortion.

and TMAB ban removal scenarios at a 30-minute drive time, meaning that an estimated 3 530 423 additional US women 15 to 44 years old who did not live within a 30-minute drive time of an abortion-providing facility would live within that drive time given this policy change (Table 1). Across all drive times and scenarios, women in rural census blocks had greater increases in accessibility than those in urban census blocks.

Generally, in states with TMAB bans, TMAB expansion resulted in little if any change in accessibility, and in states without TMAB bans the expansion and ban removal scenarios resulted in very similar if not the same accessibility. However, there were exceptions for specific states. For example, in Virginia, Illinois, Kentucky, and Ohio, states

without bans that border states with bans, the TMAB ban removal scenario resulted in increases in 30-minute accessibility relative to the TMAB expansion scenario. Similarly, in North Dakota, Oklahoma, West Virginia, Michigan, Indiana, and Wisconsin, despite the TMAB bans in these states, the TMAB expansion scenario resulted in a 30-minute accessibility increase. In both cases, these increases that contradict the state's ban status were due to accessibility increases in nearby states with the opposite ban status (Figures 1–3 and Table 1).

DISCUSSION

In this study, which involved the smallest geographic unit available through

the US census, assumed no barriers to interstate travel, and examined a variety of potentially acceptable drive times, we found that changes to TMAB programming and policy could expand abortion accessibility in the United States. Removing all state TMAB bans and expanding TMAB services to all Planned Parenthood health centers that did not offer abortion care in 2018 would result in more than 3.5 million additional US women 15 to 44 years old living within 30 minutes of an abortion-providing facility. Our findings are consistent with results demonstrating increased access in one clinic network after the implementation of a TMAB program²⁴ and further illustrate how TMAB could affect accessibility

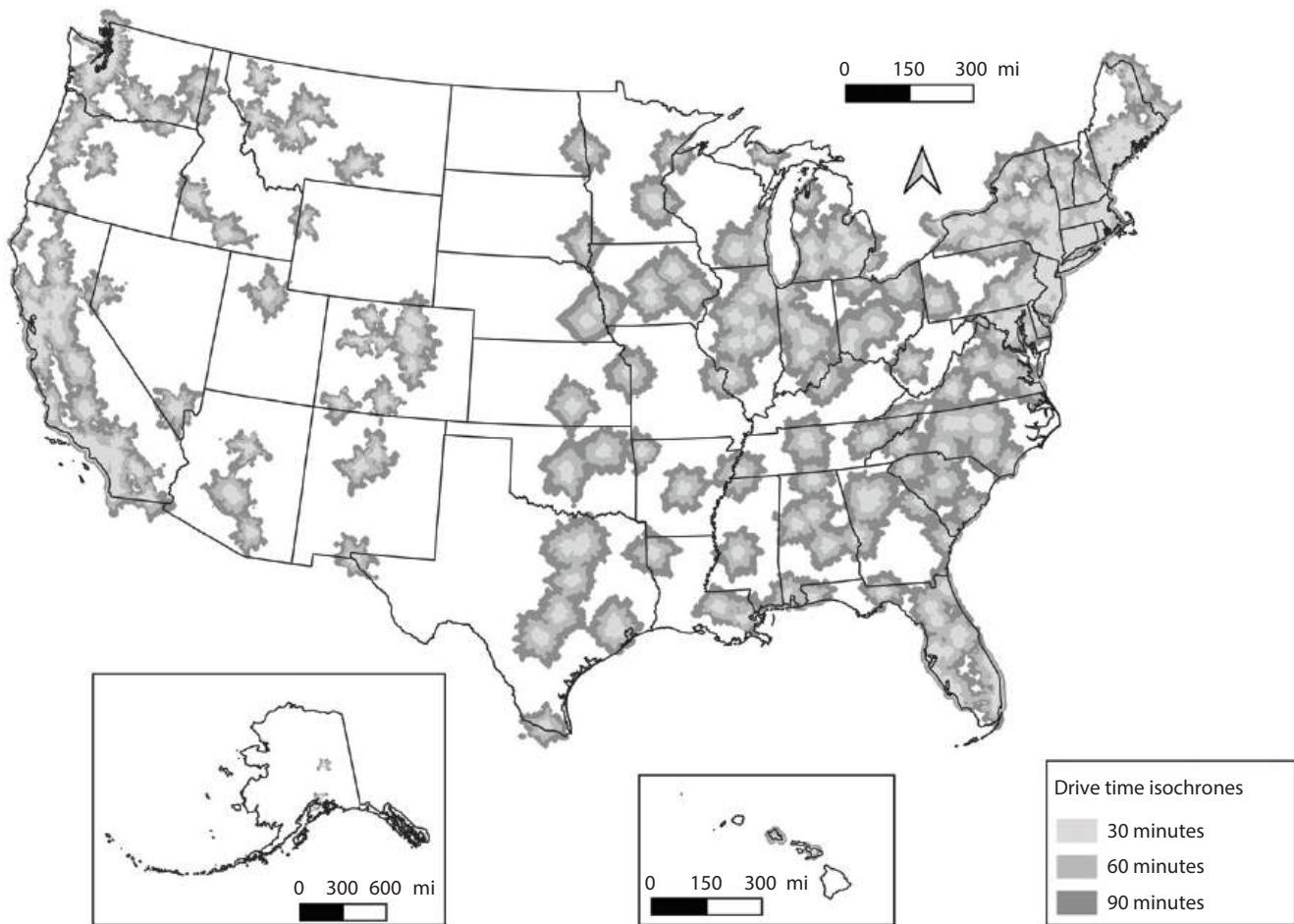


FIGURE 1— Drive Time Isochrones for Current Abortion Provision Scenario: United States, 2018

Note. Drive times were 30, 60, and 90 minutes, with 65.3%, 80.5%, and 88.9% of US women 15–44 years old living within the given drive time, respectively.

among all reproductive-aged women in the United States.

