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Racial Disparities in Cancer Care | Access to Care for Transgender Veterans | Hepatitis C Among US Veterans | Battling Tobacco Use at Home | [illegible] | How Might the Provision of Culturally Competent Services Be Enhanced for American Indian and Alaska Native Veterans? | Improving Trends in Gender Disparities | Suicidality Among Hispanic and African American Veterans Following Surgery

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COVER: Patients fill out paperwork before getting monkeypox vaccines at the Balboa Sports Complex vaccine site in Encino on Thursday, September 8, 2022. Los Angeles County Department of Public Health runs the Balboa Sports Complex vaccine site in Encino where the new bivalent COVID-19 booster and monkeypox vaccine are being offered.

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BACKMATTER

2022 Inflation Reduction Act: Climate Investments Are Public Health Investments

The Inflation Reduction Act (IRA) of 2022, which was signed into law on August 16, has multiple components important to public health, including the ability to negotiate drug prices within Medicare and an extension of subsidies within the Affordable Care Act. But the public health benefits of the IRA are not limited to improvements to the health care system. The sections of the bill related to clean energy and climate change will also improve public health in the short term and long term.

It is widely recognized that climate change has a direct impact on human health. For example, heat waves, wildfires, and hurricanes increase in frequency and intensity with a warming climate, and all are associated with adverse health effects. Reducing greenhouse gas emissions will help to mitigate climate change, although it will take many years for the benefits to manifest.

Importantly, many of the clean energy and climate change provisions in the IRA will improve public health along pathways other than climate change itself, with shorter-term benefits. For example, investments in clean electricity will reduce emissions of air pollutants from fossil fuel power plants, which will confer health benefits. Investments in cleaner fuels and vehicles will also lead to less air pollution, providing health benefits, especially to those who live close to busy roads. Transportation investments go beyond cleaner vehicles, including competitive grants that improve walkability, which will improve public health through increased physical activity.

In addition, the IRA includes multiple provisions to make homes more energy efficient, such as rebate programs and tax credits for energy-efficiency retrofits and improved technology like heat pumps. Funding is appropriated to increase energy efficiency of affordable housing, with a specific call-out to also enhance indoor air quality, a critical inclusion to center the health of residents. Along with the outdoor air pollution benefits from using less electricity or reducing household fuel combustion, the residential energy efficiency provisions will help reduce energy insecurity for lower-income households. This will also improve public health, as energy-insecure households often lack thermal comfort, have higher stress, and lack the resources needed to pay for healthy foods ("heat or eat") or preventive health care.

There is also funding to make coastal communities more resilient to extreme weather events, to mitigate the impacts of drought, and to otherwise help communities protect themselves given a changing climate. These are ultimately public health investments as well, helping communities put adaptation measures in place to protect vulnerable populations.

Multiple provisions direct investments toward communities that have been historically overburdened by pollution, which will both address environmental injustice and yield public health benefits. For example, the IRA encourages solar and wind investment in lower-income communities. It also includes environmental justice block grants that can address an array of topics, including climate resiliency, mitigating urban heat islands, and reducing both indoor and outdoor air pollution. The IRA also reinstates Superfund, charging a tax on petroleum and oil to provide resources to clean up hazardous waste sites when a responsible party is not identified. Along with incentivizing the transition to cleaner fuels, this will accelerate the rate of clean-up of hazardous waste sites and bolster the health of surrounding communities.

The IRA does not complete the clean energy transition or fully address all issues of environmental injustice, and city and local climate action plans will continue to be needed. But it provides much-needed investments that reduce greenhouse gas emissions while centering the health and well-being of historically overburdened communities. The public health community should regularly draw the connections between climate action and local health to ensure that health is centered in climate policy development. AJPH

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10 Years Ago

Social Justice in Pandemic Preparedness

Historically, socially disadvantaged groups have fared the worst of any population during influenza pandemics. They will most likely continue to do so; this certainly held true for the 2009 influenza A (H1N1) pandemic. . . . . Although that pandemic was relatively mild, its disparate impact on certain populations raises significant ethical concerns. The US Centers for Disease Control and Prevention (CDC) acknowledges, "[I]t's clear that minority groups have consistently had higher rates of serious 2009 H1N1 disease, including hospitalizations, than non-minority groups. In fact, hospitalization rates among minority groups have consistently been more than double those of White, non Hispanics." . . . To counter the social injustice of structural inequalities and adequately meet the needs of vulnerable groups, pandemic preparedness efforts must address both health disparities and access barriers.

From AJPH, *April 2012, p. 586*

20 Years Ago

The Global HIV/AIDS Pandemic, Structural Inequalities, and the Politics of International Health

Structural inequalities continue to fuel the epidemic in all societies, and HIV infection has increasingly been concentrated in the poorest, most marginalized sectors of society in all countries. The relationship between HIV/AIDS and social and economic development has therefore become a central point in policy discussions about the most effective responses to the epidemic. Important progress has been made in recent United Nations initiatives. Maintaining long-term commitment to initiatives such as the Global Fund to Fight AIDS, Tuberculosis and Malaria is especially important in the wake of September 11 and ensuing events, which threaten to redirect necessary resources to seemingly more urgent security concerns.

From AJPH, *March, 2002, p. 343*

The Conundrum of How Pornography Impacts Public Health

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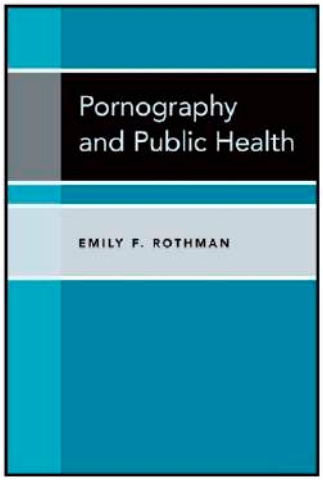

Pornography and Public Health
By Emily F. Rothman
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Pornography and Public Health is a scholarly work by Emily Rothman, ScD, professor of community health sciences, Boston University School of Public Health that explores the relationship between pornography and a range of public health issues including interpersonal violence and aggression, healthy sexuality, and body image, among other topics.

To date, there has not been such a comprehensive review of this topic. This book not only fills that gap but also does so in a frank and detailed fashion by addressing the existing body of scholarship through a series of explorations of various research questions. Rothman conducts her analysis by surgically dissecting the issue into its constituent pieces beginning with why to explore this topic at all.

STATE LEGISLATURES ATTACK PORNOGRAPHY

Pornography is a topic of interest because, as of November 2020, 14 US states have passed resolutions that declare that pornography is a public health crisis. While these proclamations do not have much direct impact, in a post–COVID-19 and post–*Roe v. Wade* world, the role of state and federal government in limiting or expanding public health powers should put the public health community on high alert. A draft model resolution prepared by the National Decency Coalition in 2018 links pornography to negative public health outcomes in 11 areas such as increased sexual aggression, difficulty maintaining relationships, and human trafficking.[1]

By passing these resolutions, many state legislatures and governors have apparently accepted the premises of this resolution without evidence to back them up. Rothman presents a balanced view of the literature and provides public health professionals with the background research necessary to bring objectivity and data to any debate on the topic. Much is unknown or inadequately researched on the effects of pornography on society, and this book also serves as a resource for public health researchers to identify key questions that need further investigation.

SETTING THE STAGE

To begin, Rothman identifies one of the first articles to look at the question, published in 1972 in *AJPH* by Mary Calderone.[2] Calderone reminded the reader of the value of the erotic to leading a healthy life. This view is echoed by a 1975 report of the World Health Organization (WHO).[3] WHO's definition of sexual health is

> a state of physical, emotional, mental, and social well-being in relation to sexuality; it is not merely the absence of disease, dysfunction, or infirmity. Sexual health requires a positive and respectful approach to sexuality and sexual relationships, as well as the possibility of having pleasurable and safe sexual experiences, free of coercion, discrimination, and violence.[4]

Calderone further proposed that one of the challenges of defining pornography—or even using the word "pornography" to encompass all visual and audio expressions of sex—would always be made difficult by the wide variation of sexual tastes and that "what seems objectionable to one person might be entirely normal for another person" (p. 5). Several US Supreme Court decisions in this area between 1957 and 2002 allowed for widespread dissemination of sexual material in part because various legal "tests" to define obscenity were so subjective. Researchers who study the impact of pornography on human behavior similarly struggle to design studies that can reproduce in the laboratory the varied and shifting ways that people view pornography in the real world.

Accepting that sexual health is a component of overall health and that people have different opinions of what is and is not obscene, the author then looks to answer a series of questions regarding whether and what role pornography may play with respect to public health.

UNDERSTANDING THE IMPACT OF PORNOGRAPHY

In a succession of logically sequenced chapters, Rothman looks at the existing research on a number of topics. The following list is not exhaustive, and my comments on these questions are not a substitute for the extensive research and nuanced assessments on each topic in the book.

- *Who, in the United States, views pornography?* It may surprise readers that females are also significant consumers of pornography. The author also supplies information regarding the age of first pornography viewing.
- *Has viewing of pornography soared during the Internet age?* While many people assume pornography viewing has spiked with Internet use, the data tell a different story. The increase in the number of viewers has not been great, though it is possible the people who watch are watching more.
- *Does use of pornography increase sexual aggression?* This is a very important topic, and the research presents mixed findings regarding whether this may be the case. Rothman explores some research studies, including several meta-analyses, including one by Wright et al.,[5] which indicate that pornography watching may be a risk factor for acts of sexual aggression. In concluding her analysis, the author writes, ". . . the prevailing conclusion of research experts is that the simple act of watching pornography is not likely to be enough to activate someone into sexual aggression without other predisposing factors in place. However, whether pornography that features aggressive sexual behavior primarily directed by men at women may influence cultural norms that encourage tolerance for sexual violence in society remains an open question" (p. 81).

In addition, Rothman explores other key questions including whether people become addicted to pornography, whether pornography weakens or strengthens the ability to form and maintain relationships, and how pornography affects the lives of those who make it.

PORNOGRAPHY AND SEX TRAFFICKING

The potential connection between human trafficking and pornography poses another critical question, given the seriousness with which society views human trafficking. The Trafficking Victims Protection Act of 2000[6] broadly defines human trafficking as any sexual activity potentially coerced through force or fraud and applies significant penalties starting with a mandatory minimum sentence of 15 years in prison. However, Rothman argues that because of the seriousness of the harms caused by human trafficking, it is easy for antisex advocates to invoke its possibility to fight consensual sexual activity including the making of pornography. At least one legal commentator has argued that the Act be used more frequently to combat the production of pornography.[7] Rothman concludes, ". . . the anti-trafficking movement is not uniformly aligned with public health promotion goals, so public health professionals need to use caution before allying themselves with anti-trafficking organizations" (p. 184).

CONCLUSION

Pornography and Public Health is a unique and important compendium of the research to date on the effect of pornography on a range of public health, health, and social issues. At the current time, powerful interests in the United States seek to make pornography a renewed controversy and use—or, truly, misuse—the veil of public health to disguise a moral issue. Increasing awareness of this challenge and understanding the arguments both pro and con should place public health professionals in a strong

position to bring science and reason to the discussion.

While the topic may be literally "sexy," this book is for those who like diving into research, and every reader will be enlightened by Rothman's incisive observations and on-the-money conclusions. Public health professionals who are interested in the preservation of personal freedoms and the protection of privacy should read this book. AJPH

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Advancing the Measurement of Structural Racism Through the Lens of Antiabortion Policy

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See also Riley et al., p. 1662.

On June 24, 2022, the US Supreme Court revoked the right to abortion in the landmark *Dobbs v Jackson* decision. This decision on the legal status of abortion is deeply embedded in the history of structural racism and White supremacy in the United States. In this issue of *AJPH*, Riley et al. (p. 1662) compellingly describe how antiabortion policies are rooted in and uphold White supremacy, and they call for public health researchers to address abortion criminalization in the context of advancements in the measurement of structural racism.

Three critical areas must be considered for the development of sound measures of abortion criminalization as a form of structural racism. First, structural racism affects racialized people's reproductive lives even before unwanted pregnancy and abortion occur. Inequities in unwanted pregnancy do not exist in a vacuum; compounding racism in health education, health care access, and urban planning generate these gaps. Second, structural racism contributes to the disproportionate burden of harm racialized people experience when they are denied an abortion, including adverse pregnancy outcomes, maternal mortality, and financial setbacks with effects across the life course. Third, racialized pregnant people encounter greater social punishments for pregnancy decision-making, including criminalization and greater social stigma of single, young, and poor motherhood. As public health continues to develop innovative measures of structural racism,[1,2] antiabortion policy and its impact on racialized communities must be included. We build on the critical points made by Riley et al. by elucidating what we see as considerations for advancing the measurement of structural racism through the lens of antiabortion policy.

ACCESS TO REPRODUCTIVE CARE AND SERVICES

The reproductive health effects of structural racism permeate the life course for racialized people, often manifesting as barriers to accessing and maintaining comprehensive, affirming, and affordable health services. Structural racism and poverty are interwoven into the American fabric, making people from racialized communities disproportionately low income and reliant on publicly funded Medicaid.[3] Half of all people with incomes below the federal poverty level who can become pregnant receive health care through Medicaid; among those racialized as Black, the proportion is 62%.[4] Across 34 states and the District of Columbia, the Hyde Amendment—a law banning federal funding for abortion care in effect since 1976—leaves 7.8 million people without abortion coverage through Medicaid and the Children's Health Insurance Program, half of whom are from racialized groups.[4] Poorly resourced Black people will most likely face financial barriers to accessing abortion because of structural racism.[4]

Beyond lack of insurance and unwanted pregnancy, the economic consequences of structural racism affect reproductive health. Black youths are less likely to receive comprehensive sex education because of underfunded schools,[5] and Black households are less likely to have access to a vehicle, an increasingly necessary tool to reach abortion clinics across state lines.[6] Provider racial biases (e.g., hypersexualization of Black womanhood, adultification of Black children) erode the bonds needed between clinician and patient to effectively provide preventive reproductive health services and reduce unwanted pregnancy.[7] A robust structural racism measure of abortion restriction must account for the accumulation of harm present in the reproductive health ecosystem for racialized people, not simply a boiled-down indicator.

UNJUST OUTCOMES

Forced pregnancy or the denial of access to abortion services has immediate and long-term implications for Black people with the capacity for pregnancy. Restricted access to abortion will likely widen gaps for Black people, perpetuating structural racism through interactions with its many domains. These interactions can and should be measured. Although every single pathway cannot be explored, we highlight some of the most profound examples.

Most individuals who choose to have an abortion do so for economic reasons. When they cannot obtain one, the financial consequences can be severe and long lasting.[8] Individuals who are denied an abortion are more likely to live in poverty six months after giving birth, more likely to remain in poverty four years later, and less likely to be fully employed after the same period.[8] When people who are already mothers are denied an abortion, their existing children are less likely to achieve developmental milestones and more likely to live below the poverty line and experience hunger.[8] Restricted access to abortion will widen these gaps, creating a cycle of life in which structural racism fundamentally dictates access to material goods, resources, and health.

SOCIAL PUNISHMENT

Abortion restrictions are one part of a state system that criminalizes the reproductive choices of racialized people. Antiabortion policies work in tandem with state power decisions to deprioritize policies such as universal childcare, maternal mortality reduction initiatives, universal paid family leave, and gun control. Racialized pregnant people must navigate a racist system in which they do not have state support in affirming their pregnancy decisions. Furthermore, racialized pregnant people are disproportionately prosecuted for pregnancy loss and often prosecuted with more severe charges.[9] Even before the *Dobbs* decision, Black pregnant people were policed and prosecuted throughout pregnancy, for example, through policies that required drug screening as a prerequisite for accessing welfare benefits.[10,11]

Measurement could illuminate connections between criminalization of abortion and other domains of structural racism. For example, women who are prosecuted for abortion may be at risk for being charged with a felony and losing suffrage, further limiting their autonomy. Abortion criminalization has the potential to transcend multiple domains of structural racism and may operate to remove people from a key form of power—political power—entirely.

INTERSECTIONALITY AND MULTIDIMENSIONALITY

Although Riley et al. allude to intersectionality, they do not fully discuss intersectionality in the context of abortion criminalization measurement. Abortion criminalization—a geographic, racialized, classed, and disability skewed issue—has the potential to be used methodologically to highlight intersectionality, a concept scholars have struggled to quantify.

Furthermore, structural racism is multidimensional, and our measures must capture that.[2] In addition to examining domains of education, criminal justice, and segregation, we must think critically about how bodily autonomy and surveillance interact with these domains. Ratios of Black–White disparities are often used as a proxy measure of structural racism, and the same logic could be applied to abortion or reproductive health outcomes (i.e., maternal mortality or the percentage of Black pregnant people who wanted but could not obtain an abortion). Policies, such as outright bans on abortion, are another indicator that could be used. Each of these potential indicators should be considered with other domains to measure the level of structural vulnerability and exploitation experienced by a person because of structural racism.

CONCLUSIONS

We must build on efforts to measure structural racism and its impact. Structural racism makes racialized people more vulnerable to criminalization, and criminalization, in turn, can increase the impacts of structural racism in other domains, with direct consequences for health. Future efforts to measure structural racism must include indicators of surveillance and autonomy as related to abortion policies.

It is estimated currently that a nationwide abortion ban will increase Black maternal mortality by 33%.[12] Although a growing body of research has identified racism as the fundamental mechanism driving these rising Black maternal mortality rates, being clear about how specific racist policies, such as antiabortion policies, contribute is critical as we do the work of measuring racism. Even policies that appear race neutral on their face can still have a racist intent that shapes population health, and this, in turn, shapes other social determinants and forms of structural racism that we do measure. As Riley et al. state:

> It is critical to include antiabortion laws as a dimension of the underlying forces of structural racism . . . Recognizing abortion criminalization as a key component of the system that perpetuates structural racism allows a more complete interrogation of the institutional connections that maintain White supremacy. (p. 1665)

We cannot change what we do not measure.[1] AJPH

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Regulation of Cannabis Retailers: Facilitating Responsible Adult Use and Promoting Health Equity While Preventing Access to Minors

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See also Matthay et al., p. 1640.