Although the policy and programming changes we considered would universally increase abortion accessibility, there was variation in the magnitude of the increase, with some states seeing little effect. This variation appeared to be a result of a combination of factors including current accessibility, whether the state or neighboring states have a TMAB ban, the number of health centers offering care, state size, and rural versus urban census block classification.

Our findings suggest that TMAB programming or policy changes could have larger benefits for rural communities.

These results are in line with a large body of research indicating that rural US residents face many health disparities relative to urban US residents, in part as a result of poor access to health care.³⁷ Furthermore, because changes to provisions in one state can affect accessibility in another and TMAB bans are concentrated in the Southeast and middle areas of the United States, future research should estimate changes in abortion accessibility assuming policy or programming changes in only certain states or regions. Such studies would help to determine where changes could have the most dramatic impact on accessibility.

The TMAB programming expansion we considered could help ensure that a range of highly acceptable abortion provision options are accessible to abortion seekers, including those who wish to visit a clinic in person. However, even in a scenario in which all Planned Parenthood health centers offered abortion care, in some states less than half of the female population 15 to 44 years of age lived within 90 minutes of an abortion-providing facility. In other words, these changes alone do not ensure accessibility for all US women.

There is growing use of direct-to-client telemedicine abortion services in the United States.³⁸ In December 2021,



FIGURE 2— Drive Time Isochrones for TMAB Expansion Abortion Provision Scenario: United States, 2018

Note. TMAB = telemedicine for medication abortion. Drive times were 30, 60, and 90 minutes, with 68.3%, 82.6%, and 90.1% of US women 15–44 years old living within the given drive time, respectively.

the Food and Drug Administration made policy changes that permanently allow for remote provision of the medication abortion drug mifepristone. As a result, direct-to-client telemedicine abortion services that arose during the COVID-19 pandemic are likely to remain available to abortion seekers in some settings. Although these services are an important addition to the abortion care provision landscape, it is vital that in-clinic options remain available for interested clients. Our study thus focused on in-clinic abortion care provision. Because TMAB bans also apply to direct-to-client telemedicine models, the policy changes

we considered are relevant not only for TMAB expansion but for the expansion of other telemedicine in medication abortion provision models, including those that do not require clients to visit a facility. As a result, ban removal could result in greater increases in accessibility than those reported here.

Limitations

A major limitation of our study is possible misclassification of abortion accessibility; the study is susceptible to the ecological fallacy, as a population-level measure of accessibility stands in for

an individual-level measure. Our analyses assumed that women had access to a vehicle at their home location and traveled to abortion care from that location. In addition, we used 3 dichotomous drive times (30 minutes or less, 60 minutes or less, and 90 minutes or less) to represent a range of reasonable distances.

Misclassification of accessibility may also arise because we calculated accessibility using data from the ANSIRH facility database. Although the combination of the ANSIRH facility database and Planned Parenthood data represents an attempted census of abortion