Matthay et al. (p. 1640) compared cannabis control policies in 241 California jurisdictions and found that jurisdictions which lacked comprehensive bans on cannabis retail outlets had higher proportions of residents who had low education, lived in poverty, and were Black or Latinx individuals. Consequently, cannabis retailers tend to cluster in these socially and economically disadvantaged areas.[1] Alcohol and tobacco retailers also tend to be concentrated in areas with low socioeconomic status.[2] The concentration of licensed cannabis retailers in economically disadvantaged areas could create or exacerbate health disparities if these communities disproportionately bear the burden of the negative consequences of cannabis use, such as increased cannabis availability to youths, driving under the influence of cannabis, car crashes,[3] cannabis-associated emergency room visits,[4] and accidental ingestion of edibles by children.[5] In addition, disadvantaged neighborhoods might lack the resources to enforce policies on cannabis licensing, sales to minors, and public use. Poor enforcement could facilitate sales to minors, sales of incorrectly labeled products or products without childproof packaging, and crime. As Matthay et al. stated, this could result in a "not in my backyard" situation, in which Californians statewide can benefit from the positive aspects of cannabis in nearby cities, but the burden of the negative aspects of cannabis falls completely on economically underresourced communities. This analysis highlights some additional issues that should be considered in decisions about the regulation of cannabis retailers.

PATCHWORK OF DIFFERENT POLICIES

Matthay et al. noted a wide variation in cannabis retail policies across the state of California. Most Californians, especially those in urban and suburban areas, live within a short drive of a cannabis retailer.[6] Policies limiting cannabis retailers might be less effective if they are not uniform across the state. Residents of cities where cannabis retailers are not allowed can simply drive to an adjacent city to purchase cannabis. Perhaps it is time for statewide implementation of local policies that have been shown to be effective. The evolution of cannabis regulation could emulate that of tobacco regulation. In California, antitobacco policies have historically begun at the local, grassroots level and finally become adopted statewide.[7] Perhaps cannabis policy would benefit from statewide adoption of consistent cannabis policies; this could prevent lax policies in one locality from undermining stricter policies in neighboring localities. Research is needed to determine the relative efficiency and effectiveness of bottom-up versus top-down approaches to achieve uniform policies.

ACCESS BY MINORS

Prevention of cannabis use by adolescents remains an important public health priority, because cannabis adversely affects the developing adolescent brain.[8] Restriction of cannabis retailers could potentially be an effective strategy to reduce cannabis use among youths. We[10] found that adolescents who live in California jurisdictions that allow cannabis retail are more likely to report easy access to cannabis and report more frequent cannabis use. However, only a small minority of adolescent cannabis users obtain their cannabis from retailers; most obtain their cannabis from social sources.[9] Research is needed to determine what proportion of the social sources is adults who purchase cannabis

products from licensed retailers and what proportion comprises friends, acquaintances, or dealers who share or sell products of dubious origin with unknown ingredients. Strict enforcement of restrictions on cannabis sales to minors could potentially prevent youth use in areas where retailers are allowed.[10] However, cities with high levels of neighborhood economic disadvantage might lack resources to enforce regulations against cannabis sales to minors. In addition, even if sales to minors can be prevented, the mere presence of cannabis retailers in the neighborhood could be a risk factor for adolescent cannabis use. Exposure to advertisements for cannabis retailers (e.g., billboards, outdoor signs) in neighborhoods with cannabis retailers could signal to adolescents that cannabis use is normative, resulting in increased adolescent use.[11] In the current environment of increased legalization, effective prevention programs will be needed to help adolescents make informed decisions about potentially impairing their neurodevelopment with cannabis.

UNLICENSED RETAILERS

Despite California's extensive cannabis retailer licensing program and local policies, unlicensed retailers continue to proliferate throughout the state.[1] Similar to licensed retailers, unlicensed retailers are more prevalent in neighborhoods experiencing social and economic disadvantage,[1] and proximity to unlicensed retailers is associated with heavy cannabis use among young adults.[12] Cannabis regulators have described the regulation of unlicensed cannabis retailers as a game of "Whack-A-Mole"; as soon as they close down one unlicensed retailer, several more appear in other locations.[13] Unlicensed retailers are more likely than licensed retailers to sell to minors, sell products that exceed the legal tetrahydrocannabinol limit, sell counterfeit products that contain pesticides, allow consumption in retail stores, ignore daily limits on purchases, stay open late at night, and sell products that are attractive to youths and lack child-resistant packaging.[14] Consumers are likely to turn to unlicensed cannabis sources when they perceive that licensed cannabis retailers are too inconvenient or that their products are too expensive.[15] Therefore, stricter retail licensing laws and higher taxes could push consumers back to unlicensed retailers unless the unlicensed retailers are eliminated. States with retail cannabis need to dedicate sufficient money to enforcement of the licensing laws to prevent proliferation of unlicensed retailers. However, this must be done carefully and thoughtfully to ensure that populations which have historically been victimized by overly harsh prosecution of possession and sales are able to afford and access the new retail licenses that are intended to reverse previous inequities.

HOME DELIVERY

Although cannabis storefront retailer policies vary across California jurisdictions, home delivery of cannabis is available throughout the state. Home delivery is available to anyone aged 21 years or older with a form of identification and a residential address. The easy availability of home delivery, even in localities where brick-and-mortar retailers are banned, could undermine local policies. The effect of home delivery on cannabis use and its consequences is unknown. Home delivery could potentially decrease car crashes and public consumption by encouraging users to use their cannabis at home, but it also could facilitate youth access if adults leave cannabis in accessible locations at home or if youths use an adult's identification to receive purchases at home.[16] Research on the positive and negative consequences of cannabis home delivery is needed.

Many cannabis users experience physical and mental health benefits from this substance. Policies should enable easy and affordable access by medical patients while preventing access by youths. Public opinion appears to be shifting toward increased legalization. It will be important for states and local jurisdictions to develop and enforce policies that allow safe cannabis purchases and responsible use by adults while preventing use by youths and preventing the adverse medical, legal, and economic consequences of being concentrated in economically disadvantaged areas. AJPH

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Are We Doing Enough to Prevent and Respond to Workplace Violence Against Adolescents?

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See also Knight et al., p. 1651.

Since the groundbreaking UN Convention on the Rights of the Child, substantial progress has been made in protecting children from all forms of violence and harm (including from harmful working environments and violence against children). Yet, in 2020, about 160 million children were in child labor, made up of 63 million girls and 97 million boys, representing 1 in 10 worldwide. Since 2016, the number of children in hazardous work has risen sharply to about 79 million.[1] In the poorest parts of the world, increasing macro- and micro-inequalities have escalated the population of children in labor over the past decade.

The well-being of children continues to be hampered by the failure of most governments in Africa in protecting them against the throes and vicissitudes of working life. In societies where there are adequate safeguards for children, the precursors for children entering work, particularly hazardous work, are considerably minimal. When children are compelled to work because of household economic circumstances, regulations are better enforced. Unfortunately, many millions of children around the world work in profoundly precarious circumstances and conditions. Although we admit that child work is not a recent phenomenon, globalizing and urbanizing norms have escalated inequalities, pushing millions of children into work.[2] Despite the many hazards that child workers are exposed to, however, the experiences may not be entirely negative for all.[3]

In most developing countries and sub-Saharan Africa, adolescents in work face several vulnerabilities: They work under extreme hazardous conditions in large plantations, fishing, and domestic settings, among others, with paltry wages and earnings. In much of Africa, rural–urban migration without corresponding sustainable employment opportunities, many accompanied and unaccompanied children are in work, often as street hawkers, head porters, and domestic workers.[4,5] In these settings, child work remains a strong economic need.[6] In addition, there are many intersecting structural factors, such as the COVID-19 and HIV/AIDS pandemics, discrimination, and gender inequality that also may increase both the likelihood of adolescents working and the propensity for the risk of violence against children and young people.[7]

EFFECTS ON ADOLESCENTS

This article reviews and adds to the Knight et al. study published in this issue of *AJPH* (p. 1651), which measured workplace violence as "self-reports of violent acts perpetrated by an employer or adult in a work-related position of authority, or by peers at the workplace" among a cohort of adolescents recruited at primary schools participating in the endline survey of a trial. This and other studies have found that the increasing numbers of children in hazardous work have enormous threats to their well-being and safety. This is complicated by the vast and many sectors and spaces where adolescents work, which can frustrate interventions aimed at tackling the problem. Although the spaces and settings where adolescents experience violence are varied and many (e.g., domestic and school settings), workplace violence against children not only impacts survivors' mental health (e.g., depression, anxiety, posttraumatic stress disorder, loss of self-esteem) and physical health (e.g., substance and alcohol abuse, self-harm) but also has strong potential of affecting their perspectives on work in adult life, which in turn can create internalized acceptance of workplace violence.

NATURE, MANIFESTATION, AND MAGNITUDE

Workplace violence often occurs in four main forms: criminal intent, customer client, worker on worker, and personal (domestic violence) relationship. The prevalence of any of these types is dependent on the nature of the

industry.[8] For instance, customer–client workplace violence is dominant in health care settings and more in North America and Asia than in other parts of the world.[9] Customer–client violence is well documented among female sex workers[10] and in worker-on-worker workplace violence.[11] Currently, we know very little about the prevalence of workplace violence against adolescents. To our knowledge and in concurrence with other authors (Knight, et al., p. 1651), workplace violence (measured as physical attacks, verbal threats, and sexual harassment) against adolescents is exceptionally scant, except for a few studies.[12,13] Although a rich body of evidence exists on violence against children and adolescents, such as in domestic and school settings, it is only now that studies such as that of Knight et al. are emerging on the magnitude and drivers of violence in the workplace.[11] In that light, we commend the authors for this important and bold attempt at bringing this to policy and programmatic attention. Studies such as this one are crucial because we need a clear and better understanding of the risks and harm spots. For many years, the scholarship on child labor has focused extensively on human capital trade-offs without commensurate discussion of other equally important outcomes or impacts, such as violence, which Knight et al. (p. 1651) tackle regarding two of the four forms of workplace violence: worker-on-worker and personal relationship violence.

CONVENTIONS AND LAWS ARE NOT ENOUGH

Having laws and policies for tackling violence against adolescents is commendable, but their mere existence has proved inadequate in preventing and responding to all forms of violence against children. The INSPIRE framework[14] (implementation and enforcement of laws, norms and values, safe environments, parent and caregiver support, income and economic strengthening, response and support services, and education and life skills) affirms that implementation and enforcement of laws do work. Bold and sustained efforts at penalizing individuals and institutions that expose and subject children to workplace violence, regardless of the setting, is an important step toward protecting children from violence. In Uganda and most other African countries, there are many laws and statutes promulgated to protect children and adolescents, but a weak state of enforcement of these instruments has contributed to creating a culture of impunity—the bane of effectively addressing some of the most pressing and persisting social challenges in the region.

POLITICAL COMMITMENT IS NEEDED

In Shiffman's[15] seminal framework for assessing political commitment, our attention is drawn to the importance of (1) national political leaders publicly and privately expressing sustained concern an issue, (2) using authoritative decision-making processes to enact policies that offer widely embraced strategies to address a problem, and (3) government allocating and releasing public budgets proportionate to the problem. As affirmed earlier, what are demonstrably missing are domains (1) and (3) as far as the current architecture or landscape for preventing violence (in all forms) against adolescents in the workplace is concerned.

IS THERE A SUSTAINABLE LONG-TERM SOLUTION?

Our simplest answer is yes. Although the interventions proposed by Knight et al. (p. 1651) are unquestionably important in the context of public health, we contend that more could be done. Tackling workplace violence against adolescents lies in targeting the main triggers of adolescents getting into work (especially hazardous work) in the first place. Previous research unequivocally demonstrates that adolescent work is overwhelmingly propelled by poor household economic circumstances in addition to gender and ethnicity, among others.[16] Consequently, it is crucial to target social interventions for households in which the risk of adolescent work is high. We are not oblivious to the fact that eradicating adolescent work completely sounds utopian. Our position is that in increasingly emerging capitalist systems with poor labor regulation systems, placing the responsibility on employers of preventing and responding to workplace violence against adolescents may yield very little impact. For instance, among adolescents who work in domestic settings, the perpetrators of workplace violence are mostly their employers.[17] It thus seems certain that employers are not best placed, and indeed are conflicted, in solving problems they cause. After all, adolescent work in these settings is more of survival, and, without addressing survival needs, little to nothing may be achieved. Long-term resolutions must address child and adolescent poverty and, in the short to medium term, complementary interventions (e.g., safe environments, changing adherence

to harmful and gender norms, response, and support services) to prevent and respond to violence against adolescents already in work. AJPH

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50 Years After the Tuskegee Revelations: Why Does the Mistrust Linger?

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The COVID-19 pandemic proved that mistrust of the government's public health efforts stems not only from manipulated political anger toward federal policies but also from personal and collective memories of medical and public health experiences.[1]

Fifty years ago this past July, media outlets across the country reported that between 1932 and 1972 the US Public Health Service had been conducting an experiment in and around Tuskegee, Alabama, to study, but not treat, hundreds of African American men who had the noncontagious stage of latent syphilis.[2] Throughout its 40-year history, the government doctors lied to the men, telling them over and over again they were being treated for an unspecified sickness called "bad blood" that might or might not be syphilis. Many of the men had their lives shortened, and scores died from not being treated. Although they were supposed to be at the noncontagious stage, many passed the dangerous disease on to their sexual partners, wives, and children.[3] After 1972, "Tuskegee" entered our public health and medical vocabulary as a metaphor for racism in medical research and public health practices.

After the Tuskegee Study was disclosed to the broader public, the efforts to acknowledge it and provide reparations began.[4] The case demanded litigation. Fred Gray, the iconic Alabama civil rights lawyer who represented Rosa Parks and Martin Luther King during the Montgomery bus boycott, filed and settled a lawsuit that gave modest sums to the surviving subjects, controls, and the families of the deceased. In addition, the Center for Disease Control (later renamed Centers for Disease Control and Prevention) provided medical care, then health care, for any issues to the remaining men and any of their wives and children who had contracted syphilis. A badly flawed federal report followed, evaluating some of the research malpractice embedded in the Tuskegee Study. Several years later, knowledge of the Tuskegee Study was instrumental in pushing the government to establish guidelines that require the principles of justice, beneficence, and respect for persons in federally funded human participants' research.

THE LEGACY BEGINS

These measures were too modest and too few to prevent the Tuskegee Study's ongoing damage to African Americans because it followed on so many other experiences.[5] When a medical procedure harms or kills an individual patient, a malpractice lawsuit may provide financial compensation to the victim and their family. Often, only the family and the doctor or hospital know about it. When a study that injures or kills scores of its subjects is conducted by a government agency, however, the damage extends far beyond the immediate victims. An entire populace or group can have their trust in government shattered and collective memories, both false and true, become the truths that shape their response to offers of positive health interventions when new health crises arise.[6]

The rumors about what happened in Tuskegee began as soon as the news broke 50 years ago, especially the false belief that the men were actually infected by the government doctors, rather than had the disease already. This belief is reinforced time and again whenever a photo taken by the Public Health Service in the 1950s that shows a White doctor doing a blood draw with a syringe on a Black man's arm is viewed. If you do not look closely, it looks as if an injection is being administered. Then, when the AIDS epidemic erupted and spread in the early 1980s, researchers found that memories of the Tuskegee Study vitiated the trust many African Americans had in offers of health care.[7] Many African Americans, including educated professionals, believed that HIV was a manmade disease created in laboratories for the explicit purpose of perpetrating genocide on Black people.[8]

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After these rumors circulated, especially that the study's men had been given the disease by the government, "Tuskegee" provided a partial answer to why this theory about HIV had traction. Yet, many in Black communities who were disposed to believe the worst of their government had a much deeper vision of the past linked to their day-to-day lives. Their perspective reached back to their ancestors who were captured by slave traders in Africa; to the horrors of the "middle passage"; to those trapped for centuries in the nightmare of slavery; to the dashed hopes of "40 acres and a mule" after the Civil War; to the economic impoverishment created by sharecropping, the crop lien system, and convict labor; to Jim Crow laws, lynch laws, and the erection of legal barriers that restricted African Americans' right to vote for the better part of a century; to knowledge of other medical horror stories; and to the drug wars that fueled mass incarceration. Then there is, of course, most importantly, the mistreatment in individual recent medical encounters that layered on the collective past.

In the 1990s, as the 20th anniversary of the Tuskegee Study rolled around, documentary film makers provided a visual memory. The federal doctors who were involved and still alive expressed little to no remorse in their filmed interviews. Angered by this response, a group of historians and health providers, aided by the Black Congressional Caucus, successfully lobbied President William J. Clinton to offer a formal federal apology in 1997 to the last six surviving subjects, their families, and the entire African American community.[9] That was an important gesture, but it could not end the mistrust. It was only one step toward truth and reconciliation. It merely acknowledged the past. It did not change the present nor shape the future.

COVID-19 AND RENEWED MISTRUST

When the COVID-19 pandemic hit 23 years later, the Tuskegee Study seemingly once again complicated the government-sponsored vaccine rollout in many African American communities.[10] Working to overcome misinformation, suspicions, and mistrust, frontline physicians and other health providers offered reassurances that the vaccine was safe and effective. Indeed, the leaders of the Voices for Our Fathers Legacy Foundation, the organization that represents the descendants of the men in the Tuskegee Study, made a public service announcement to explain why they were taking the vaccine and why others should as well.[11] Despite these efforts, many doubters in Black communities remained unpersuaded, prompting some journalists to opine that African Americans were trapped in the past, unable to escape raw memories of the rancid racism that had blighted Black lives throughout US history.[12]

Yet the problem was not limited to abuses in the distant past. For many African Americans, the absence of trust in the government's medical policies and directives flowed from their everyday lives and was tied to the here and the now. Significantly younger mortality rates for both Black men and women compared to Whites, cancers diagnosed later and treated less aggressively, disturbingly higher maternal and infant mortality rates, complaints of pain routinely discounted—the list goes on and on, and the disparities have gotten worse.[13] Nor are the problems limited to diminished life expectancy and the low quality or lack of medical care. The outrages are as fresh as the latest state laws to hinder African Americans from voting or the fear of what might happen if they or their child got stopped by the police for driving while Black.[14]

RESTORING TRUST

Once trust in medical professionals and the government is weakened, how can it be created or restored? President Clinton's formal apology was an important, albeit insufficient, first step. This past June, there was a moving ceremony in the city of Tuskegee itself that was covered by the Associated Press and widely reported in the press.[15] The Milbank Memorial Fund, a New York City–based public health foundation, acknowledged the role it had played in supporting the Tuskegee Study by financing the burial stipends that were used to induce the families to allow autopsies on the study's men to further the research.[16] Accepting the apology and a major contribution the Fund made to their education fund, the Voices for Our Fathers Legacy Foundation was gracious in its response to this attempt at healing through historical reparations.