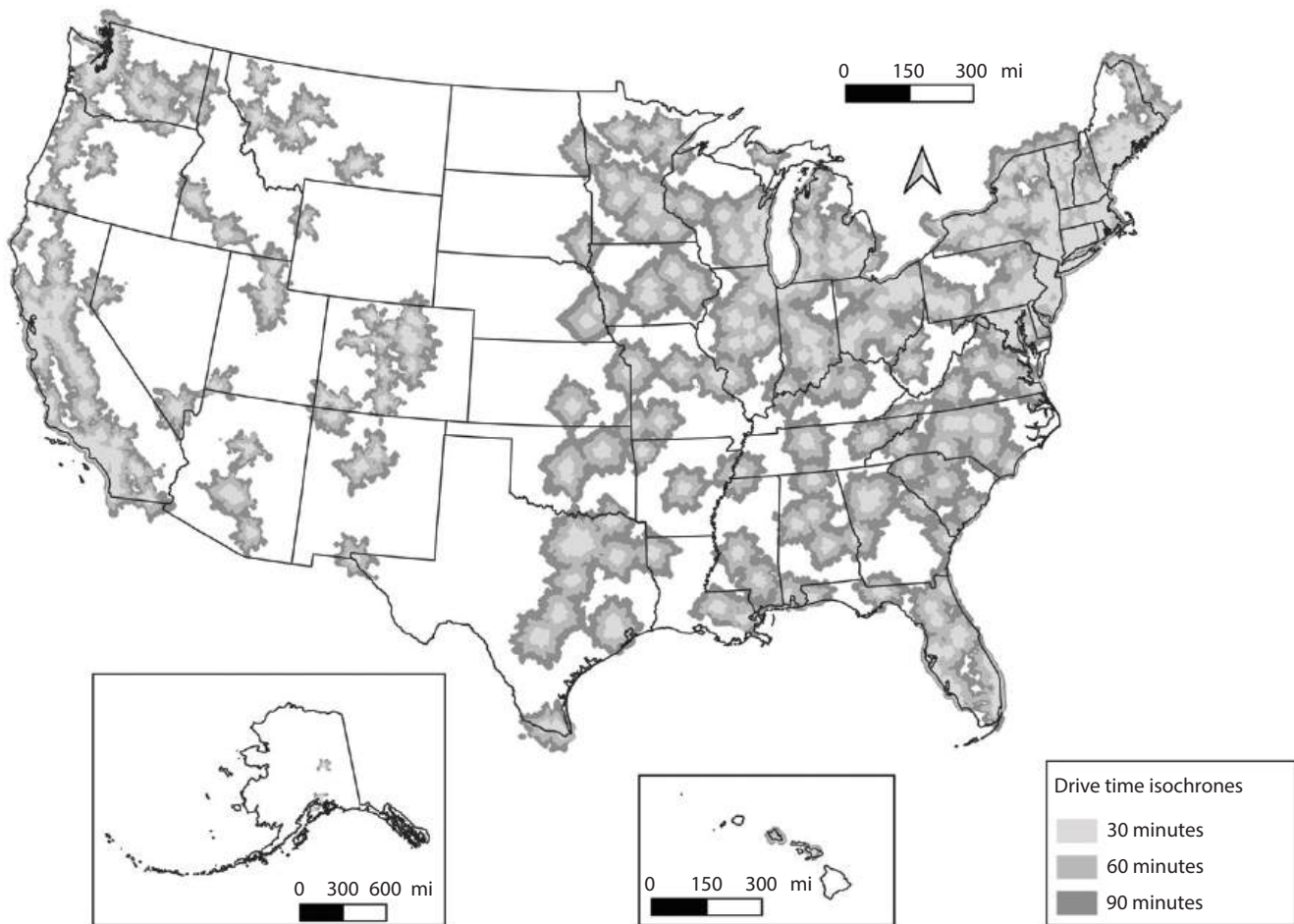


FIGURE 3— Drive Time Isochrones for TMAB Ban Removal Abortion Provision Scenario: United States, 2018

Note. TMAB = telemedicine for medication abortion. Drive times were 30, 60, and 90 minutes, with 70.9%, 84.7%, and 91.7% of US women 15–44 years old living within the given drive time, respectively.

providers in the United States, the facility database may not be a complete census of abortion-providing facilities and could result in an undercount of facilities and, consequently, accessibility. However, because the database was constructed through Internet search terms mimicking those of people seeking services,²⁷ we believe that our definition of accessibility closely represents the lived experience of US women of reproductive age.

Our analyses also considered only a single element of access, accessibility operationalized as driving time, which alone cannot ensure access to abortion

care. Other factors that influence abortion access include hours of operation, out-of-pocket cost of care, and the cultural competency of staff and providers. Accessibility alone likely misclassifies abortion access; however, the population did not change across the 3 scenarios, and thus the estimates of percentage point changes in population access should have been unbiased.

Furthermore, in the United States, medication abortion is approved for use up to 10 weeks' gestation, although some providers offer care at later gestational ages through off-label use of

the medications. Although nearly 80% of abortion care is provided at or before 9 weeks' gestation,³⁹ our measure of accessibility was misclassified for pregnancies beyond 10 weeks' gestation. Similarly, some abortion seekers, even if within the gestational age limit for medication abortion, have contraindications for medication abortion or prefer procedural abortion and cannot or would not use medication abortion.⁴⁰ Our accessibility measure was also misclassified for these individuals.

Finally, we considered only 2 changes in abortion provision scenarios, programming and policy changes that

resulted in care expansions to additional Planned Parenthood health centers. Given resource constraints and laws that target abortion provision (i.e., targeted regulation of abortion provider laws), it is unlikely that one provider network would expand services so dramatically, even in response to policy changes. Furthermore, other abortion providers, including independent providers, might choose to establish additional clinics should these changes occur. Also, given the politicization of abortion in the United States, it is unlikely that all states with TMAB bans would remove these bans simultaneously.

Our analyses estimated the upper limit of expansion if only Planned Parenthood made service changes; however, other program and policy changes (e.g., clinic openings and closures) over time within and outside the Planned Parenthood system are likely and would affect the exact proportion of the population with access to abortion care. Our estimates serve as an example of how policy and program shifts could affect accessibility.

Public Health Implications

Our findings point to areas where increased abortion provision in the form of TMAB would have the greatest impact on one domain of abortion access, accessibility, as defined by the number of reproductive-aged women within a given drive time of an abortion-providing facility. These increases in accessibility could have meaningful public health effects given that obtaining wanted abortion care is a determinant of health and well-being.¹⁻⁹ For abortion seekers in states with mandatory preabortion counseling or waiting periods between counseling and the

abortion visit, TMAB expansion that included TMAB options for counseling (either direct to client or site to site) could further reduce barriers to care. However, even with these changes, large numbers of women would remain without adequate abortion accessibility according to our measures. Our data can be used by health care advocates and funders as they consider where to invest policy- and program-specific resources to improve abortion accessibility in the United States.

We used a broadly applicable framework to measure abortion accessibility. Our study design can easily be adapted to assess the effects of different abortion service expansions or restrictions on the same measure of accessibility. In addition, rather than the road networks used for our drive time analysis, future studies could employ public transportation networks to assess accessibility among populations without access to a car. In the future, both projections that are reactive to policy changes and those that proactively assess the effects of policy changes may be particularly useful to help determine resource and funding allocation as the abortion provision and policy landscape shifts. Furthermore, such measures of accessibility must be incorporated into future studies that consider multiple domains of access simultaneously. Doing so will help ensure that access is accurately measured and that results inform a multifaceted response to improve abortion access in the United States. *AJPH*

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CONTRIBUTORS

J. W. Seymour conceptualized the study, implemented the analyses, and wrote the article. T. -A. Thompson, L.A. Wise, and A.E. Rudolph provided study oversight. D. Milechin and A.E. Rudolph supported the analyses. All of the authors provided critical feedback and helped shape the research, analyses, and article.

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CONFLICTS OF INTEREST

After the completion of this study, J. W. Seymour served as a consultant to an independent US abortion provider. In this capacity, she provided technical assistance with data analyses regarding the effects of implementation of a telemedicine for medication abortion care model on service delivery patterns. The authors report no other conflicts of interest.

HUMAN PARTICIPANT PROTECTION

In consultation with the Boston University Medical Campus and Boston Medical Center institutional review board staff, it was determined that this study did not involve human participants and therefore did not require institutional review board oversight.

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Xylazine and Overdoses: Trends, Concerns, and Recommendations

Ryan S. Alexander, DO, MPH, Bethany R. Canver, MD, MSW, MSSP, Kimberly L. Sue, MD, PhD, and Kenneth L. Morford, MD

Xylazine is a nonopioid veterinary anesthetic and sedative that is increasingly detected in the illicit drug supply in the United States. Data indicate a striking prevalence of xylazine among opioid-involved overdose deaths.

The emergence of xylazine in the illicit drug supply poses many unknowns and potential risks for people who use drugs. The public health system needs to respond by increasing testing to determine the prevalence of xylazine, identifying its potential toxicity at various exposure levels, and taking mitigating action to prevent harms.

Currently, there is little testing capable of identifying xylazine in drug supplies, which limits the possibility of public health intervention, implementation of harm reduction strategies, or development of novel treatment strategies. (*Am J Public Health*. 2022;112(8):1212–1216. <https://doi.org/10.2105/AJPH.2022.306881>)

Xylazine is a veterinary pharmaceutical that is rapidly disseminating across the unregulated drug supply in the United States. It is not commonly tested for in clinical settings or forensic testing labs and can be deadly.^{1,2} As recently as 2018, xylazine was rarely seen in the US drug markets, but it is now a common additive to substances like fentanyl, heroin, and cocaine. Most concerning is its increasing involvement in drug overdose deaths.³

Xylazine is a nonopioid anesthetic and sedative approved by the US Food and Drug Administration for use in veterinary medicine but not for use in humans.⁴ It is an α -2 adrenergic receptor agonist that has a chemical structure similar to dexmedetomidine, a paralytic, and clonidine, an antihypertensive, as well as phenothiazines and tricyclic antidepressants.^{4,5} In humans, α -2 agonist medications similar to xylazine are often used as adjunctive

medications in anesthesia to reduce the requirement for general anesthesia.⁶ The effects of xylazine are primarily actuated in the central nervous system (CNS) via the locus coeruleus, which then causes sedation, analgesia, and muscle relaxation.⁵ These actions appear to be mediated by xylazine inhibiting the release of norepinephrine in the CNS, leading to decreased excitatory action.⁷

The effects of xylazine that may contribute to overdose risk in humans include CNS depression, hypotension, bradycardia, and respiratory depression.⁸ When combined with opioids, xylazine increases the potential for fatal respiratory depression. Although the opioid reversal agent naloxone plays a critical role in responding to any overdose with possible opioid involvement, it does not reverse the effects of xylazine. Furthermore, there is no specific reversal agent for xylazine approved for

use in humans, although the α -2 adrenergic antagonist tolazoline has been described as a xylazine reversal agent in veterinary medicine.⁹ Consequently, people who ingest xylazine may need acute medical care, including mechanical ventilation.⁸ Without timely and widespread testing for xylazine, clinicians are underprepared to recognize and respond to the medical needs of people exposed to it.

In this article, we describe current trends of xylazine in the US drug supply highlighting state-level data from Connecticut, identify clinical concerns, and present recommendations for addressing xylazine contamination moving forward.

CURRENT TRENDS IN DRUG SUPPLY

Xylazine was first reported as a frequently encountered drug contaminant in Puerto Rico in 2001.¹⁰ Since then,

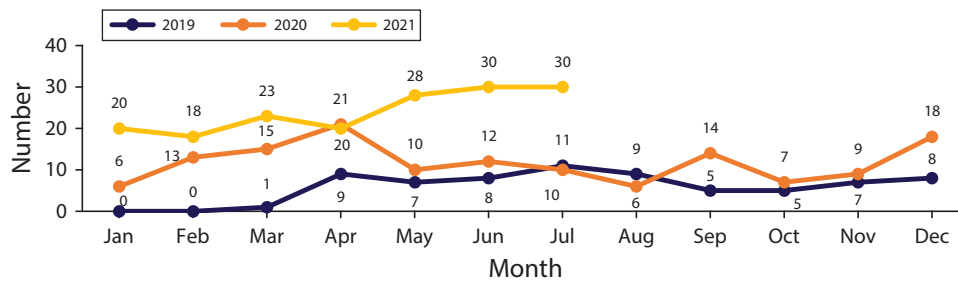


FIGURE 1— Number of Xylazine-Involved Overdose Deaths, by Month: Connecticut, 2019–2021