In the half century since it ended, the Tuskegee Study has become our nation's most powerful symbol of scientific racism, moral blindness, and mind-numbing arrogance in the name of "science." If its tragic story is going to promote change for the good, however, it must serve as a reminder to public health and medical communities of the long-term consequences of what we do. We need to provide care instead of harm, and we must acknowledge the structural racism that underlies the mistrust. What we do every day in our public health and medical practices is

what matters. Fifty years from now, when the 100th anniversary of the Tuskegee Study arrives, we hope people will remember its history as the disparities become history as well. AJPH

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How Is COVID-19 Impacting You? A Community-Based Photovoice Workshop

Linda Sprague Martinez, PhD, Judith C. Scott, PhD, LICSW, MPP, Melanie Rocco, MSW, MPH, Angela Wangari Walter, PhD, MPH, MSW, and Serena Rajabiun, PhD, MPH, MA

Have you stopped to reflect on how the pandemic has impacted you? In February 2022, staff and peer leaders from 12 demonstration sites funded by the Minority HIV/AIDS Fund and the Health Resources and Services Administration, HIV/AIDS Bureau, Ryan White HIV/AIDS Program Part F – Special Projects of National Significance Program critically explored the question "How is COVID-19 impacting you?" as part of an applied photovoice workshop. Photovoice is a form of visual ethnography that engages participants in photography, critical reflection, and collective action.[1,2]

The image depicting a lone seal in the middle of a harbor was submitted by a participant at the workshop. It invoked a vibrant discussion that began with isolation. However, as the group peeled back the layers, a contradiction emerged.

> It's a contradiction for me because it's calming and I love the water, but I feel isolated . . . particularly during COVID we're so busy and it's such a traumatizing time and it's "I'm fighting this thing alone."

Indeed, the pandemic has been isolating while also involving a constant sense of urgency. Fighting the HIV epidemic for Black women in a pandemic during a societal "racial reckoning" can tax the mind, body, and soul. As participants gazed deeply at the image, there was a brief silence before a participant chimed in.

> I think part of me wonders how long the seal can stay afloat... like, at what point will the seal need help, because trying to keep your head above water can be exhausting and you don't have time to get energy back . . . or to breathe.

During the COVID-19 pandemic, many health and social service providers as well as peers, advocates, and organizers had to pivot to taking part in pandemic response efforts—engaging clients; ensuring access to food, medications, and protective gear; and offering family and social support—similar to what they continue to do in managing the HIV epidemic in their communities. They also held space as state-sponsored violence ended the lives of one Black person after another.

> I think this pretty much exists for a lot of us who do . . . community work as a whole, who have patients or clients . . . sometimes we have to be a shoulder for other people to cry on or motivation for people to stay in care . . . and sometimes it gets flipped where sometimes we might need that support.

> There's times . . . when you're overwhelmed and depressed, times when you feel calm but also isolated, and then times when you're feeling like you're adapting and you got it.
>
> I don't think we're always acknowledging . . . that people are going through cycles . . . and we're not giving ourselves, you know, the authority to just . . . to be honest . . . to acknowledge what we're all going through.

During one videoconferencing meeting (e.g., Zoom, Teams) after another, after telephone calls, and after outreach, participants faced a steady flow of work while managing new household duties (e.g., teacher, caregiver, grief counselor). It may seem calm on the surface, but for many the waters below are churning faster than ever. What will happen when they stop? Cases had initially gone down but are rebounding. Workplace policies have tightened up as the country returns to "business as usual." It seems that societal systems are working to find equilibrium, a new normal. But what is under the surface? Collectively and as individuals, we have experienced multiple traumas: lives, homes, jobs, sense of self, and sense of security lost. How are we taking care of ourselves? How are we taking care of each other?

The effects of the pandemic on community mental health and well-being are likely to persist far into the future. Collective community losses, such as those experienced throughout the pandemic, can have a negative impact on psychological well-being.[3] For Black women, these losses may be exponential when combined with state-sponsored violence against Black people and other anti-Black hate crimes. As such, pandemic recovery efforts inclusive of fostering supportive services, workplace accommodations, and housing and employment assistance programs are needed.[4] Similarly, investment in mental health advocates and peer support as well as access to community-based mental health support services is essential to addressing pandemic-induced mental health conditions. Designing a response plan in collaboration with the community, inclusive of those most affected, will be a critical first step. AJPH

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Note. The content is solely the responsibility of the authors and does not necessarily represent the official views of, or an endorsement by, the HRSA or the US government.

CONFLICTS OF INTEREST

Linda Sprague Martinez is an external evaluator for Action for Boston Area Development and the Boston Public Health Commission as well as a qualitative research consultant for the Boston Medical Center and The City School.

HUMAN PARTICIPANT PROTECTION

The protocol was reviewed by the Boston University Charles Review Campus institutional review board and determined not to be human subjects research.

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Strategies for Addressing Vaccine Hesitancy Within California State Prisons in 2021 and Beyond

Ilana R. Garcia-Grossman, MD, Liz Gransee, BA, and Brie Williams, MD, MS

Although widespread vaccination in correctional facilities is crucial for preventing COVID-19 morbidity and mortality in these institutions and their surrounding communities, there are little data on how to effectively perform vaccine outreach to people experiencing incarceration who remain unvaccinated. In this article, we describe lessons learned from a successful vaccine education initiative in California state prisons and describe opportunities for application to other correctional settings. (*Am J Public Health*. 2022;112(11):1543–1545. https://doi.org/10.2105/AJPH.2022.307042)

COVID-19 has disproportionately affected incarcerated people in the United States, with infection and mortality rates exceeding those in the general population.[1] With new variants continuing to spread across the globe, correctional facilities remain at high risk. To prevent and mitigate COVID-19 outbreaks in prisons, public health approaches must be multifaceted and prioritize vaccine delivery in addition to decarceration, optimized ventilation, masking and physical distancing, and surveillance testing.[2,3] Modeling studies suggest that COVID-19 vaccination rates greater than 90% are critical for lowering the risk of outbreaks, particularly as prisons resume in-person activities (e.g., group education, visitation).[4]

Although it is clear that widespread vaccination among residents and staff is crucial for preventing COVID-19 morbidity and mortality in correctional facilities and their surrounding communities, vaccination has been variably prioritized by state policymakers, departments of public health, and correctional facilities.[5–7] In California, prisons were prioritized for early vaccination; the California Department of Corrections and Rehabilitation (CDCR) started its vaccine program in December 2020. Many barriers exist for vaccine uptake in prisons, including concerns about vaccine safety, limited access to health information, misinformation, and distrust of medical and correctional professionals.[8] To date, there has been little research on how to effectively perform vaccine outreach to people experiencing incarceration who are still deliberating whether to get vaccinated.

INTERVENTION AND IMPLEMENTATION

To address the ongoing need to increase vaccination rates within California prisons, vaccine education events were implemented to universally increase education and access to COVID-19 vaccines for adults in custody, with a focus on those who were unvaccinated.

California Correctional Health Care Services (CCHCS) and CDCR designed COVID-19 vaccine education events for their state prisons starting in summer 2021. During each event, a multidisciplinary group provided vaccine education, including staff and three or four external volunteers who were invited by CCHCS, such as volunteers who lead prison programs and individuals who work with advocacy organizations (including lawyers and physicians). Nonmedical volunteers were provided a list of frequently asked questions about COVID-19 for reference. People in correctional facilities often have multiple reasons to distrust institutions; this may have been exacerbated by the COVID-19 pandemic. Therefore, bringing in outside clinicians, public health experts, trusted mentors, advocates, and peers, such as formerly incarcerated people, can be helpful for ensuring that residents of correctional facilities can access multiple sources of trustworthy information.

Over two to three days, the education events were held in a large gymnasium, and all general population housing units were assigned a scheduled time to attend. When possible, events were co-located with other popular preexisting events to increase participation.

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Residents housed in higher security settings were not able to attend large group functions, so the multidisciplinary group met individually or in small groups with them. The events were held in English with some Spanish-speaking staff available, and other languages accessible via a phone interpreter.

The vaccine education events included vaccine trivia with candy prizes, an art contest (Figure A, available as a supplement to the online version of this article at https://ajph.org), and informal question-and-answer sessions with health care professionals. Free snacks and food also attracted residents. Vaccine visibility was emphasized, as all vaccinated residents could wear a decorative "I'm vaccinated" sticker. Having multiple stations and games facilitated a casual environment and allowed for informal small-group conversations to emerge organically. This approach also allowed people to engage in conversation with an educator of their choice to address their individual questions and concerns.

To enhance vaccination acceptance, nurses were on site at the education event and were prepared to give any unvaccinated person their choice of vaccines (Moderna, Pfizer, or Johnson & Johnson). Vaccine choice was valuable, as different individuals weighed the benefits of each differently.

PLACE, TIME, AND PERSONS

The first event was held at Salinas Valley State Prison. On the basis of its success, the event was replicated at Pleasant Valley State Prison. These two events took place in summer or fall 2021; events were paused during surges, but are planned to restart in 2022.

Vaccine education events were available to all people who were incarcerated at the prison. However, the target population was unvaccinated residents.

PURPOSE

We sought to enhance vaccination education and administration among adults who are incarcerated.

EVALUATION AND ADVERSE EFFECTS

At the time of the initial vaccine education event at Salinas Valley State Prison, 62% of the approximately 2900 residents were already vaccinated. During the event, 10% of unvaccinated residents received their first vaccine (n = 113), and many more accepted education and written materials. At Pleasant Valley State Prison, with about 2600 residents and a 67% vaccination rate, 19% of the unvaccinated residents received their first COVID-19 vaccine (n = 160) at the vaccine education event. Here we summarize the elements that may have contributed to the events' success so that they may be employed in other facilities:

1. Make vaccination education enjoyable for all participants.
2. Strategically optimize participation to ensure all residents can participate.
3. Make vaccines available and offer options for multiple types of vaccines when possible.
4. Diversify sources of information by including multidisciplinary team members.
5. Consider engaging formal and informal leaders within the prison before the event to answer questions, address concerns, and gauge possible support for vaccinations, as peer support can be beneficial.
6. Ensure access to high-quality information verified by medical and public health professionals and provide written materials that are accessible to people with lower literacy levels (e.g., Amend's frequently asked questions [https://amend.us/covid], which was written by physicians based on questions from incarcerated people and their loved ones and is available in English and Spanish[9]).
7. Continue to offer the vaccine after the event and ensure those who are still not ready for vaccination are instructed on how to request a vaccine appointment if they become interested.

Large events can carry the risk of COVID-19 exposure. To mitigate risk, events were not held while there were known COVID-19 outbreaks, and strict masking was enforced.

SUSTAINABILITY

Currently, there is commitment from CCHCS and CDCR leadership in expanding to state prisons across California, as well interest from multiple facilities. Support has also been obtained from external volunteers and the Federal Receivership who oversees health care in the CDCR. Future research should explore what information unvaccinated people in prisons believe would be most beneficial in their decision-making process about vaccination and assess what elements of educational events increase acceptance of vaccines. Future research should also evaluate whether there are racial disparities in vaccine

acceptance and whether educational interventions can help close disparities.

PUBLIC HEALTH SIGNIFICANCE

These successful vaccination events in California state prisons hold important lessons for other correctional institutions and congregate living facilities seeking to disseminate vaccine information and encourage COVID-19 vaccine uptake. At the core, this initiative stemmed from dedicated staff who were motivated to marshal community resources and use multiple engagement strategies to facilitate information exchange between residents, custodial staff, educators, and medical professionals. Similar events can also be held for correctional staff, though modifications may be necessary.

As vaccination against COVID-19 continues to be a critical method for optimizing the health and safety of people living in congregate living environments, interventions that increase trust and acceptance of vaccines in correctional settings are of paramount importance. This approach at California state prisons offers a potential blueprint for success. AJPH

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HUMAN PARTICIPANT PROTECTION

Institutional review board approval and informed consent were not required for this project because the work was conducted as a part of California Department of Corrections and Rehabilitation COVID-19 vaccine outreach, and this work did not directly use any data from human participants.

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Lifeguard Training Program and Drowning Death Rates in Ecuador, 2000–2019

Tatiana Rojas, MD, Paul Dunning, MBA, and Ivan Sisa, MD, MPH, MS

Drowning is a common cause of death and disability worldwide. We report the experience of Ecuador, a middle-income country, where a lifeguard training program was implemented to reduce incidents of drowning. We describe how "Project Ecuador" was able to expand from one to 20 beaches in a five-year period. We detail how these interventions triggered the creation of a self-sustained national program and a law proposal that guarantee a safe environment across the Ecuadorian coastal region. (*Am J Public Health*. 2022;112(11):1546–1550. https://doi.org/10.2105/AJPH.2022.307013)

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Drowning is the development of respiratory impairment because of immersion in liquid and can cause relevant morbidity or even death. The World Health Organization (WHO) lists drowning as the third leading cause of "unintentional injury death" worldwide.[1] In 2019, the estimated number of deaths from drowning was 236 000, comprising mostly people younger than 30 years of age. More than 90% of unintentional drowning deaths occur in low- and middle-income countries such as Ecuador.[2] For example, until 2006 Ecuador reported up to 4.8 deaths per 100 000 population related to unintentional drowning, compared with 3.8 deaths per 100 000 in non-Latin Caribbean countries and 2.3 per 100 000 in the region of the Americas (i.e., North, Central, and South America and islands in the Caribbean Sea).[3] On the basis of a systematic review focused on low- and middle-income countries, drowning risk factors are young age, male gender, rural areas, unsupervised activities, and limited swimming instruction.[4] High-income countries have plenty of experience regarding primary and secondary prevention strategies to tackle drowning deaths.[4] Therefore, previous studies suggested that increasing the number of lifeguards is an effective measure to prevent drowning deaths.[1,4] Currently, according to the Global Report of Drowning, drowning-related mortality is one of the top five causes of death among people aged 1 to 14 years in Ecuador.[1] We present the experience of implementing a lifeguard training program to reduce drownings in the Ecuadorian coastal regions.

INTERVENTION AND IMPLEMENTATION

A five-year drowning prevention program named Project Ecuador focused on swimming skills, lifeguard training, rescue equipment knowledge, and cardiopulmonary resuscitation (CPR) techniques, combined with cross-sectoral collaboration with the Ministry of Tourism, the Red Cross, the Civil Defense, the military, the National Service for Risk and Emergency Management, and government officials. This effort ultimately led to a national water safety plan called Project Safe Beaches.

The Ecuadorian Ministry of Tourism contacted Paul Dunning and John Pearce from the Long Beach Lifeguard Association, based in California, to create a local lifeguard program. After the initial contact with the Long Beach Lifeguard Association, an all-volunteer, donation-funded humanitarian mission was designed to run Project Ecuador.[5] An agreement was reached, as evidenced by the first of many memorandums of understanding detailing Project Ecuador's commitment to providing free lifeguard training and rescue equipment while the Ministry of Tourism and cities would provide local transportation and housing in all coastal provinces (Figure A, available as a supplement to the online version of this article at http://www.ajph.org). More than 75 American ocean lifeguards volunteered to travel to Ecuador at their own expense and transported donated lifesaving and rescue equipment, valued at

approximately US $33 000.[5] During the first three years of Project Ecuador, interventions were limited to one beach. However, because of the project's sustainability, in 2009 it expanded to cover almost all the coastal regions of Ecuador. Over five years, this initiative trained a total of 415 participants with the invaluable help of 146 instructors. Each instructor presented workshops, which included information about swimming skills, CPR, rescue equipment knowledge, and surf rescue techniques. Over time and after the initial positive results, the program continued to adapt to the different places where it was implemented (Table 1).

PLACE, TIME, AND PERSON

There were a total of eight interventions from 2006 to 2011 during or after the Carnival holiday; they started in Playas de Villamil beach and then expanded to 19 additional dangerous beaches, eventually covering Ecuador's entire coastline of 5271 km (Table 1).[5] Initially, two experienced lifeguards designed the project and were in charge of training supervision. Subsequently, several Ecuadorian lifeguards became directors to expand the project. Athletic individuals aged older than 18 years with basic swimming skills were able to join the workshops. Local authorities managed the space required for the activities, including public buildings and beaches (online Figure A).

PURPOSE

The purpose of Project Ecuador was to train local Ecuadorians to become certified lifeguards and build self-sustained professional ocean lifeguard services to reduce local drowning mortality.

EVALUATION AND ADVERSE EFFECTS

Ecuador's drowning death rate in 2006 (4.8 deaths per 100 000 population) was higher than the overall rate for the region of the Americas (2.3 deaths per 100 000) and for Central America, Mexico, and the Latin Caribbean (3.1 deaths per 100 000).[3] However, a sustained downward trend started in Ecuador in 2008; in 2019, the year of the last available data, the rate was 2.7 deaths per 100 000—a 43.5% reduction since 2006.[3]

Project Ecuador presumably influenced this progressive decrease through its multiapproach intervention (Figure 1). Although the last workshop took place in 2011, this program influenced several Ecuadorian lifeguards and sectors to keep creating training opportunities and seeking ways to improve and expand them. For instance, one of the beneficiaries of the program, who became a certified lifeguard in 2009 in his hometown of Manta, offers a low-cost swimming course for children, with successful results. Strategies like these could make a remarkable local difference in drowning incidence.