Source. Adapted from the Connecticut Department of Public Health.¹⁴

reports from Pennsylvania, Connecticut, and other areas of the United States have arisen.^{3,11,12} Starting in 2019, xylazine first presented in toxicology reports of opioid overdose fatalities in Connecticut.¹³ Over the last 2 years, xylazine has more than doubled in prevalence among fatal opioid overdoses in Connecticut,¹⁴ with similar increases reported in Philadelphia, Pennsylvania,³ implying widespread and underrecognized adulteration of the illicit drug supply. Besides being used as an adulterant, xylazine is sought out by some individuals for its effects when combined with other substances, in part leading to its increased prevalence.

Xylazine is rapidly increasing in prevalence among various illicit substances, primarily in combination with fentanyl, but is also found in samples containing cocaine, heroin, and other substances.¹⁵ The effects of xylazine are thought to enhance, prolong, or modify the effects of heroin and fentanyl, and recent mixed methodologies including ethnographic data note that people use xylazine to extend the “legs” (duration of opioid effect) of fentanyl.¹⁶ In 2014, it was believed to be more accessible and easier to acquire than substances such as fentanyl because xylazine is not classified as a controlled substance.⁸ Furthermore, xylazine may serve as a bulking agent that can be used by

street-level distributors to extend the supply of their other drug products.^{11,17}

In Puerto Rico, xylazine has been used for almost 2 decades. Despite long-time knowledge that xylazine has been used as an adulterant of other substances, little has been done in terms of prevention, surveillance, and education regarding this substance. In the United States, xylazine is currently emerging as a significant component of the drug supply and appears to be regional. Current data show that in 2019 only 2% of all drug overdose deaths contained xylazine, but the majority of cases (67%) were in the northeastern United States.¹² However, this regional distribution could reflect the uneven availability of toxicology testing for xylazine, with variability across counties and states, rather than the true distribution of xylazine, which may be more widespread.

STATEWIDE DATA FROM CONNECTICUT

All suspected overdoses in the state of Connecticut are investigated through the Office of the Chief Medical Examiner, and toxicology testing is standardized statewide; xylazine testing commenced in 2013 for all suspected accidental drug intoxication deaths.¹³ Monthly and annually, the Connecticut Department of Public Health releases an update on fatal

drug overdoses. The department’s August 2021 monthly report showed rising rates of xylazine-involved overdose deaths since they started tracking in 2019 (Figure 1).¹⁴ In 2019, the first report of xylazine among opioid-involved overdose deaths in Connecticut identified 71 deaths containing xylazine and fentanyl. In 2020, 141 overdose deaths involving xylazine and fentanyl were reported, and in the first 30 weeks of 2021 there were 172 overdose deaths involving xylazine and fentanyl. In August 2021, data from the report indicated that xylazine prevalence among fatal opioid overdoses was rapidly increasing.¹⁴ The US Centers for Disease Control and Prevention (CDC) reported that between 2019 and July 2020, Connecticut saw unintentional drug overdose deaths with a lethal combination of fentanyl and xylazine increase from 5.8% to 11.4% of cases.¹¹

NATIONAL DATA

National data are similar to the trends seen in Connecticut, with evidence of increased prevalence of xylazine in the US drug supply. In 2019, the CDC released a report indicating that xylazine had been identified in post-mortem toxicology samples from drug overdose deaths in 25 of the 38 states that were examined.¹² Prevalence of

xylazine-involved overdose deaths has risen over the past year, with states including Connecticut, Massachusetts, and Pennsylvania reporting substantial increases in the number of cases identified from postmortem toxicology testing over the past 1 to 2 years.^{3,11,18} The CDC also reported that xylazine was identified in over 3800 national toxicological surveillance samples reported from 2015 through December 2020, with progressive increases each year, culminating in 1492 reports in 2020.¹²

DATA LIMITATIONS

Reported increases in prevalence of xylazine-involved overdose deaths significantly underestimate true prevalence because of wide variation in how cause of death is reported and how postmortem samples are tested within and across states.¹ Causes of death are classified according to *International Classification of Diseases, 10th Revision (ICD-10)* classifications, many of which do not specify the substance involved (e.g., “other opioid,” “other narcotic,” or “drug overdose”). Thus, even if the involved substance is known, it is not captured via current overdose death reporting systems. Although the National Association of Medical Examiners recommends listing all involved substances on death certificates, this recommendation is not universally adopted in standard practice.¹ Furthermore, xylazine involvement is likely being undercounted among overdose deaths because testing only occurs at the request of the medical examiner and not in routine practice.⁸

CLINICAL CONCERNS

The clinical effects of acute xylazine toxicity in humans are not well defined but

generally include significant respiratory depression, bradycardia, hypotension, and decreased consciousness.⁸ There are no specific reversal agents for xylazine toxicity approved for use in humans, and supportive measures such as mechanical ventilation, fluid resuscitation, blood pressure management, and heart rate monitoring may be indicated.⁸

Another important clinical concern is unique skin lesions associated with chronic xylazine injection, typically appearing as abscesses or ulcerations predominantly on the extremities.¹⁹ Multiple associations have been made between xylazine and severe skin ulcerations based on observational studies.^{19,20} Although a link has not yet been definitively established, it is important to recognize these severe skin lesions as potentially xylazine related to effectively address the underlying cause and recommend cessation of xylazine injection, both intentional and unintentional. Of note, these ulcerations are not specifically localized to the sites of injection but can occur diffusely.¹⁰

RECOMMENDATIONS

The rising prevalence of xylazine in the drug supply is a concerning trend that may be altering the risk profile of substance use, changing use patterns, and affecting treatment response for individuals with suspected overdose events. To further understand the impact of xylazine on the drug supply and on drug users, additional testing, research, education, and harm reduction measures are needed.

Testing

Despite postmortem testing showing xylazine involvement in an increasing

number of overdose deaths, there remains minimal screening, surveillance, or monitoring for xylazine among people who use drugs, or of the drug supply itself. There is great need for improved surveillance to develop a better understanding of the current drug supply. This information is crucial for an appropriate and directed public health response and for first responders and clinicians making medical decisions related to xylazine-involved drug overdoses and associated complications.

Despite there being high-quality, detailed data from Connecticut, Philadelphia, and a few other areas in the Northeast United States, overall, there is a dearth of surveillance testing and therefore a scarcity of information on the prevalence of xylazine, both nationally and in most localities. All cases of suspected drug overdose should include xylazine testing; however, current xylazine testing requires a comprehensive toxicology screen via gas chromatography–mass spectrometry, which is a timely and costly barrier to widespread screening. A rapid xylazine screening test needs to be developed and disseminated to allow for point-of-care testing for clinical and individual use. In fact, point-of-care drug checking services using Fourier transform infrared spectroscopy have identified xylazine in the drug supply.²¹ Given the growing presence of xylazine in drug overdose deaths, test kit developers should consider creating xylazine test strips, similar to fentanyl test strips (rapid antigen testing for use on urine samples), to allow for rapid detection of xylazine in settings utilizing drug checking technologies to identify components of unregulated substances prior to use.

Research

Research is critical to better understanding the national distribution of xylazine in the drug supply, the physiological effects of xylazine in humans at various exposure levels, and the combined effects of xylazine and other commonly used drugs (e.g., fentanyl, heroin, cocaine, amphetamines). One important area of clinical research is determining any causal relationship between xylazine and skin ulcerations and ways to treat and prevent these dangerous complications. The safety and effectiveness of tolazoline as a reversal agent for xylazine-related sedation in humans should also be investigated. More qualitative research, including ethnography, is critical to understanding how people are managing xylazine's risks, adapting their use patterns, and avoiding the substance or seeking it out, and to knowing the drug's relative availability and cost on the street and its embodied effects.

Patient and Clinician Education

Education about the presence of xylazine in the drug supply is important for both patients and clinicians. First-line medical staff and responders—including emergency medical technicians, paramedics, emergency medicine clinicians, and people who use drugs—need to be aware of its rising prevalence as well as what to do in cases of suspected xylazine-involved overdose. In addition to continuing the use of naloxone for all overdoses with potential opioid involvement, all first responders should consider xylazine as a contributor when response to naloxone administration is inadequate, and be prepared to provide hemodynamic

support for xylazine-induced hypotension. Testing for xylazine should be performed, if available, and those with confirmed or suspected xylazine exposure should be evaluated for skin ulcerations. Importantly, testing the drug supply, and informing people who use drugs of identified contaminants, provides them the opportunity to modify their behaviors and incorporate harm reduction strategies.

Harm Reduction

Because there are currently no specific interventions for xylazine, it is important to continue to recommend and implement universal harm reduction measures as the prevalence of xylazine increases around the country. Harm reduction strategies and education on xylazine should be given to all individuals who use drugs. These harm reduction interventions include the following:

- Never use drugs alone. If using alone, individuals should take advantage of resources such as the Never Use Alone hotline (1-800-484-3731).²²
- Always have and know how to use naloxone if using unregulated substances. Always administer naloxone in response to any suspected overdose, including suspected xylazine, to reverse any possible opioid involvement.
- Start low and go slow: use a small test sample first to ensure that potency and effects are what is expected. Give ample time between dosing. Stagger use if using with others, so that 1 person can administer naloxone if necessary.
- Use from the same supplier if possible.

- Adopt safe injection practices (sterile syringes, clean skin with alcohol swab, don't lick needles, don't share or reuse needles).
- Seek medical care for unusual abscesses.
- Always contact emergency services in the event of drug overdose. Naloxone will not reverse the effects of xylazine.

CONCLUSION

The emergence of xylazine in the US drug supply represents a growing threat to people who use drugs. Coupled with the rise of high-potency synthetic opioids, such as fentanyl and its analogs, xylazine is a new potential risk in an ongoing overdose crisis. Initial steps to addressing this threat must include expanded xylazine testing, patient and clinician education on its risks, and promotion of harm reduction strategies to prevent further morbidity and mortality. *AJPH*

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was involved in the conceptualization of the article and revisions of subsequent drafts. K. L. Sue was involved in revision of drafts for important intellectual content and in response to reviewer comments. K. L. Morford was involved in revision of drafts for important intellectual content, design of the article, response to reviewer comments, and final approval of the article.

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Social Vulnerability and Safe Building Recertification Violations in Miami, Florida, 2013–2018

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 See also Lehnert, p. 1089.