In addition to drowning prevention outcomes, Project Ecuador affected the socioeconomic sector; some of the trained participants were hired as lifeguards, becoming a source of livelihood for their families (Table 1).[5] This contribution was later reinforced by a law project (Law Project on the Professional Practice of Aquatic Rescue and Salvage) sent to the Ecuadorian Legislative Institution in 2018 (the project is still awaiting approval).[6] In low- and middle-income countries, evidence regarding policy evaluation studies is scarce and issues with data completeness and quality are common.[1] Nevertheless, it is difficult to find a reason for the downward trend observed in Ecuador other than the impact of Project Ecuador. At the regional level, however, the decrease in drowning-related mortality could be the result of other initiatives; these include (1) the WHO's 10 actions to prevent drowning published in 2014 that might have become a useful tool for the region of the America's governments to establish specific strategies; and (2) the endorsement of the WHO's recommendations by well-known agencies such as the International Life Saving Federation and Red Cross.[1] For example, the American Red Cross has created a program of swimming lessons and lifeguard training throughout the United States. This organization also launched the "Swim App" to promote water safety, with parents' involvement in their children's swimming achievements.[7]

To the best of our knowledge, there are no adverse effects related to this program.

SUSTAINABILITY

Project Ecuador catalyzed the effort to scale and promote a self-sustained program at the national level. For example, in October 2011 the Ecuadorian National Secretary for Risk Management (SNGR, Spanish acronym) launched a program called Project Safe Beaches, which was created to institutionalize lifeguards in all coastal provinces of Ecuador. Local municipalities were in charge of creating a budget to contract certified lifeguards.[5] In 2016, the SNGR published the first edition of "Safety, Rescue and Aquatic Salvage Regulations on Sea Beaches With Tourist Incidence," which reinforces the participation of local authorities to

TABLE 1— Drowning Prevention Interventions by Project Ecuador: Ecuador, 2006–2011

Year of Intervention, Event	Location (Province: Beach)	No. of Project Ecuador Instructors/ Ecuadorian Instructors	No. of Participants	Donations	No. of Rescues/ Preventions	No. of Nonfatal Drownings (Location)	No. of Fatal Drownings (Location)	Outcomes
2006, initial training	Guayas: Playas de Villamil	2	23	7 rescue buoys, 6 pairs of swim fins, and 22 uniforms	NR	NR	NR	Promotional media activities. 1st MOU signed.
2007, Carnival training	Guayas: Playas de Villamil	3	13	6 rescue buoys, 8 pairs of fins, uniforms and first aid supplies	50/approximately 100	2	0	Playas town hires 6 full-time lifeguards. 20 new lifeguard towers in Guayas.
2008, Carnival training	Guayas: Playas de Villamil	9	16	16 rescue buoys, 12 pairs of fins, uniforms, and first aid supplies	60/approximately 100	15	1	Playas has 10 full-time professional lifeguards.
2009, Carnival training	Guayas: Playas de Villamil; Engabao Santa Elena: Montañita, Olón, Manglaralto, Ballenita, Ayangue, Libertador-Bolívar	27/2	45	34 rescue buoys, 16 pairs of fins, uniforms, radios, first aid supplies, and 40 Spanish training manuals	80/NR (Playas), 238/NR (Santa Elena)	15 (Playas), 6 (Santa Elena)	1 (Playas), 1 (Montanita)	MOU with Santa Elena's mayor.
2009, post-Carnival training	Guayas: Playas de Villamil; Santa Elena: Montañita	2	38					
2010, Carnival training	Santa Elena: Olón, Montañita, Manglaralto; Manabí: Murciélago, Crucita, San Lorenzo, Santa Marianita, San Mateo	24/6	55	44 rescue buoys, 23 pairs of fins, uniforms, radios, and first aid supplies	250	6 (Montanita)	10 (Playas)	MOU with Manta's mayor. Expanded training to Esmeraldas province with full government support. MOU with Esmeraldas's mayor.
2010, post-Carnival training	Guayas: Playas de Villamil; Santa Elena: Salinas; Esmeraldas: Esmeraldas	3/3	75					
2011, Carnival	Guayas: Playas de Villamil; Engabao Santa Elena: Salinas, Punta Carnero, San Pablo, Libertador-Bolívar, Manglaralto, Montañita, Olón; Manabí: Murciélago, Crucita, San Lorenzo, San Mateo, Bahía de Caráquez; Esmeraldas: Esmeraldas, Atacames	45/20	150	40 rescue buoys, 20 pairs of fins, uniforms, radios, and first aid supplies	252 (All beaches)/ approximately 2000	0	1 (Playas)	MOU with SNGR. October 2011: SNGR launched the program "Project Safe Beaches."[7]

Note. NR = not registered; MOU = memorandum of understanding; SNGR = Ecuadorian National Secretary for Risk Management (Spanish acronym).

Source. Paul Dunning's field notes; Secretaría de Gestión de Riesgos.[8]

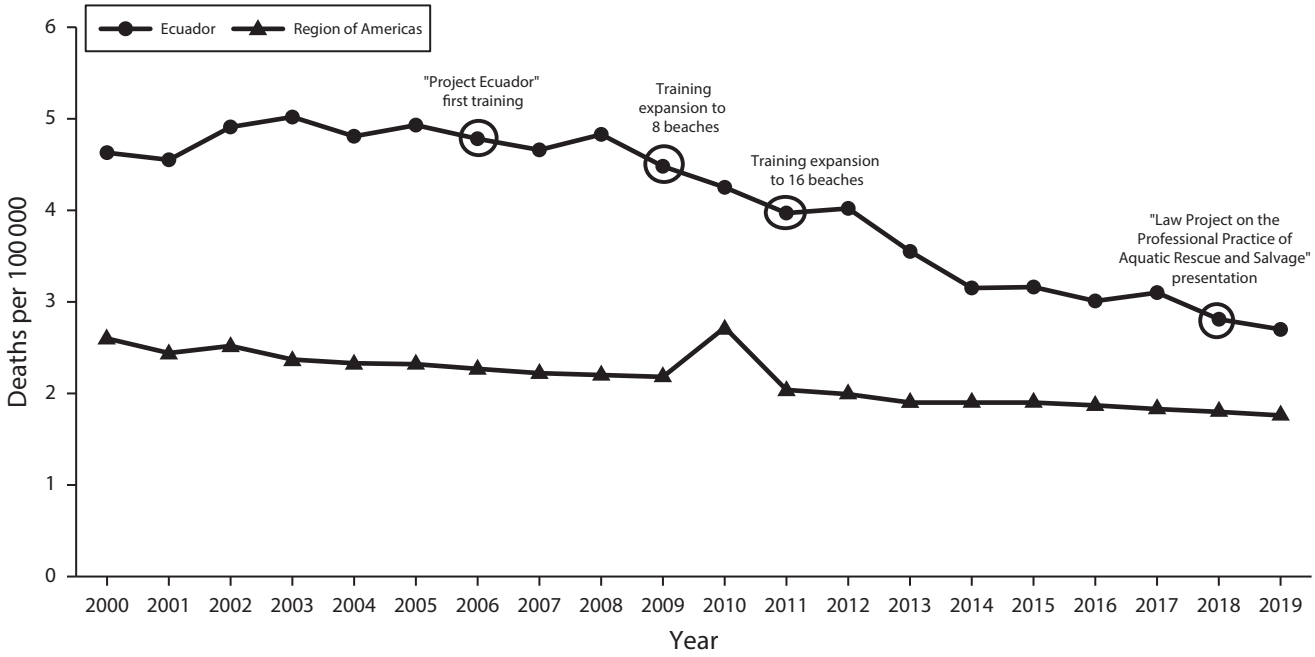

FIGURE 1— The Impact of Project Ecuador on Ecuadorian Drowning Death Rates

Note. The figure shows the mortality rate from drowning in Ecuador and the region of the Americas from 2000 to 2019.
Source. Data are from the Pan American Health Organization.[3]

establish safety and aquatic rescue plans along Ecuadorian beaches.[8,9]

PUBLIC HEALTH SIGNIFICANCE

In 2021, the United Nations published the Global Drowning Prevention resolution, which suggests establishing a national strategy for drowning prevention and the enforcement of effective water safety laws by member countries.[10] Project Ecuador helped to inspire the creation of two proposals: one national security regulation (Safety, Rescue and Aquatic Salvage Regulations on Sea Beaches With Tourist Incidence) and one national project law (Law Project on the Professional Practice of Aquatic Rescue and Salvage).[8,9] Although the national project law is still awaiting approval, both regulations would greatly contribute to and catalyze the long-term work of mitigating drowning-related deaths locally. Furthermore, with the COVID-19 pandemic, tourism has been one of the most affected sectors across Latin America.[11] In this context, as part of economic reactivation in areas like Ecuadorian beaches, it is imperative to keep creating employment opportunities for well-trained lifeguards. The sustainability of initiatives such as Project Ecuador could help create a safer recreational aquatic environment for Ecuadorians and visitors.

Please note that a Spanish version of this article can be found in Appendix A, available as a supplement to the online version of this article at https://www.ajph.org. AJPH

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P. Dunning and I. Sisa conceptualized the article. T. Rojas wrote the first draft of the article. I. Sisa is the guarantor of the study and data. All authors contributed with revision and editing of the final version of the article for submission.

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The present article did not require institutional review board approval because we do not report human participant data.

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Digital Inclusion for Farmworkers in a Pandemic: The North Carolina Farmworker Health Program Internet Connectivity Project, 2020–2021

Leslie E. Cofie, PhD, MPH, MA, Natalie D. Rivera, MPH, Jocelyn R. Santillán-Deras, BS, Glenn Knox, and Joseph G. L. Lee, PhD, MPH

The North Carolina Farmworker Health Program (NCFHP) implemented an emergency program in response to North Carolina migrant and seasonal farmworkers' urgent need for Internet access for health information, family connections, and telehealth services during COVID-19 isolation and quarantine. This article describes the NCFHP Internet Connectivity Project implementation and evaluation from June 2020 to December 2021. The project placed 448 devices across the state and provided Internet access to more than 3184 farmworkers during the 2021 peak farming season. (*Am J Public Health*. 2022;112(11):1551–1555. https://doi.org/10.2105/AJPH.2022.307017)

Rural communities are less likely to have access to the Internet as part of the "digital divide," and previous evidence suggests even larger gaps in Internet access among migrant and seasonal farmworkers (hereafter, "farmworkers").[1–3]

INTERVENTION AND IMPLEMENTATION

The North Carolina Farmworker Health Program (NCFHP) launched the Internet Connectivity Project as an emergency effort to get Internet access to farmworkers in the COVID-19 pandemic. Internet access is not a required utility under North Carolina's migrant housing standards. Farmworker housing, typically provided by the employer in North Carolina, is often situated in remote[4] locations in rural areas where poor cell phone reception and limited options for Internet connectivity contribute to the "digital divide."[3] North Carolina's 1921 registered farmworker housing units are often concrete or metal, and large numbers of farmworkers in one location can significantly contribute to issues with bandwidth and signal. Led by a full-time project coordinator (N. D. R. until January 2022 and subsequently J. R. S.), NCFHP developed and implemented three models of Internet connectivity solutions for farmworkers.

Model 1: Hotspot Lending

This strategy provided an emergency, temporary solution to farmworkers with poor or no Internet connection during coronavirus outbreaks and isolation or quarantine orders. Community health workers (CHWs) were trained and provided with mobile hotspots to distribute directly to farmworkers, and they collected them at the end of the season, like a library lending model. Each hotspot provided Internet for up to 10 to 20 devices at any given time.

Model 2: Grower Reimbursement for Internet Service

This strategy was to reimburse permanent Internet connectivity solutions through set-up of wired connections for farmworker housing (e.g., via fiber or cable installation). The NCFHP partnered with the North Carolina Agromedicine Institute to recruit and provide reimbursements to growers up to $1000 per housing unit for the set-up of Internet services. This was initiated in July 2020, but the state contract was not executed until October 2020. Qualifying purchases included routers, antennas, infrastructure build-out, and service plans.

Model 3: Internet Hubs

The third strategy was to establish Internet hubs via a fixed rugged cellular network router and antenna capable of providing Internet access for up to 100 devices. This model was ideal for locations requiring more than a hotspot to provide access to more than 20 farmworkers or for farms without the option of wired connection because of availability and reach of local Internet service providers. This was initiated in December 2020, with state procurement in March 2021 and installations in summer 2021.

To enhance the models, the NCFHP partnered with the North Carolina Broadband Infrastructure Office to develop a farmworker housing intake process to identify the ideal Internet connectivity model for various locations. East Carolina University's Laupus Health Sciences Library developed Spanish-language digital literacy training and videos for farmworkers.[5] The NCFHP also partnered with community and governmental organizations to form the North Carolina Agriculture Digital Alliance.

PLACE, TIME, AND PERSONS

This project took place as a statewide program in North Carolina between June 2020 and December 2021. The population served were the approximately 80 000 farmworkers in North Carolina, more than 85% of whom earn at or under the federal poverty line, and their families.[6] Farmworkers experience health inequities including substandard housing conditions, lack of protective equipment, exposure to extreme heat, lack of sanitary cooking and eating facilities, and occupational risks.[4,6,7]

PURPOSE

The project's goal was to support farmworkers in gaining access to telemedicine, social support, family connection, emergency communication, and educational opportunities. Health care, connection to families, contact tracing, vaccine rollout, and health education are hindered by lack of Internet access. The coronavirus pandemic resulted in outbreaks among farmworkers and limited the availability of protective equipment.[8] Many agencies paused in-person CHW outreach early in the pandemic, and Internet access became critically important.[3]

EVALUATION AND ADVERSE EFFECTS

We used a utilization-focused evaluation that included English- and Spanish-language semistructured qualitative interviews with farmworkers (n = 29), CHWs (n = 8), and farm owners or managers (n = 4). Figure 1 shows the project

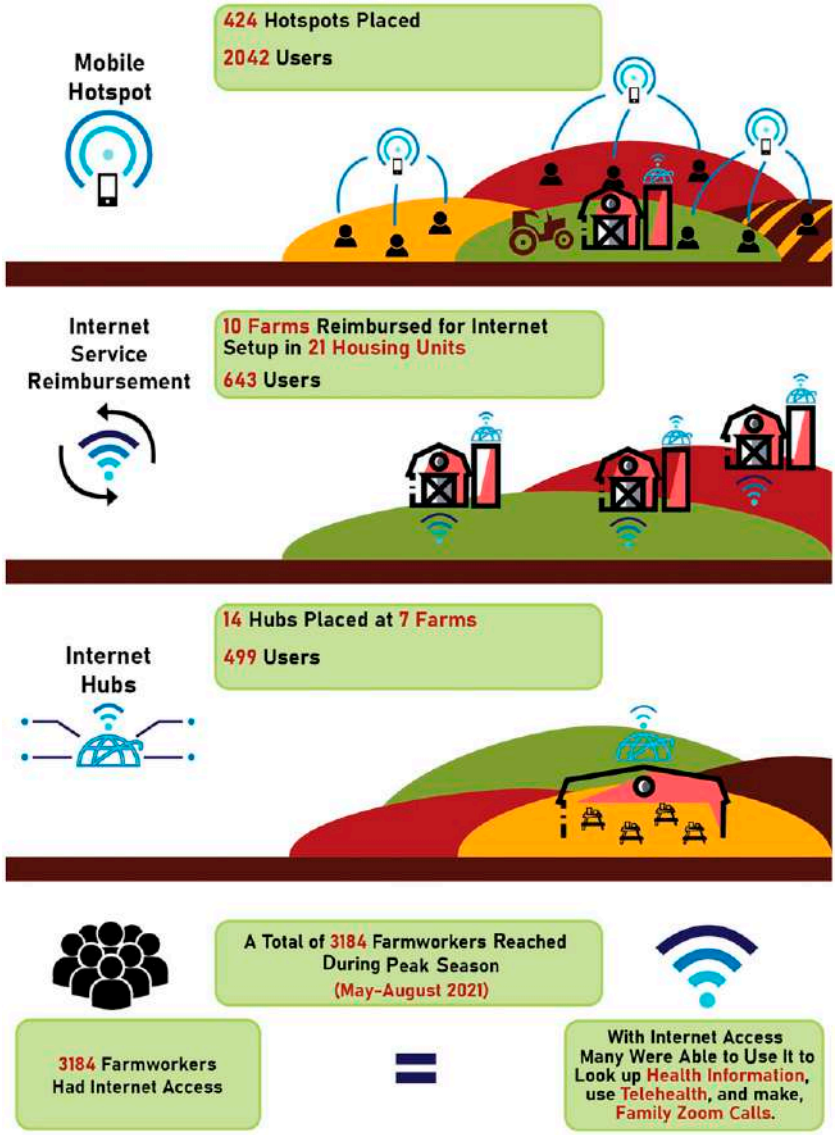

FIGURE 1— North Carolina Farmworker Internet Connectivity Project Outcomes: 2021

served more than 3100 farmworkers and distributed more than 400 devices. Thematic analysis of the interview transcripts revealed details of the project's impact (Box 1). The evaluation also yielded information regarding implementation of Internet connectivity solutions, reimbursement of growers, the important role of CHWs, and advice for practitioners.

Of the three types of Internet connectivity solutions, hotspots were the easiest to deploy and were cost-effective (~$39.99 per month for Internet services [most hotspot devices were provided at minimal cost on the contract], compared with $1000 per housing unit for grower reimbursement and ~$2400 for Internet hubs' router, antenna installation, and $39.99 per month for service). The total cost of providing Internet devices and access was approximately $124 662 during the peak farming season. Participants highlighted the ease in distributing, setting up, and training farmworkers to use the devices. Establishing Internet hubs proved to be an excellent alternative for farms with large numbers of farmworkers and an ideal medium-term solution, particularly in areas lacking wired Internet connection options. However, notably, service may only be available in a communal location (e.g., a picnic area). Future projects should include extenders for the signal to reach the rooms where farmworkers reside.

Reimbursing growers for permanent Internet connectivity was the most challenging because of the lack of broadband infrastructure in farmworker housing. Growers found the cost to run wires and install Internet to be prohibitively expensive in many cases—if Internet service was even available.

CHWs found it important to designate a farmworker with knowledge on how to use the hotspot to oversee the device, have a plan for the farmworker to return the device at the farming season's end, and develop and distribute flyers with information for farmworkers on how to access the Internet.