Objectives. To determine whether an association exists between Social Vulnerability Index (SVI) scores and 40-year recertification violation within the City of Miami, Florida.

Methods. A cross-sectional, observational secondary data analysis of social and housing vulnerability, including the Centers for Disease Control and Prevention's SVI overall themes, estimated median year a housing unit was built, and 40-year recertification code violation data. We conducted the study using data sets from 2013 to 2018 at the census tract level in response to the collapse of Champlain Tower South in Surfside, Florida.

Results. Every 1-unit increase in a census tract's SVI score yielded a 21-fold increase in the odds of being a census tract with high 40-year recertification violations. Census tracts within the third quartile for SVI scores had approximately 9 times the odds, and tracts within the fourth quartile had 11 times the odds of being tracts with high 40-year recertification violations.

Conclusions. Findings demonstrate that inequitable conditions exist among the City of Miami's most socially vulnerable residents, through greater exposure to risky housing environments. (*Am J Public Health*. 2022;112(8):1217–1220. <https://doi.org/10.2105/AJPH.2022.306890>)

Champlain Towers South, in Surfside, Florida, made global headlines as a catastrophe rarely witnessed in the developed world, when the building partially collapsed on June 24, 2021, killing 98 people.¹ Preliminary reports point to a combination of poor design, construction, leadership, and maintenance.¹ The events prompted calls for building code reform and scrutiny of the 40-year recertification process required by Miami-Dade County, which the building was in the process of completing at the time of the collapse.¹ The 40-year recertification process requires all aging buildings, except single-family homes, duplexes, and minor structures, to undergo reinspection after 40 years, and every 10 years thereafter.² Recertification

exists to confirm that buildings are safe for continued use and to mitigate disasters. In communities where vulnerability is high, however, preventing these occurrences and dealing with the aftermath present additional challenges.^{3,4} The capacity to identify these communities is available through the Centers for Disease Control and Prevention (CDC)/Agency for Toxic Substances and Disease Registry (ATSDR) Social Vulnerability Index (SVI), which evaluates risk factors that might affect a community's ability to respond to external stressors like the Surfside tragedy.³ Taking into account recent events, exploration of linkages between the SVI and housing quality, as measured by violations of failing to complete 40-year recertification, might be used

to identify areas of the City of Miami with particular vulnerability to hazardous housing conditions and impaired capacity for emergency preparedness.

METHODS

To determine whether an association exists between higher SVI and higher 40-year recertification violations, we conducted a cross-sectional, observational secondary data analysis of measures from the 95 census tracts within the City of Miami. We used census tract data from the CDC/ATSDR's SVI,⁵ parcel data aggregated to the census tract level from the Florida Department of Revenue real property roll,⁶ and building code violation folio data aggregated

to the census tract level from the City of Miami Building Department.⁷ Our study population consisted of the 95 census tracts contained within the City of Miami.

Measures

Our measures of social and housing vulnerability included SVI themes overall, estimated median year a housing unit was built, and 40-year recertification code violation data. SVI themes overall indicates the relative vulnerability of census tracts in terms of 15 indicators categorized by 4 themes: socioeconomic status, household composition and disability, minority status and language, and household type and transportation.³ We used census tract-level data available in the 2018 SVI data sets to analyze information relevant to data collection years across folio and parcel data. We also created a dichotomous high-low SVI variable by splitting SVI themes overall at its median. The estimated median year a housing unit was built consists of the median year housing units were constructed within census tracts.⁶ The 40-year recertification process involves building owners receiving a Notice of Required Inspection, giving them 90 days to hire a registered engineer or architect to examine the building and submit a report.² A 40-year recertification violation consists of a property failing to obtain the required 40-year recertification as established by the City of Miami Building Code.² We calculated the percentage of folios with recertification violations in each census tract to compute our 40-year recertification violation variable. We also dichotomized the 40-year recertification violation variable into high and low by splitting it at its median.

Analysis

We performed statistical analyses using SPSS version 27.0 (IBM Corp, Armonk, NY). Statistical significance was defined as $P < .05$. For bivariate analyses, we analyzed census tracts' average SVI scores, average estimated median year a property was developed, and average percentage of 40-year recertification violation scores between high and low 40-year recertification violations via independent sample *t* tests. To determine an association between SVI quartile and high or low 40-year recertification violations, we used Pearson's χ^2 2-tailed tests. We included variables associated with high and low 40-year recertification violations at the $P < .05$ level in a logistic regression model. The variables included in the final models were (1) SVI and 40-year recertification violations and (2) SVI quartiles and 40-year recertification violations. Using ArcGIS 2.8 (Esri, Redlands, CA), we developed a choropleth map to demonstrate the spatial distribution of SVI and 40-year recertification violations among census tracts.