The evaluation also indicated that public health practitioners should consider the following: (1) understand the pros and cons between the three types of Internet solutions; (2) identify specific Internet service providers that offer reliable Internet services for farmworker housing in different areas; (3) know that a state-level project can benefit from negotiated prices for equipment on

BOX 1— Interviews With Farmworkers (FW) and Outreach Workers (OW): The North Carolina Farmworker Health Program Internet Connectivity Project, 2020–2021

Preproject Implementation Themes	
Limited Internet access	"No, I'd never had Internet here until this time when they offered it [Internet] to us." –FW
Health outreach and services limitations	"We are in a very rural area. Even ourselves, we just received a new mobile clinic, and we were like we have to start using the EHR [electronic health record] once we go out and everything. But it's like, in half of the camps we visit, we have no service." –OW
Postproject Implementation Themes	
Reliable Internet access	"They're grateful because that was another bill that they didn't have to worry about for the duration of their time here. . . . I think it helped them financially as well." –OW
[Health] information access	"We give them education about CDC [Centers for Disease Control and Prevention] and NCDHHS [North Carolina Department of Health and Human Services], or various Spanish links where they can get actual reliable information . . . not getting too overwhelmed with searching a bunch of stuff on Google." –OW
	"You can find information about taking care of yourself, how to protect yourself, what to do, what medicine to take and which not to. Yes, it's truly been useful." –FW
Medical services access and delivery	"If that patient that we test has COVID and [has] to quarantine, at least they'll have a way to connect back home, and do telephone health visits with their provider . . . they can be seen via telehealth. With the assistance of the hotspot, that kind of eliminates the barrier of them having to come to the clinic." –OW
	"When we were offered the hotspots . . . there was better reception in the camps to carry out the medical video calls. The other service that I didn't mention is mental health and those consultations are also by video calls with the therapist." –OW
Communication with family	"It's helped me communicate with my mother, who's in Guatemala. Sometimes it's so hard to live so far away, but thanks to the service you're giving us, the Internet, sometimes even though we're so far away we don't feel it." –FW
Education access	"They gave us the device and set it up. . . . I was able to take some classes thanks to the Internet. And I'm so happy, because my girls can now use it for school. The little one is three years old and she's going to start receiving remote classes, too." –FW

state-projects; however, be aware that state procurement can easily delay the project; and (4) cultivate partnerships with CHWs and growers, as this was critical to our project's success.

There were no adverse effects identified.

SUSTAINABILITY

This project demonstrates the feasibility of delivering Internet connectivity in a global public health emergency to farmworkers, and the models that are presented can be applied in other settings. However, as the project is led by a state agency, it is limited in its ability to sustain Internet connectivity for all farmworkers. Leadership by organizations that serve farmworkers and growers is critical for implementing Internet solutions during emergencies like the pandemic, testing long-term Internet solutions, and establishing alliances to promote digital equity in the agricultural community.

PUBLIC HEALTH SIGNIFICANCE

Basic utilities and infrastructure are already patterned by race and resources in North Carolina, where there is inequitable access to clean water and sewer systems.[9–11] There is an urgent need to ensure that rural broadband does not follow the same pattern of other utilities. Digital equity issues in a public health emergency can be ameliorated by policies, systems, and resources promoting broadband that include the needs of farmworkers. In the meantime, a state health agency, with dedicated partnerships and strong connections to CHWs, was able to address the urgent Internet connectivity needs of farmworkers in a pandemic by working in partnership with CHWs. AJPH

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L. E. Cofie led the evaluation of the research project and significantly contributed to drafting and revising the article. N. D. Rivera led the conceptualization, design, and implementation of the research project, and contributed to drafting and revising the article. J. R. Santillán-Deras contributed to data collection for the project evaluation, provided input on results interpretation, and contributed to revising the article. G. Knox contributed to the implementation of the research project and revising the article. J. G. L. Lee significantly contributed to the design and implementation of the project and to the drafting and revising of the article.

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CONFLICTS OF INTEREST

J. G. L. Lee is an unpaid member of the governing board of the North Carolina Farmworker Health Program, Office of Rural Health, North Carolina Department of Health and Human Services.

HUMAN PARTICIPANT PROTECTION

The East Carolina University and Medical Center institutional review board approved this study (UMCIRB 19-001817). Informed consent was obtained from all study participants.

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Mobile Health Services for COVID-19: Counseling, Testing, and Vaccination for Medically Underserved Populations

Priya Sarin Gupta, MD, MPH, Amir M. Mohareb, MD, Christine Valdes, MD, Christin Price, MD, Margaret Jollife, Craig Regis, Nehal Munshi, Eddie Taborda, MS, Miriam Lautenschlager, MSN, NP, Anne Fox, Diane Hanscom, Gina Kruse, MD, Regina LaRocque, MD, MPH, Joseph Betancourt, MD, MPH, and Elsie M. Taveras, MD, MPH

Mobile health units can improve access to preventive health services, especially for medically underserved populations. However, there is little published experience of mobile health units being used to expand access to COVID-19 vaccination. In concert with local public health departments and community members, we implemented a mobile COVID-19 health unit and deployed it to 12 predominantly low-income and racial/ethnic minority communities in Massachusetts. We describe the success and challenges of this innovative program in expanding access to COVID-19 vaccination. (*Am J Public Health*. 2022;112(11): 1556–1559. https://doi.org/10.2105/AJPH.2022.307021)

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As with prior infectious disease outbreaks and public health crises, socially marginalized communities have borne a disproportionate burden of COVID-19. In the state of Massachusetts, Black and Hispanic people have 1.5 to 3 times the risk of COVID-19 infection and higher age-adjusted incidence rates of mortality.[1] Communities with higher social vulnerability indices, predominantly composed of Black and Hispanic people, have had access to less COVID-19 testing and fewer vaccination resources than would be expected for their level of COVID-19 risk.[2] Novel, community-based efforts are needed in these communities to address the continued high burden of COVID-19 in addition to long-standing disparities in chronic diseases and health care access.

INTERVENTION AND IMPLEMENTATION

To improve access to COVID-19 vaccination, we designed and implemented an adaptable system of mobile vaccination units for medically underserved communities. Our objective was to improve access to COVID-19 vaccination in communities with high social vulnerability indices and high COVID-19 incidence rates. We also aimed to improve uptake of COVID-19 vaccination among adolescents and young adults.

With key stakeholder engagement[3,4] guiding needs assessment and intervention, we deployed vans as part of a community care initiative of our hospital system (Figure 1). We allied with a local transportation company that was at risk for downsizing because of lost business during the COVID-19 pandemic, and used their equipment and van staffing. We procured funding from our health system and the Kraft Foundation. We also gained funding from the National Institutes of Health Rapid Acceleration of Diagnostics (RADx), an initiative to speed innovation in the development, commercialization, and implementation of technologies for COVID-19 testing.

We participated in regular meetings with community partners, including nonprofit organizations, local departments of public health, school board representatives, and community members. We engaged local health department representatives in their vaccination strategies throughout the different phases of vaccine roll-out in our state. This key stakeholder engagement guided intervention, including optimization of van placement. We staffed the van with a core team consisting of a physician, medical assistant, and community health worker and utilized a large volunteer network of clinicians and research assistants. We made a dedicated effort to ensure that, in the affected communities, persons of color were represented and held leadership positions.

FIGURE 1— **Mobile Health Clinic Used in Community-Based COVID-19 Vaccination Program in the Greater Boston Area, Massachusetts, 2021**

PLACE, TIME, AND PERSONS

We deployed a program of mobile health units in the Greater Boston area. The units offer low-barrier, easily accessible vaccination on a walk-in basis without regard to insurance, immigration status, or ability to pay. Individuals presenting to the van were guided through the vaccination process, given the vaccination, and observed for the required 15- to 30-minute observation period. Vaccination was recorded in the hospital electronic medical record (EMR) and sent to state public health records via the automatic EMR reporting. These mobile units offered other preventive services, including COVID-19 testing and prevention kits (i.e., hand sanitizers, masks, and informational brochures) in addition to vaccinations. Mobile units provided COVID-19 vaccination beginning on May 20, 2021. Trained, multilingual staff also provided clinical counseling and were able to provide referrals for social and case management supports, including food supports, prescription drug assistance, and ride vouchers for clinical visits.

Free vaccination through the mobile health units was open to all persons regardless of insurance, background, residence, and citizenship. We implemented this program in communities in the Greater Boston area that have had the highest burden of COVID-19 among non–nursing home residents: Chelsea, Everett, Revere, Lynn, Roxbury, Jamaica Plain, Dorchester, and Mattapan (combined 2020 population = 439 762).[1] These communities are predominantly composed of racial and ethnic minorities, and they are in the upper third of social vulnerability indices in Massachusetts, as defined by the Centers for Disease Control and Prevention.[5]

PURPOSE

Mobile health units have previously been effective in delivering other health services to medically underserved populations—for example, in prevention and screening of sexually transmitted infections and substance use disorder.[6] During the COVID-19 pandemic, people

in economically disadvantaged communities witnessed higher rates of unemployment, unstable housing, and loss of health insurance.[7] These factors had the potential to prevent timely access to much-needed health care services through traditional clinics, including for COVID-19 vaccination.

EVALUATION AND ADVERSE EFFECTS

From May 20, 2021 to August 18, 2021, the mobile COVID-19 vaccination units held 130 sessions and administered 2622 COVID-19 vaccine doses to 1982 unique participants. Mobile health clinics administered a mean 152 vaccine doses per week (range = 46–315; Figure 2). The median (interquartile range) age of participants was 31 years (range = 16–46), 1016 (51%) were female, 1575 (80%) were non-White, and 1126 (57%) were Hispanic. Ongoing assessment by our community partners was broadly positive and motivated the expansion of mobile health clinics, particularly to adapt to changes in the pandemic (i.e., rise in Delta variant and changes in vaccine eligibility). The success of this program, serving as a proof of concept, led to additional institutional and extramural funding, and this mobile platform will add to its menu of services other preventable services for this population.

No major adverse effects were identified while the mobile clinics were operational in the community. A limited number of safety events arose in the setting of antivaccination protesters publicly expressing distrust in the mobile clinic. These were quickly and safely managed with de-escalation strategies by the mobile clinic staff and on-site security aides.

SUSTAINABILITY

The need for community-based programs of health outreach will persist in future phases of the pandemic. Mobile clinic services are reassessed on a regular basis; they include vaccination for children, booster dose vaccinations for adults, and screening and referral for social determinants of health. The mobile clinic platform and close community collaborations are also adaptable to other public health needs, including screening, counseling, and referral of sexually transmitted infections, vaccine-preventable diseases, and noncommunicable diseases.

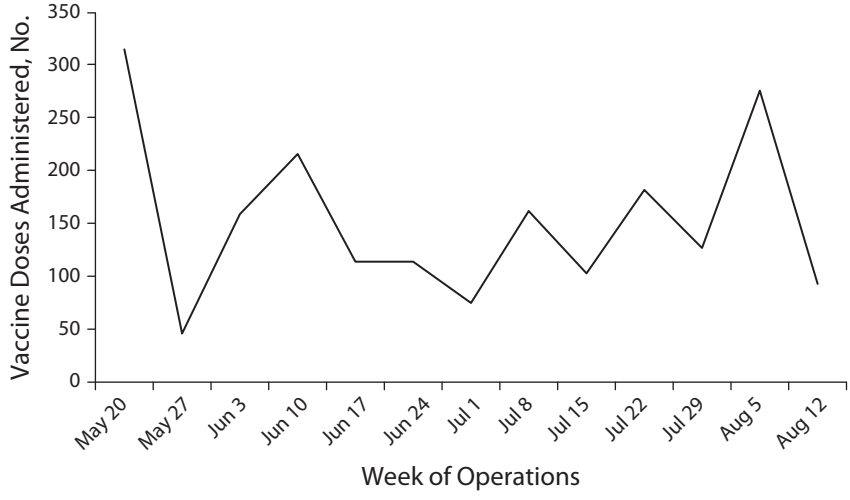

FIGURE 2— COVID-19 Vaccine Doses Administered by Week of Mobile Health Clinic Operations in the Greater Boston Area, Massachusetts, May 20–August 18, 2021

PUBLIC HEALTH SIGNIFICANCE

Current COVID-19 vaccination efforts need to gain more participation from medically underserved communities, including racial/ethnic minorities, young adults, and adolescents.[3] Throughout the United States, mass vaccination sites have been effective in scaling up vaccine coverage in a short period of time, but such efforts are frequently inaccessible to people in low-income communities who face barriers related to transportation, paid time off from work, and health literacy.[4,8] At the same time, many in-person services offered in community outpatient clinics have transitioned to virtual care. Mobile health units have the potential to improve access to COVID-19 vaccination, and other preventive health services, for medically underserved populations who disproportionately face barriers associated with these changes in health care delivery. To service the communities most affected by the pandemic, our program employed a "double equity" model by utilizing a local transportation company at risk for downsizing because of economic losses during the pandemic. We collaborated closely with our health system and with local partners to ensure that services administered on the mobile clinic meet the same standards of care in outpatient clinics. Future health needs during the pandemic will also require dedicated services and novel methods of outreach to these communities. AJPH

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P. Sarin Gupta led the collaboration and mobile unit vaccination program. A. M. Mohareb analyzed the data. P. Sarin Gupta and A. M. Mohareb interpreted the results. P. Sarin Gupta and A. M. Mohareb primarily drafted the article. All authors contributed to mobile unit vaccination program, reviewed the manuscript for appropriate intellectual content, and approved the final version of the manuscript.

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Making Vaccines Equitably Available to All Persons in Pima County, Arizona, 2020–2021

Theresa Cullen, MD, Jennie Mullins, MPH, Crystal La Tour Rambaud, RN, MPH, Pierce Lawlor, BA, and Mary V. Davis, DrPH, MSPH

We review the Pima County (Arizona) Health Department's efforts to achieve equitable COVID-19 vaccine distribution in a county with a social vulnerability index of 0.88. We expedited vaccine distribution, focusing on equitable distribution, implementing a multi–point of dispensing approach, and using a periurban and rural strategy. Pima County has one of the highest vaccine distribution percentages among the highest social vulnerability index quartiles and is more than 10 percentage points ahead of other large counties in Arizona in vaccine uptake. (*Am J Public Health*. 2022;112(11):1560–1563. https://doi.org/10.2105/AJPH.2022.307040)

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We review the effectiveness of the Pima County (Arizona) Health Department (PCHD) in achieving equitable COVID-19 vaccine distribution from December 2020 through August 2021. Initial vaccine distribution emphasized reducing stress on hospital capacity while decreasing COVID-19 community infections, following Centers for Disease Control and Prevention (CDC) guidance for distribution to priority groups.[1] PCHD continuously adjusted vaccine efforts, using multiple strategies and collaborating with existing and new partners, to aggressively expedite equitable vaccine distribution and address gaps.[2]

INTERVENTION AND IMPLEMENTATION

To advise itself on approaches to engaging and serving historically underserved and underrepresented communities and those hardest hit by the pandemic, PCHD engaged a community advisory and an ethics committee. These committees advised PCHD in its community response to meet the county's diverse needs and concerns, including ethical and equitable allocation and prioritization of scarce resources in county vaccine plans.

PCHD implemented multiple strategies to increase vaccine uptake, including data dashboards and GIS (geographic information system) mapping to identify communities with the highest levels of social vulnerability; a multi–point of dispensing (POD) approach with drive-through, walk-up, and mobile pop-up community sites, at-home and in-congregate settings; continuous engagement of county agencies and partners; and contracted and community providers. As vaccine supply became more readily available, distribution expanded using a periurban and rural strategy in partnership with federally qualified community health centers, health care providers and community-based organizations, the city of Tucson, and Tribal Nations and organizations. In February 2021, Pima County began operating mobile vaccination PODs in high-risk communities with contracted vaccine providers, public health nurses, state and federal partners, and community health workers and in partnership with elected officials, faith-based organizations, and schools.

PCHD identified POD locations based on infection, morbidity, and mortality rates; outbreak and vaccine uptake data at census tract and zip code levels; and Social Vulnerability Index (SVI) scores. Existing trusted relationships and networks established early in the pandemic through a COVID-19 testing and care coordination initiative (i.e., the Mitigating the Impact of COVID in Communities of Color Program)[3] also informed POD placement.

Plan implementation relied on collaboration with listed partners as well as local public safety, law enforcement and emergency management services, and state and county Medicaid–Arizona Long Term Care Services. Contracted

vaccination providers adopted a hub-and-spoke model from the mobile vaccination PODs to reach homebound individuals, people experiencing homelessness, and those living in high-risk congregate settings. US Department of Health and Human Services Region IX and Federal Emergency Management Agency mobile vaccination POD response teams provided support at PCHD's request.

PLACE, TIME, AND PERSONS

Pima County, Arizona, encompasses 9189 square miles, shares 124 miles of international border, and shares jurisdiction with two Tribal Nations. The city of Tucson accounts for 92% of Pima County's 1 068 730 population and has a majority minority population.[4] Pima County's SVI is 0.8828.[5] Approximately 20% of the county population is aged 65 years or older, 38% of the population is Hispanic, and 11% are Black, American Indian or Alaska Native, or Asian. Nearly 18% live below 100% of the federal poverty level, and 25% of children younger than 18 years live below 100% of the federal poverty level.[6]

PURPOSE

Immunization plans used data-driven criteria to reach populations at greatest risk for infection, severe illness, and death. County data demonstrated that poverty, population density, race and ethnicity, access to resources, occupation, and communal living settings were aggravating factors in making communities more susceptible to COVID-19 infection, severe illness, and death.[7] Designing county-level data dashboards and GIS mapping were crucial for a data-informed vaccination rollout at the census tract, zip code, and jurisdictional levels. We developed standard operating procedures for implementing precision public health to guide consistent practice and equitable response.

EVALUATION AND ADVERSE EFFECTS

PCHD exceeded the initial goal of providing 300 000 single-dose immunizations by March 31, 2021, administering 525 000 doses with at least one dose of vaccine to 362 766 people and full vaccination of 202 208 individuals. By August 26, 2021, approximately 63% of the eligible population had received one vaccine dose, 55% were fully vaccinated, and 85% of those aged 65 years or older were fully vaccinated.[8]

Figure 1 presents mobile POD site location overlayed on Pima County SVI data by census tract. POD sites were located throughout the metropolitan Tucson area in high- and moderate-SVI census tracts, in outlying rural and semiurban communities, and at the

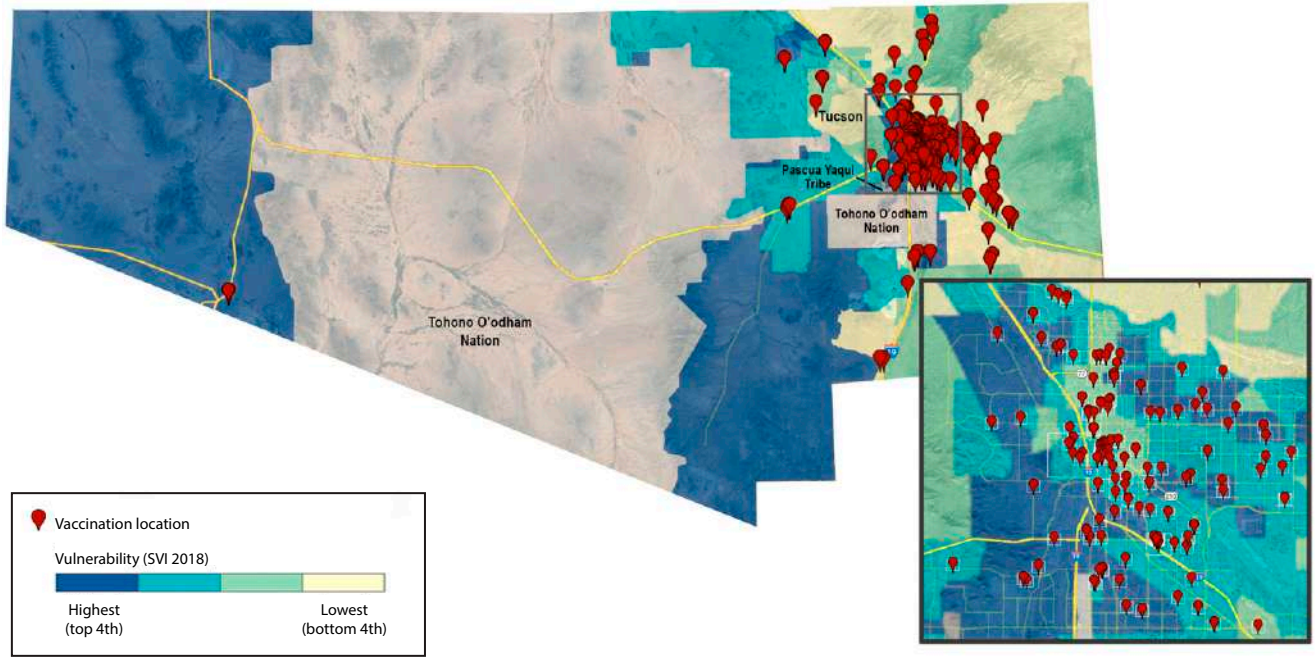

FIGURE 1— COVID-19 Vaccine Points of Dispensing by Census Tract Social Vulnerability Index (SVI): Pima County, AZ, December 2020–August 2021

United States–Mexico border. Data for tribally led vaccination activities are not included in the figure as these data reside with those entities.

Despite incomplete data at the national and local levels to fully determine equitable vaccine distribution, largely because of incomplete race/ethnicity data, Pima County has one of the highest vaccine distribution percentages among the highest SVI quartiles, which the CDC uses as a measure of equitable vaccine distribution, in the nation.[5] Pima County is more than 10 percentage points ahead of other large counties in Arizona in vaccine uptake.[9]

Through an internal review, PCHD staff and partners identified the following vaccine plan implementation facilitators. County and health department leadership implemented policies to support vaccine distribution goals—specifically providing vaccines to all persons and using data to inform equitable vaccine distribution—and leadership engaged cross-jurisdictional agencies and previously mentioned partners and advisory groups throughout. PCHD staff managed vaccine supply and allocation, developed and implemented plans and strategies, led community engagement and outreach, and created and implemented registration and support systems, POD operations, communications, data informatics, and other systems. Partners in Health partnered with PCHD's response efforts and provided technical support and expertise. Advisory committees and groups ensured that programs and plans were responsive to diverse cultural and community needs and values.

PCHD's vaccine rollout was hampered by contextual factors that affected all jurisdictions, including the scale and length of the response,[10] workforce shortages, and lack of institutional preparedness knowledge and capacity.[11,12] Workforce issues included lack of staff capacity and capability to meet the demands of assigned roles. Preparedness issues included inconsistent and inappropriate use of the Incident Command System, ensuring POD logistics were engineered and practiced before implementation, and continuously communicating vaccine strategy with staff and across jurisdictions, elected officials, and partners.

Impeding factors specific to PCHD included creating vaccine registration systems when expected solutions were not available; insufficient telephone, broadband access, and information technology; and meeting continued demands for health and risk communications, data informatics, and managing volunteers. Before and during vaccine distribution, PCHD needed to strengthen and maintain trust with new and existing partners, including health care organizations, schools, historically marginalized communities and leaders, and businesses. PCHD also had to forge formal agreements with Tribal Nations to authorize collaboration, sharing of resources, and mutual aid.

SUSTAINABILITY

PCHD continues to implement a multi-POD approach to improve vaccine uptake targeting census tracts and zip codes with lower vaccination rates. Working through county board of supervisor districts, county towns and jurisdictions, and partners, mobile PODs continue to be scheduled at schools, community sites, and nontraditional venues, including barber and tattoo shops. At-home vaccinations continue for people who are unable to leave their homes or live in congregate sites. Staff capacity, turnover, and burnout have challenged sustainability, which has been addressed through the use of contracted vaccination providers, recruitment campaigns, and additional staff compensation.

PUBLIC HEALTH SIGNIFICANCE

PCHD implemented an equitable COVID-19 vaccination plan, resulting in high vaccine coverage rates overall and a high vaccine coverage rate among those with the highest SVI. Equity-focused planning can be adapted for other public health efforts. AJPH

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Note. The contents are those of the authors and do not necessarily represent the official views of, nor an endorsement by, the CDC, the HHS, or the US government.

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The authors have no conflicts of interest to declare.

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Monkeypox, After HIV/AIDS and COVID-19: Suggestions for Collective Action and a Public Health of Consequence, November 2022

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See also COVID-19 & Monkeypox, pp. 1564–1620.

Monkeypox (MPX) presents a combination of two significant challenges the public health community faced during the COVID-19 and HIV/AIDS pandemics: homophobia and racism. In this Public Health of Consequence, we examine how homophobia and racism have shaped the perceptions of MPX, HIV/AIDS, and COVID-19 as threats to our overall population health. We highlight these two forms of discrimination as a lens to understand how the public health responses to each pandemic have been shaped as well as how they *should* be shaped.

The initial labeling of HIV/AIDS as "gay-related immune disease" was emblematic of the homophobia around HIV/AIDS even as it became clear that men and women, regardless of sexual orientation, were vulnerable. As the HIV/AIDS pandemic progressed, both HIV stigma and homophobia-related discrimination continued to thwart efforts to end the epidemic, even with increased availability of behavioral and biological HIV prevention and intervention tools. Currently, inequitable access to HIV prevention and intervention tools by both race and geography have actually increased.[1] Furthermore, homophobia fueled by the HIV pandemic was codified in many countries that criminalized same-sex sexual relations by enacting anti-homosexuality laws. In fact, there are currently 70 countries that have such discriminatory laws, and 6 of these include the death penalty in their anti-homosexuality legislation.[2] These bans conflict with the need to reach out specifically to sexual and gender minority communities while also being able to provide information to the broader public regarding modes of transmission and strategies to prevent MPX. These structural and social forms of stigma and discrimination against men who have sex with men (MSM) are heightened as the current outbreak of MPX cases appears to be transmitted primarily by male-to-male sexual behavior, despite the fact that transmission can occur via exposure to the virus or fluids containing the virus on surfaces as well as through maternal–child transmission.

Similarly, the racist labeling of COVID-19 as the "China flu" perpetuated anti-Asian stereotypes and promulgated an increase in anti-Asian hate crimes.[3] As of June 30, 2021, over 9,000 hate incidents were reported to the Stop AAPI Hate Coalition, with 63.7% involving verbal harassment, 13.7% physical assault and 11.0% involving civil rights violations. The racist stereotypes around MPX are fueled by the fact that MPX is endemic in parts of Central and West Africa. Consequently, the World Health Organization has renamed the different clades of MPX so that they no longer have a geographic connection, and a plan is underway to rename MPX itself.[4]

EPIDEMICS DO NOT OCCUR IN A VACUUM

In the United States and globally, those who have been and continue to be disproportionately impacted by HIV, COVID-19, and now MPX are people who have been made vulnerable by long-standing social, economic, and political disinvestment. Structural racism and homophobia, along with gender inequality, continue to permeate cultures globally and in the United States. This inequitable social and

structural landscape provides fertile ground for problematic attempts to fight the HIV/AIDS epidemic by, for example, criminalizing HIV transmission.[5] HIV criminalization only builds on the Black community's suspicion of the US health care system. The powerful summary by Jones and Reverby (p. 1538) reminds us of how the racist and completely wrong Tuskegee syphilis study created and perpetuated medical mistrust within the Black community. Although the name "Tuskegee" is often invoked as a large source of mistrust of the US-based medical system, we must remember the details of how the Tuskegee experiment was revealed to the public and the very slow, painful, and inadequate attempts to address the harm that had been done and that continues to reverberate throughout the HIV and COVID-19 pandemics.

During the HIV pandemic, failure to engage gay, bisexual, transgender women, and MSM in developing and deploying prevention and intervention efforts resulted in often misguided, ineffective, and unsuccessful efforts. These included closing MSM social venues; enacting restrictive or discriminatory laws against homosexuality and people living with HIV; discriminating against MSM and other at-risk individuals in housing, health care, and employment; and imposing restrictions on travel.

COVID-19 again unveiled the stark inequities in access to quality health care and environments safe from contagion, both in the United States and globally. In the United States, Black, Latinx, and Native American people were among the groups disproportionately affected by COVID-19. This disparity includes virtually every aspect of COVID-19, including infection rates, access to vaccines, serious illness, and death. This is shown in the work of Tipirneni et al. (p. 1584), which demonstrates that counties with heightened vulnerability as measured across four different indices of social disadvantage were more likely to experience increased COVID-19 morbidity and mortality.

A CALL TO ACTION

As noted by Holloway (p. 1572), to avert the mistakes in the response to the HIV and COVID-19 pandemics, the public health responses to MPX can build on policies and programs that worked as well as those that did not in the effort to mitigate the spread and impact of HIV and COVID-19. Thus, we posit the following three suggestions for collective action in support of people affected by MPX as well as those still vulnerable to infection and its wide-ranging sequalae. These investments should support multilevel interventions that address homophobia, racism, increasing resilience, and empowering community coalitions.[6]

First, we need a rapid assessment and mapping of behavioral, social, and structural factors driving MPX vulnerability by partnering with community-based organizations and other social service providers. Information from the community level up provides a more appropriate and complete picture of multilevel factors impacting MPX transmission dynamics. The availability (or lack thereof) of community-level resources can be leveraged to support and effectively disseminate MPX prevention and intervention services.

Second, involvement of communities of MPX-affected as well as vulnerable people in the design, implementation, monitoring, and accountability concerning case finding, contact tracing, and prevention is necessary. This includes the design and deployment of primary risk reduction programs to increase equitable access to vaccines and other technologies, all informed by evidence and combined with antidiscrimination policies, laws, and actions.[7] The practice pieces by Davis et al. (p. 1560), and Gupta et al. (p. 1566) provide strong support for collaborating with local health departments and community-based organizations to reduce barriers and improve access to COVID-19 testing and vaccination that can serve as exemplars for MPX testing and vaccination efforts.

Third, community leadership should be supported in designing educational messaging on MPX specifically adapted to their communities. For the broader public, messaging should avoid further stigmatizing gay, bisexual, and other MSM. For gay, bisexual, and other MSM, the Centers for Disease Control and Prevention has developed a two-page fact sheet titled "Monkeypox and Safer Sex" or "La Viruela Simica o del Mono y las Relationones Sexuales Mas Seguras" that can be adapted to be culturally relevant for the community in which it is being used.[8] Importantly, many of the recommendations for addressing HIV and COVID-19 have been about meeting communities where they are and listening to their voices. The following message from the National Black Gay Men's Coalition (NBGMAC) exemplifies the inclusivity, honesty, and clarity in messaging that we can achieve by partnering with community advocates:

> We remain committed to promoting the health and wellness of Black gay men. Monkeypox can infect anyone, but the current US outbreak is in gay, bisexual and other men who

have sex with men. NBGMAC knows that viruses never stay where they start. Protect yourself with knowledge.

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From COVID-19 to Monkeypox: Unlearned Lessons for Black, Latino, and Other Men With HIV Who Have Sex With Men

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See also COVID-19 & Monkeypox, pp. 1564–1620.

The past few years have demonstrated that infectious diseases remain a challenge for public health. Unfortunately, the United States is still unprepared to respond to public health emergencies. Monkeypox (MPX) is a viral zoonosis (an infection transmitted to humans from animals) with symptoms like those seen in people with smallpox, a phylogenetically related virus. However, it is clinically less severe.[1] In April 2022, MPX was identified in the United Kingdom and has been found throughout Europe and other parts of the world. The current MPX strain behaves differently from those historically found in Central and Western Africa.[2] The first case in the United States was confirmed in May 2022, and diagnoses have grown exponentially since that time. On July 23, 2022, after more than 23 000 cases were confirmed cases globally—including eight deaths—the World Health Organization director general declared the current MPX outbreak a public health emergency of international concern.[3] During the first week of August, the United States declared MPX a public health emergency, and by then, there were more than 26 000 cases worldwide, one in four of which was diagnosed in the United States.

In the United States, most confirmed cases of MPX have been among gay, bisexual, queer, and other men who have sex with men (MSM), with New York State reporting the most, followed by California, Florida, Georgia, and Texas. Washington, DC, has the highest case rate by population, and these diagnoses potentially underestimate the actual number of cases. If the COVID-19 pandemic in the United States can serve as a guide, MPX infections could take hold first in the coastal states and then move to the interior of the United States.

Several lessons from COVID-19 have not been heeded in the current outbreak. These lessons include the need for timely and disaggregated surveillance data, free or affordable access to testing and vaccines, greater prioritization of populations at greatest risk, and tackling multiple, overlapping structural barriers.

TIMELY DISAGGREGATED DATA

Despite being three months into the outbreak of MPX in the United States, we are operating in the dark. The Centers for Disease Control and Prevention (CDC) declared MPX a notifiable disease on August 1, 2022. Before then, it was voluntary for states and territories to share the data with the CDC. A little more than 24 months ago, public health authorities were figuring out how to respond to an emergent pandemic while lacking critical data.[4] Information about those disproportionately overrepresented among COVID-19 morbidity and mortality cases was fundamental to addressing already known health inequities.[5] Essential public health practices have not changed despite knowing the significant adverse outcomes of insufficient information to respond to a public health crisis. The lack of disaggregated data from the states and territories is hampering the response to the MPX outbreak because data use agreements to share fundamental information, such as race/ethnicity and HIV status, are still not in place. As of July 26, 2022, the CDC had detailed information on only about half of the reported cases.[6]

After assessing publicly available data, we found that only 12 states and territories report some sociodemographic characteristics, mostly location (i.e., county,

health region) and sex of those confirmed to have MPX. The most recent CDC report on the epidemiological and clinical characteristics of MPX diagnosed cases in the United States through July 22, 2022, included information from only 41% of the cases because of incomplete data. Findings from this report confirmed that most infections have been reported among Black (26%) and Latino (28%) MSM as well as MSM with HIV (41%).[7] Using data of confirmed MPX cases from selected counties, it has been reported that up to 80% of MSM of color with MPX are also HIV positive.[8]

Although MPX has been sexually transmitted in the current outbreak, the transmission has not been limited to the skin contact common during sexual intercourse. Household clusters have been identified in Europe,[9] and in the United States, we already have cases reported among infants.[10] However, because of the lack of data, we do not have reliable information on secondary attack rates, nor can we make accurate projections of future new infections or tailor prevention strategies. This appalling scenario mimics the poor early response to the COVID-19 pandemic, in which limited data and proper interventions fueled infections and deaths among racial/ethnic minorities, people whose first language is not English, and those with low health literacy, among others.[5]

Another parallel is the challenge of addressing a public health emergency that may disproportionately affect certain groups without stigmatizing or increasing their social vulnerability. During the response to the COVID-19 pandemic, we saw an increase in racist attacks on Asians and Asian Americans.[11] During the MPX outbreak, we are experiencing the resurgence of historically negative connotations associated with same-sex sexual practices, HIV, sex work, and sexual and gender minorities, as evidenced by the reluctance of health workers to draw blood from men with suspected MPX cases.[12,13] Homophobia and other forms of discrimination kill. If early prevention and services fail, the impact of this virus among MSM, particularly among Black and Latino MSM, will be devastating.

TESTING AND VACCINES

As with the COVID-19 pandemic, MPX testing began very slowly and was limited to only a subset of authorized laboratories. Testing capacity has ramped up, from being limited to CDC and other public health laboratories to being expanded to commercial laboratories. Combining the public health laboratories and commercial sector, the total MPX testing capacity in the United States is 80 000 tests per week,[14] but we are not reaching this capacity. Data on the number of tests performed also are not being publicly released. It is imperative to remove barriers to testing and provide culturally congruent services, considering the negative experiences of Black and Latino MSM when seeking testing for other infections.[15,16] Health care providers must recognize the clinical manifestations of MPX, which sometimes are similar to syphilis and other sexually transmitted infections, and provide testing when necessary. Testing also must be provided free in community settings (e.g., clubs, bars), community-based organizations, and sexual health clinics trusted by MSM populations. With an efficient testing infrastructure, better surveillance can be conducted and sentinel studies can be implemented in collaboration with health departments, community partners, and academia.