RESULTS

Our analysis involved the 95 census tracts of the City of Miami. The average SVI score for the census tracts was 0.73 (SD = 0.29). The average percentage of 40-year recertification violations was 44.28% (SD = 17.08). The average estimated median year a housing unit was built was 1969 (SD = 17.66). When we compared high and low 40-year recertification violation tracts, tracts with high rates of recertification violations had significantly higher SVI scores (0.84, on a scale of 0 to 1; SD = 0.24) than low tracts (0.62; SD = 0.30; $P < .001$) and significantly higher 40-year recertification violations (57.63%; SD = 9.94%)

than low tracts (30.66%; SD = 10.93%; $P < .001$). There was no significant difference in average estimated median year built. Additionally, when considering SVI quartiles, we found that higher quartile SVI scores were more likely to correspond with high 40-year recertification violations ($P < .001$). In logistic regression analysis, every 1-unit increase in a census tract's SVI score yielded a 21-fold increase in the odds of being a census tract with high 40-year recertification violations (odds ratio [OR] = 20.52; 95% confidence interval [CI] = 3.63, 116.20). Additionally, census tracts within the third quartile for SVI scores had approximately 9 times the odds (OR = 8.50; 95% CI = 2.29, 31.55) and tracts within the fourth quartile had 11 times the odds (OR = 10.77; 95% CI = 2.77, 41.75) of being tracts with high 40-year recertification violations (Table 1). The choropleth map confirms that census tracts with high SVI scores overlapped with census tracts with high percentages of 40-year recertification violations (Figure A, available as a supplement to the online version of this article at <http://www.ajph.org>).

DISCUSSION

Natural and anthropogenic hazards are not distributed randomly across communities.⁸ Communities with higher social vulnerability experience greater concentrations and magnitudes of environmental hazards.⁸ Findings from our study indicate that census tracts with higher SVI scores are more likely to be census tracts with increased amounts of 40-year recertification violations. Given the additive effect of increasing SVI within tracts, residents of census tracts identified as particularly vulnerable disproportionately appear to be exposed to risky housing environments.

TABLE 1— Relationship Between Social Vulnerability Index (SVI) and High Rates of 40-Year Recertification Violations Among Census Tracts: City of Miami, FL, 2013–2018

Census Tract Characteristics	Overall, Mean \pm SD	Census Tracts With High Rates of Recertification Violations, ^a Mean \pm SD or No. (%)	Census Tracts With Low Rates of Recertification Violations, ^a Mean \pm SD or No. (%)	<i>p</i> ^b	OR (95% CI)
Model 1					
Social Vulnerability Index	0.73 \pm 0.29	0.84 \pm 0.24	0.62 \pm 0.30	<.001	20.52 (3.63, 116.20)
% of folios within census tracts with 40- to 50-y recertification violations	44.28 \pm 17.08	57.63 \pm 9.94	30.66 \pm 10.93	<.001	...
Model 2					
SVI quartiles within the City of Miami ^c				<.001	...
1st quartile SVI		6 (26.10)	17 (73.90)		1 (Ref)
2nd quartile SVI		5 (20.80)	19 (79.20)		0.75 (0.19, 2.89)
3rd quartile SVI		18 (75.00)	6 (25.00)		8.50 (2.29, 31.55)
4th quartile SVI		19 (79.20)	5 (20.80)		10.77 (2.77, 41.75)

Note. OR = odds ratio; CI = confidence interval. The sample size was $n = 95$.

^aDichotomized 40-year recertification violations variable split at the median.

^bSocial vulnerability index and percentage of folios within census tracts with 40-y recertification violations, *t* tests; SVI quartiles within the City of Miami, Pearson's χ^2 test.

^cFirst quartile SVI has the lowest social vulnerability, and 4th quartile SVI has the highest social vulnerability.

In addition to increased exposure to risks, communities experiencing higher levels of social vulnerability have reduced abilities to recover from disasters.⁹ The survivors of the Champlain Towers South collapse continue their journeys of managing life and property loss and acquiring new housing. When communities with higher and lower social vulnerability experience equivalent damage and loss, the communities with higher social vulnerability have a more difficult and slower recovery time than other communities, exacerbating inequities.⁹

Research addressing social vulnerability has found associations between higher social vulnerability and property destruction and loss,^{9–11} extreme heat exposure,⁹ fire outbreaks,⁹ and physical hazards.^{9,10} Associations have also been found between lower social vulnerability and healthier built environments.¹² Our research aligns with past findings, and it expands the existing body of research by

addressing social vulnerability and risky housing structures, as operationalized by SVI and 40-year recertification violations.

PUBLIC HEALTH IMPLICATIONS

Difficult lessons have been learned in the aftermath of the Champlain Towers South collapse. Given the ways in which hazard exposure, structural vulnerability, and social vulnerability overlap,¹¹ and considering the ways in which communities experiencing such conditions tend to have fewer social, political, and economic resources to ameliorate the consequences of natural and anthropogenic disasters,⁸ ample opportunities exist for policymakers and building code enforcement to identify and assist vulnerable communities in cases of unsafe housing structures.

To prevent future tragedies, our findings identify census tracts particularly

vulnerable to exposure to risky housing environments. Policies that strictly enforce code compliance and penalize violators could improve inequitable exposures to hazardous housing conditions among populations with greater social vulnerability. To keep responses to 40-year recertification notifications prompt, code compliance officials could inform residents and homeowner associations of 40-year recertification violation reports, rather than only notifying boards of directors. [AJPH](#)

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CONTRIBUTORS

T. L. Hollar and A. Ferreira de Melo conceptualized the study. A. Ferreira de Melo led the procurement of data, and K. Maitland assisted with the procurement of data. T. L. Hollar performed the data analysis. T. L. Hollar, A. Ferreira de Melo, K. Maitland, and S. Cuenca wrote the manuscript. E. Chung created the choropleth map. All of the authors assisted with revisions.

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The authors have no conflicts of interest to declare.

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The institutional review board of Nova Southeastern University designated this study as non-human participant research.

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