Unlike in the early stages of the COVID-19 pandemic, when we lacked an efficacious vaccine, we have vaccines that offer protection against MPX, but they are in limited supply. The MPX vaccines are being made available through the Strategic National Stockpile. As of August 12, 2022, the US Department of Health and Human Services (HHS) has shipped 634 213 vials of Bavarian Nordic's JYNNEOS, a US Food and Drug Administration–licensed vaccine to prevent smallpox and monkeypox in adults 18 years and older.[17] The ACAM2000 vaccine is also available and in much greater supply, but because of significant side effects is not recommended for everyone. The HHS reports allocating the JYNNEOS vaccine to "meet the needs of at-risk individuals and prioritize the hardest-hit jurisdictions, which have high case burden and transmission rates."[17] This vaccine allocation strategy will likely adapt as the outbreak evolves. However, there is undoubtedly an inequitable distribution of the vaccines and not enough information to optimize the distribution of limited supplies. Most doses have been allocated thus far to New York State, California, and Florida, where most MPX cases have been identified; however, concentrations of Black and Latino MSM, as described later, inhabit other jurisdictions.

As with COVID-19 testing and vaccines, slots for MPX vaccines have been made available primarily online. We need vaccines in the arms of the most vulnerable, including Black and Latino MSM. They are negatively affected by social factors, such as access to technology and employment, which can challenge their vaccine uptake. Eligible people who do not have fast Internet access or the ability to leave work to get a vaccine have been left behind. Similarly, without knowing the HIV status of

confirmed cases, the HHS is blinded to providing vaccines to locations where sexual networks with people with HIV could be at increased risk for infection and disease progression. As documented in a Kaiser Family Foundation report,[18] the current distribution of MPX vaccines is very limited in jurisdictions with high concentrations of Black and Latino MSM and MSM with HIV, including several states in the South (e.g., AL, MS) and Puerto Rico. Furthermore, most are going to White recipients even where the vaccines are available. In North Carolina, 70% of the cases are in Black men, but only 24% of vaccines have gone to Black recipients (67% have gone to White recipients).[19]

Lesbian, gay, bisexual, transgender, and queer (LGBTQ) people are more likely to engage in vaccination efforts, as evidenced by their uptake of the COVID-19 vaccine, than are heterosexuals. Using data from the National Immunization Survey–Adult COVID Module, the CDC found that gay men reported high COVID-19 vaccination coverage and vaccine confidence compared with other sexual minority groups. It is worth noting that COVID-19 vaccination coverage was lower among non-Hispanic Black sexual minorities but still close to 75%.[20] MSM and other LGBTQ populations are receptive to public health innovations during public health emergencies. There may be more of them with a high willingness for MPX vaccination than there are vaccines available, which may contribute to the shortage of vaccines.

PRIORITIZING POPULATIONS

The response to the MPX outbreak needs to be bolstered. A greater focus should be placed on containing the outbreak in MSM and other populations at elevated risk for HIV. Early evidence also suggests that special attention should be placed on vaccinating and treating people with HIV. As shown in Figure 1, communities of color are disproportionately affected by HIV. Consequently, this public health emergency should prioritize Black and Latino MSM, transgender people, sex workers, and people who use drugs.

The CDC has already issued recommendations for treatment and prophylaxis for MPX among people with HIV and has recognized the increasing severity of MPX infection among people who have advanced HIV or are not virologically suppressed. The CDC also has documented the safety of the JYNNEOS vaccine for people with HIV and the considerations for MPX treatment in this group.[21] The JYNNEOS vaccine provides a significant immune response after the first dose. Data from the United Kingdom based on ELISA (enzyme-linked immunoassay) testing shows that the immune response 28 days after the first dose is up to 83% among people without HIV and 67% among people with HIV. At 42 days or 14 days after the second shot, the immune response per HIV status was 98% and 96%, respectively.[22]

However, these data are from a group of people with HIV who were virally suppressed. Because Black and Latino MSM are less likely to be virally suppressed than are White MSM—possibly leading to worse MPX outcomes—MSM of color living with HIV should be among the groups prioritized for the second dose of the JYNNEOS vaccine. Moreover, the US transition to one fifth of the recommended vaccine

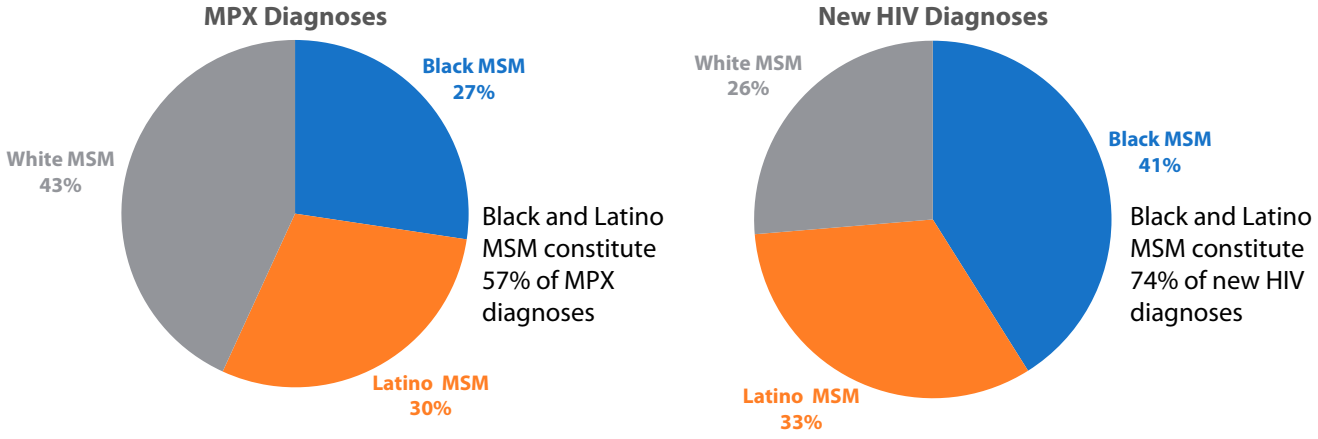

FIGURE 1— Cumulative Monkeypox (MPX; 2022) and New HIV (2020) Diagnoses Among Black and Latino Men Who Have Sex With Men (MSM) vs White MSM: United States

Source. Centers for Disease Control and Prevention (CDC) Morbidity and Mortality Weekly Report Epidemiologic and Clinical Characteristics of Monkeypox Cases (August 5, 2022) and CDC HIV Special Focus Profile (2020 data).

dose will raise questions of equity, given that communities of color have been less likely to be vaccinated with the standard 0.05 milliliter dose. In addition, the lower vaccine dose must be administered intradermally, increasing the likelihood of scarring and keloids among people of color and the possibility of underdosing if injections are administered too deeply.

As in the early days of the HIV epidemic and the COVID-19 pandemic, community-based organizations are responding to the needs of MSM. It is no surprise to witness these communities' resourcefulness and resilience again. However, many organizations operate in constant public health emergency mode while resources are limited. Any resources that are made available in response to the MPX outbreak must be provided to organizations working with Black and Latino MSM and MSM with HIV. These organizations know their communities and, over time, have gained the trust of those often underserved by the broader health care system. Funding should support the work of Black- and Latino-led organizations; LGBTQ organizations; ballroom communities; leather and other groups serving gay, bisexual, and transgender populations; and networks of people with HIV, sex workers, and people who use drugs. These groups can work with other stakeholders and community clinical providers to educate, promote harm reduction practices among, screen, vaccinate and treat people with a diagnosis or at heightened risk for MPX. They can do so with a stigma- and shame-free approach to sexual health and consistently with the values of different MSM and people with HIV.

Resources should also be allocated to addressing syndemics. For example, meningococcal disease vaccination should be expanded to all MSM, not only those in or traveling to Florida. Public sexually transmitted infection clinics and primary health care centers providing comprehensive sexual health, HIV, and sexually transmitted infection services must receive funding for their crucial services. Social support should be contemplated for those who may lose their jobs, reduce their income, or lack the resources to isolate during care or prevent the virus's transmission.

TACKLING BARRIERS

As with COVID-19, structural barriers remain challenging to health equity in the fight against MPX. However, we have lessons learned from the response to previous and current public health emergencies, on such topics as community engagement and research, that certainly should help reduce the disparities during this outbreak. The engagement with the LGBTQ community and racial and ethnic minorities must be supported at all stages of the response, from crafting and delivering prevention messages to developing national guidelines. This community engagement will be effective only if we create conditions in which communities are empowered to make decisions, provide recommendations, and manage resources. Their safety is fundamental, and the stress and vulnerability caused by recent legal decisions about sexual health, sexuality education, and inclusion of transgender people in different social contexts should be acknowledged as these communities engage in the public health response. Likewise, the National Institutes of Health should provide funding for research to understand the impact of the current MPX outbreak and its overlap with HIV and explore whether prevention fatigue may affect MPX prevention and care practices among people at risk for or with HIV.[23]

Several lessons from the response to the COVID-19 pandemic seem to have been unlearned. The CDC needs more information to face the public health emergency, but the agency depends on voluntary information sharing from the states. Under the US Constitution, states have primary responsibility for public health. But this presumes that states finance public health. Today, however, the federal government is the primary payer for public health through grants to states and territories (and to cities to a limited extent). There may need to be a renewed negotiation over the terms of collaboration between the federal government and the states for the federal government to have a more comprehensive national picture of public health threats and to be able to mobilize all federal, state, and local resources more quickly in the face of significant threats to the public. Congress needs to consider these issues and to work with the executive branch. Legislation may be required for a comprehensive system to manage epidemiological data in the United States and to develop an updated and stronger collaborative relationship between federal and state agencies that allows more nimble responses and that fosters public trust. Creating more bureaucracy is not the solution to public health problems.

The LGBTQ communities, including MSM, have learned from decades of response to the HIV epidemic. More recently, we have faced an unprecedented pandemic. In the United States and globally, we have the resources to contain this MPX outbreak and avoid the resurgence of health inequities. We must collectively do everything we can

to keep our broader communities healthy. Otherwise, we will be perpetuating health inequities by choice. AJPH

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Lessons for Community-Based Scale-Up of Monkeypox Vaccination From Previous Disease Outbreaks Among Gay, Bisexual, and Other Men Who Have Sex With Men in the United States

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See also COVID-19 & Monkeypox, pp. 1564–1620.

As of August 5, 2022, there have been more than 7500 confirmed or suspected monkeypox (MPX) cases in the United States—mostly among gay, bisexual, and other men who have sex with men (GBMSM).[1] These numbers are certainly underestimates, given the lack of widespread testing. Although effective vaccines exist, they are in short supply, and to date, the federal government has prioritized MPX postexposure prophylaxis. The World Health Organization and the Centers for Disease Control and Prevention (CDC) have highlighted the significance of controlling the spread of MPX early on as the number of cases climbs rapidly[2]; however, this will take coordinated planning by public health officials, local health jurisdictions, and GBMSM communities as the federal government makes more vaccines available.

In the coming months, the federal government will deploy an estimated 1.6 million doses of the two-dose JYNNEOS vaccine to prevent MPX.[3] Although scale-up of MPX vaccination is a key pillar of the Biden–Harris administration's strategy to combat the MPX virus, the plan lacks guidance for local health jurisdictions about how to deploy vaccines to reach those most affected by MPX. The health inequities that GBMSM already face compared with their heterosexual counterparts demand focused attention on our communities without further stigmatizing GBMSM in the context of MPX. Fortunately, we can rely on scientific evidence from previous infectious disease outbreaks primarily affecting GBMSM, including HIV and invasive meningococcal disease, as well as lessons learned from the COVID-19 pandemic.

Although invasive meningococcal disease is more virulent and fatal than monkeypox, vaccine coverage among GBMSM is low: the 2018 study by Holloway et al. estimated that less than 40% of GBMSM had been vaccinated during an ongoing outbreak in Southern California.[4] By contrast, a February 2022 CDC *Morbidity and Mortality Weekly Report* noted that nearly 90% of GBMSM had received at least one dose of the COVID-19 vaccine,[5] which may bode well for MPX vaccination campaigns. However, the long-complicated relationship between GBMSM and public health presents potential barriers: many GBMSM continue to face challenges trusting and accessing health care services. If efforts to control the spread of MPX in the United States are to be effective, public health must work collaboratively with GBMSM communities on vaccination implementation. Figure 1 outlines four key strategies for improving MPX vaccine coverage among GBMSM.

A strengths-based perspective for achieving MPX vaccination among GBMSM, including GBMSM living with HIV, should use existing health care engagement. In the United States, an estimated 700 000 GBMSM are living with HIV,[6] and hundreds of thousands more are current users of HIV preexposure prophylaxis, a prevention strategy that requires quarterly sexually transmitted infection testing. During the 2016 invasive meningococcal disease outbreak, Holloway et al. found that 12% of preexposure prophylaxis users had not been vaccinated for invasive meningococcal disease—a key missed opportunity for vaccination during preexposure prophylaxis provider visits.[7] HIV service providers, sexual health clinics, and CDC-funded preexposure prophylaxis centers of excellence should

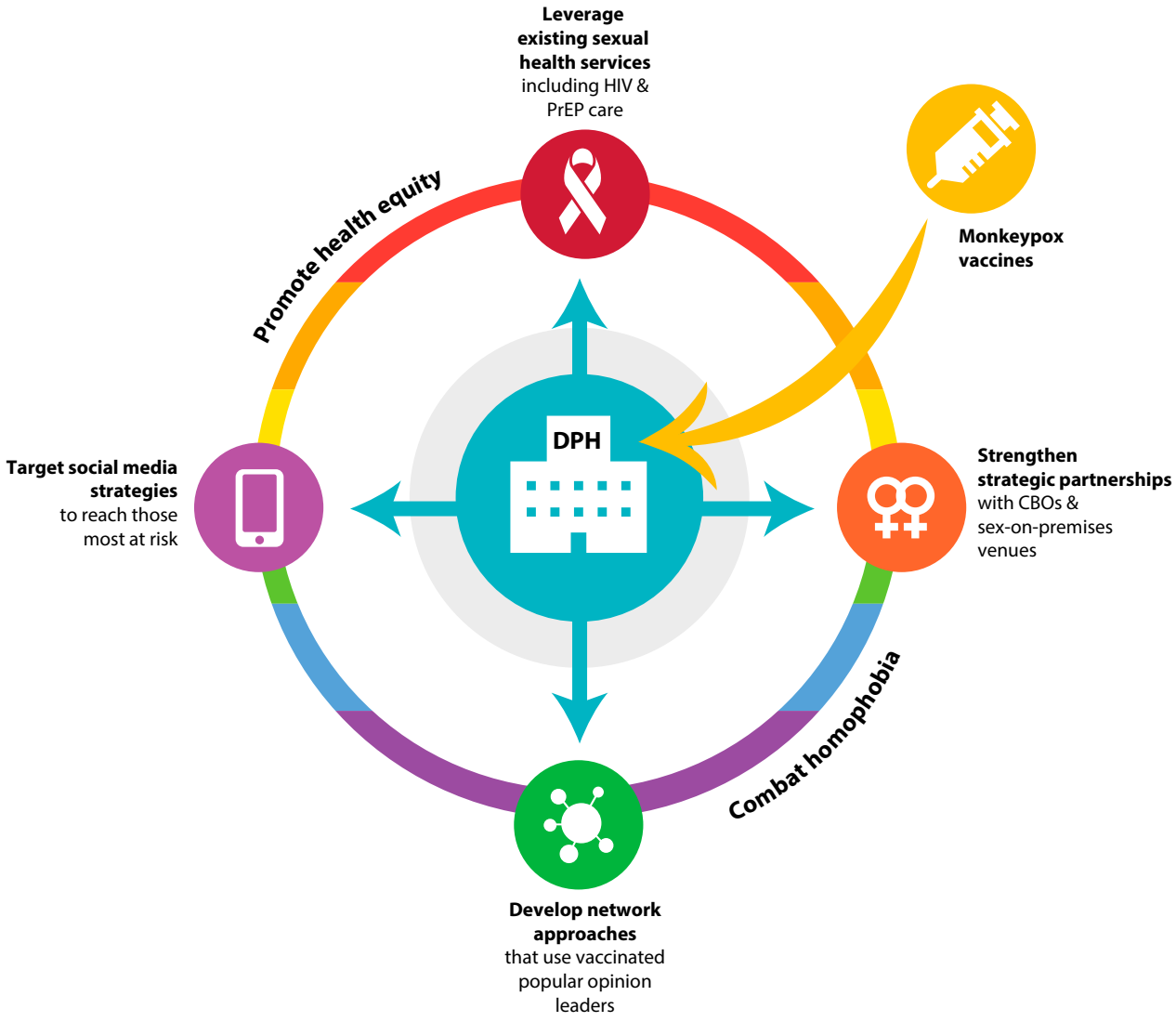

FIGURE 1— Four Community-Based Strategies for Scale-Up of Monkeypox (MPX) Vaccination Among Gay, Bisexual, and Other Men Who Have Sex With Men in the United States

Note. CBO = community-based organization; DPH = department of public health; PrEP = preexposure prophylaxis.

be prioritized as MPX vaccination sites. This strategy would benefit those who are immunocompromised and those whose sexual behaviors may put them at elevated risk for contracting MPX.

As with COVID-19, local health jurisdictions have been the first to receive limited JYNNEOS vaccine. In preparation for widescale distribution, public health officials across the United States should forge and strengthen existing relationships with lesbian, gay, bisexual, transgender, and other sexual and gender minority (LGBTQ+) community–based organizations that serve GBMSM. These same organizations have been at the forefront of educating GBMSM about MPX while minimizing stigma about the disease. Many of these community-based organizations are federally qualified health centers or are affiliated with health care networks that have established trust with GBMSM over decades and are well poised to be MPX vaccine providers.

Beyond community-based organizations that serve the LGBTQ+ community, public health providers must establish robust partnerships with sex-on-premises venues that cater to GBMSM. Bathhouses, saunas, raves and other electronic music events, and popular sex parties are ideal places to hold vaccination clinics. Many sex-on-premises venues already offer HIV and

sexually transmitted infection prevention services (e.g., informational resources, weekly sexually transmitted infection testing) and are keenly interested in health promotion. In the early days of HIV, some local health jurisdictions closed sex-on-premises venues, cutting off key opportunities for community education during an emerging health crisis. Now, approaching owners and organizers of sex-on-premises venues early and making the case for protecting staff and patrons from MPX in ways that respect the social context will be crucial. As we learned from COVID-19, these clinics need to be carefully managed to meet the requirements of vaccine storage and to schedule follow-up appointments for those receiving their first dose. Planning now will ensure that protocols and processes are ready for deployment when vaccine supplies arrive.

Although many GBMSM attend sex-on-premises venues, more seek sexual partners via geosocial networking applications and Web sites. The 2016 California Department of Public Health guidance for invasive meningococcal disease vaccination included GBMSM who sought partners through Web sites or telephone digital apps, as they are more likely to have multiple sex partners and to have been diagnosed with a sexually transmitted infection than GBMSM who do not use these technologies.[4] Grindr, a popular dating app among GBMSM, has recently been used for MPX-specific education efforts, yet there are hundreds of niche apps and Web sites used by GBMSM who would not be reached by Grindr. Public health departments, therefore, must get comfortable with advertising vaccination opportunities on other niche gay sex partner–seeking platforms. Further collaboration with GBMSM networking apps to create profile fields that indicate whether users have been vaccinated for MPX, as was done with COVID-19, will simultaneously raise awareness of and set community norms for vaccination.

One of the most well-established HIV prevention interventions among GBMSM is the popular opinion leader model.[8] Just as MPX is being spread via dense, interconnected social networks, vaccination information can be too. As public health departments and community-based organizations are vaccinating early adopters, likely those with the most confidence in vaccines, they should also be distributing and incentivizing referrals. GBMSM who are interested in becoming opinion leaders can be trained on how to talk to their friends and acquaintances about MPX. Public health departments and community-based organizations can begin holding workshops now for GBMSM who wish to serve their communities in this way.

Online popular opinion leader interventions have been used to increase discussions of sexual health and HIV testing among racial/ethnic minority GBMSM.[9] This strategy may be especially helpful in promoting MPX vaccination uptake among racial/ethnic minority GBMSM, who have had lower levels of COVID-19 vaccination than their White counterparts.[5] Although the federal government prioritizes vaccine allocation to jurisdictions with the highest MPX disease burden, local public health officials must pay careful attention to creating vaccination access points in diverse communities and offering vaccination clinics with weekend and evening hours. Finally, demographic data must be collected at vaccination, and those data should be rapidly synthesized and delivered back to local and federal public health officials to promote vaccine equity strategies.

One of the most widely shared videos on social media regarding MPX is that of an actor, Matt Ford, who contracted MPX and shared his story.[10] Personal anecdotes are effective ways to shift public opinion. Many remember the positive impact that Magic Johnson and Pedro Zamora had on changing attitudes about HIV in the early 1990s. GBMSM community leaders, including drag and adult film performers, who have been vaccinated should be recruited (and compensated) to tell their stories. Personal accounts that highlight the importance of protecting oneself and protecting one's community are powerful and can inspire widespread MPX vaccination in GBMSM communities. These efforts also combat stigma, one of the most intractable challenges in the fight against HIV.[11] Unfortunately, we have seen a rise in online homophobia surrounding MPX as well as prominent figures, including celebrities and politicians, spreading the misinformation that MPX is a "gay disease." Of course, MPX can affect anyone, and although it is currently concentrated in GBMSM communities, stigmatizing messages will only hamper ongoing public health efforts. In response, we must meet homophobic discourse with condemnation and focus our efforts on community education that inspires MPX vaccination, testing, and treatment.

Unlike the early days of the HIV epidemic, we currently have a presidential administration that acknowledges and values the lives of GBMSM. In late May, less than a month after the first cases of MPX were detected in the United States, the White House convened a meeting of LGBTQ+ community leaders to discuss strategies for combating the MPX virus. This is a stark contrast to the federal government's inaction

during the first years of the HIV epidemic. Although there is certainly more to be done to combat MPX, including substantial resource allocation to local health jurisdictions to implement vaccination, the efforts of GBMSM activists are not being ignored as they were in the early 1980s.

In addition, unlike the early days of the COVID-19 pandemic, we have a US Food and Drug Administration–approved vaccine, which is currently being deployed and ordered in bulk. We also have a community ready to receive MPX vaccination and an established network of LGBTQ+ community–based organizations and opinion leaders ready to disseminate messaging to encourage vaccination. In the coming weeks and months, as JYNNEOS becomes more widely available, the strategies I have described can help establish widespread MPX vaccination coverage among GBMSM in the United States. AJPH

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Getting the Message Right: Nurses and Vaccine Hesitancy

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See also COVID-19 & Monkeypox, pp. 1564–1620.

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Vaccines are the single most effective prevention tool to protect the public from severe disease and mortality from COVID-19. This issue of *AJPH* includes an important new study by Rich-Edwards et al. (p. 1620) of COVID-19 vaccination among nurses using the Nurses' Health Study and Growing Up Today Study cohorts to assess COVID-19 vaccine uptake and hesitancy in spring 2021 among a large representative sample of the US nursing workforce.

Vaccination of health care personnel is essential for reducing severe illness and ensuring adequate workforce capacity, both in this pandemic and future public health emergencies. As nurses are the largest group of health care providers in the United States, high vaccination coverage in this segment of the health care workforce confers distinct benefits. Nurses are one of the most patient-facing members of the health care team. Their close contact while providing patient care can increase the risk of virus transmission to themselves, their families, fellow health care providers, and patients. Additionally, the close relationships patients have with their nurses provide more opportunities for nurses to influence patients, as some may feel more comfortable asking questions or seeking advice from nurses.

Rich-Edwards et al. point out that perceived vaccine hesitancy among nurses, as reported in the media,[1] may have contributed to vaccine hesitancy in the general public. Indeed, nurses are consistently rated the number one most honest and ethical professionals in the United States and thus are a key source of trusted health information for the general public.[2] Media narratives about nurses matter for public health: they affect the extent to which the public trusts nurses for health care and health information and the extent to which policymakers and the public are willing to support the nursing workforce. These much-needed data from Rich-Edwards et al. that 91% of US nurses were vaccinated against COVID-19 in spring 2021 confirm that stories about vaccine hesitancy among nurses are overrepresented. Furthermore, the authors illuminate two important narratives about nurses and vaccine confidence, as well as hesitancy for the public and for the profession of nursing.

First, findings from this study suggest that the public can rely on nurses as the most trusted profession in regard to COVID-19 vaccination. The vast majority of nurses was vaccinated early and has been dedicated vaccine advocates. Nurses vaccinated their health care colleagues and the public, from the first authorization of COVID-19 vaccines for high-risk health care personnel in 2020 to vaccination of infants and children in 2022. Nursing professional organizations, including the American Nurses Association and the American Academy of Nursing, among others, have endorsed COVID-19 vaccination for their members and the public.[3,4]

In addition to putting their lives on the line by providing patient care during the pandemic, nurses have consistently prioritized the needs of patients, families, and the public along with their own needs by accepting COVID-19 vaccines in large numbers. Nurses remain a trustworthy source of vaccine information and are overwhelmingly provaccine. Studies suggest that small numbers of health care personnel of all types (e.g., nurses, physicians, pharmacists) refuse COVID-19 vaccines because of personal beliefs, concern about medical conditions, or potential allergic reactions or side effects, but this minority does not represent any major health care profession.[5,6] It is essential that negative media narratives about nurses and vaccines be corrected with empirical data so that the public can continue to trust nurses when they need health care and accurate health information.

The second narrative from this study is for nurses themselves about their

role in population health equity. Among the 7% of nurses who had not received and were not planning to receive a COVID-19 vaccine at the time of the study, Rich-Edwards et al. identified several factors associated with nurse vaccine hesitancy that may be targeted for interventions. These included lower level of nursing education, working in home health or congregate care, residing in the US South, and having previously had COVID-19. Race/ethnicity and political affiliation have also been identified as factors implicated in vaccine hesitancy, although these constructs were not explored in detail among nurses in the study by Rich-Edwards et al.[7,8] Vaccine-hesitant nurses cited concerns about safety and side effects, believing the vaccine was ineffective and not being worried about COVID-19 or already having had COVID-19 as reasons for refusal.

These findings suggest a need for a paradigm shift for the profession of nursing in how we apply our ethical code to patients and the public. Nurses have an ethical obligation to safeguard patient autonomy and practice with beneficence, nonmaleficence, and justice.[9] However, nurses are primarily taught to apply this ethical code to individual patients and families. In light of the COVID-19 pandemic and other longstanding health equity challenges in the United States, individual care ethics can no longer be considered sufficient for nursing practice. Ethical practice in nursing must extend to population health; in other words, nurses of the future must understand the role of their individual practice ethics in shaping population health and must see population health equity as part of nursing's scope of practice.[10]

The National Academy of Medicine report *The Future of Nursing 2020–2030: Charting a Path to Health Equity* lays out a vision for the next decade to use the nursing workforce to achieve health equity.[11] Nursing education programs and professional organizations must adapt accordingly, emphasizing population health competencies, pandemic preparedness, and how to operationalize principles of health equity in nursing care. Such changes must extend to all levels of nursing education, including vocational and practical nurses and nurses with associate degrees, and to all settings, including home health and long-term care, particularly in the US South and underresourced communities.

Despite limited detail by race/ethnicity and socioeconomic status and the study's cross-sectional nature before recommendations for COVID-19 vaccine booster doses, Rich-Edwards et al. present compelling data affirming that US nurses have overwhelmingly received and supported COVID-19 vaccines. These data point to two critical messages: first, that nurses can be trusted to advocate vaccination and public health and, second, that disparities in vaccine uptake among nurses signal the need for a reorientation of nursing to population health equity. By linking nursing practice ethics to population health equity, going beyond a responsibility to individual patient care alone, nurses can continue to merit the position of number one most trusted and use this trust to promote public health. AJPH

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Vaccine Hesitancies Across the World in the Era of COVID-19

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See also COVID-19 & Monkeypox, pp. 1564–1620.

As one of the most cost-effective ways to prevent diseases, vaccination is saving millions of lives each year, and COVID-19 vaccines are no exception to this success. From December 2020 to December 2021, immunization against SARS-CoV-2 (the causative agent of COVID-19) is thought to have prevented nearly 20 million deaths worldwide.[1] In terms of numbers of doses administered, countries affected, or media coverage, COVID-19 vaccination campaigns have broken records. It is thus not surprising that along with this unprecedented mass vaccination has come unprecedented debate about vaccination.[2] In their research article in this issue of AJPH, Beca-Martínez et al. (p. 1611) analyze trends and factors associated with vaccine hesitancy and acceptance in Spain, a country where vaccination rates have traditionally been high.

Defined by the World Health Organization's Strategic Advisory Group of Experts on Immunization as a "delay in acceptance or refusal of vaccines despite availability of vaccination services,"[3] vaccine hesitancy captures the "middle of a continuum ranging from total acceptors to complete refusers."[4(p2150)] Unlike the polarizing term "antivax," "vaccine-hesitant individuals" depicts with more nuance the people who have access to the vaccine but are not vaccinated. Indeed, a majority of unvaccinated people are not formally against vaccination but either have doubts, prefer to wait, or are reluctant to get a specific vaccine but not others.

For COVID-19, vaccine hesitancy prevalence was estimated at around 25% worldwide in June 2021, although varying greatly over time and place.[5] In Spain, Beca-Martínez et al. found a 15.1% rate of vaccine hesitancy at the same period, confirming a relatively high acceptance there compared with other European countries, and they further point out some determinants of vaccine hesitancy. Although some of those determinants were found to have a similar association in other countries (e.g., gender or trust in scientists), some show more complex relations to vaccine acceptance depending on time and place (e.g., age or socioeconomic status). Through a few selected examples, we aim to discuss how those determinants play a role in other parts of the world. Because each situation is composed of multiple layers of complexity, it is beyond the scope of this editorial to exhaustively describe how determinants come into play in each example.

DETERMINANTS OF VACCINE HESITANCY

According to Beca-Martínez et al., high levels of trust in health care professionals and confidence in institutions might be key factors for vaccine acceptance in Spain. Those findings are consistent with previous studies on COVID-19 vaccines in which mistrust in science or governments was strongly associated with vaccine hesitancy.[5] On the other side of the spectrum, Russia shows remarkably low levels of trust in health authorities. In a 2021 study conducted in 17 countries (upper-middle-income to high-income countries only), less than 50% of Russians expressed trust in national public health organizations, making Russia the country with the lowest level of trust assessed.[6] Poland and Ukraine also showed high levels of mistrust toward national health organizations. Overall, distrust in health authorities seems to be one of the factors explaining the vaccine gap between Western and Eastern Europe.

In the United States, mistrust in the health system has been shown to be one of the reasons for lower vaccination rates among some ethnic minority populations, especially in Black communities.[7] Often explained through a historical lens by the legacy of unethical research such as the Tuskegee study, this mistrust is also related to contemporary experiences of racial discrimination in hospitals, lack of representation, or structural inequities in health care.[7]

According to Beca-Martínez et al., older age was associated with higher vaccine acceptance, which correlates with previous results in Europe,

Northern America, and South Korea.[5] Age being a main risk factor for severe disease and death, older individuals see a greater benefit in immunization and are more likely to get vaccinated. Furthermore, older people, born into a world with far fewer vaccines, have observed the success of many vaccines over their lifetime, which may also explain their greater acceptance.

Interestingly, age was conversely associated with higher hesitancy rates in China.[8] Some cultural reasons for this hesitancy might be a preference among the elderly for traditional Chinese medicine or the belief that vaccines are dangerous for fragile patients with chronic diseases.[9] Difficulties for older populations in accessing the vaccine also add to the picture, resulting in low vaccine coverage in adults aged 60 years and older—for example, in Shanghai, where only 38% were fully vaccinated (i.e., received three doses) in May 2022. Low vaccination rates in the elderly can result in consequential situations, such as in Hong Kong during the fifth wave of the SARS-CoV-2 pandemic. With nearly 20% of the population aged older than 60 years unvaccinated, Hong Kong registered fatality rates 10 times higher than that of countries like New Zealand, where only 2% of those aged older than 65 years were unvaccinated (0.76% vs 0.07% crude case fatality rates).[10]

Health literacy is another determinant that has shown mixed association with vaccine hesitancy in literature. Although usually found to promote vaccination, as in the research by Beca-Martínez et al., health literacy has been paradoxically associated with greater hesitancy—for example, for the influenza vaccination in the United States or for the national immunization program in the Netherlands.[4,11] This could be because better health literacy—and especially critical health literacy, defined as "cognitive skills that can be applied to critically analyze information and use it to exert greater control over life events and situations"—allows greater self-determination in health decisions.[11(p479)] Hence, patients with good critical health literacy are more prone to deliberate over their doctor's recommendations than others.

Moreover, some authors highlight a lack of standardization in the assessment of health literacy and state that a differentiation between general health literacy and vaccine literacy might be useful.[11] Some groups may have good health knowledge in certain areas but negative views on vaccination, especially if their health knowledge is influenced by anthroposophical or alternative medicine beliefs.[4]

ADDRESSING VACCINE HESITANCY

The examples given show the variety and complexity of determinants of vaccine hesitancy, which can change across time, regions, and communities. Often unfairly labeled as "antivax," vaccine-hesitant individuals have various reasons for doubt that are understandable and sometimes legitimate. The crystallization of tensions and the polarization of debates on vaccination can discourage those unvaccinated people who are open to dialogue and would like their concerns to be heard. Understanding and acknowledging the complexity of vaccine hesitancy determinants can be a first step toward a healthier debate. Moreover, this complexity highlights the need for tailored responses to different populations of vaccine-hesitant individuals. Although changing people's minds is a difficult task, informing correctly remains the duty of clinicians and health authorities, and some dialogue-based interventions have proven successful in reducing vaccine hesitancy.

For example, efforts to counter misinformation, such as public information campaigns, are essential for addressing vaccine hesitancy. The circulation of misinformation about vaccines greatly influences public perception of vaccine safety and efficacy and increases vaccine hesitancy.[5] Health organizations and health care workers need to share evidence-based, easily understandable information to address myths and false rumors. However, rational arguments may be insufficient or even ineffective in changing the opinion of some. In a health care provider–patient relationship, trying to convince by stating hard facts can be counterproductive. This has led to the development of a motivational interviewing approach in the context of vaccine hesitancy.[12] Initially developed in the treatment of addictions, motivational interviewing relies on a nonjudgmental, collaborative communication approach that does not rely on giving hard facts, unless specifically requested by the patient. Moreover, the clinician does not position himself or herself to convince, but listens to the patient and explores his or her ambivalence toward vaccination.

In addition, strategies to address vaccine hesitancy that involve community engagement, such as collaborating with trusted actors among vaccine-hesitant communities, can be effective.[13] In vaccination campaigns against polio, involvement of religious or traditional leaders has proven to be particularly efficient in African and European countries.[14] In Switzerland, involving complementary and alternative medicine providers in the creation of communication tools for vaccine-hesitant parents has helped in

tailoring a better-fitting message for a skeptical audience.[15]

To conclude, vaccine hesitancy is a complex phenomenon, and its determinants are not always transferable across countries, communities, or vaccine types. Regional and qualitative studies are therefore of great value for better understanding vaccine hesitancy. Vaccine-hesitant individuals are not a uniform group of people, and the reasons for their doubts are varied and often legitimate. Hearing those doubts and reestablishing dialogue not only is a necessary step toward better vaccination rates, but it could also be beneficial for better adherence to health recommendations in general. AJPH

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Rethinking the Role of Jails Amid COVID-19

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See also COVID-19 & Monkeypox, pp. 1564–1620.

The COVID-19 pandemic is not over, especially for the most vulnerable. Just recently, on August 1, 2022, Pinellas Jail announced an extended lockdown because of a COVID-19 outbreak.[1] As noted by Levintow et al. in this issue of *AJPH* (p. 1589), jails are common outbreak sites for COVID-19 because of their crowded spaces and limited availability of hygiene products. Yet, jail administration is often opaque, and there are no enforceable national standards to ensure that jails meet constitutional requirements for the health and safety of those they house. This makes surveys of jail practices important. Levintow et al. impressively surveyed 254 jails in four states across the Southeast during the pandemic to document COVID-19 mitigation strategies as well as testing and test positivity rates. Previous research on COVID-19 in jails tended to focus on single-site jails, making the study by Levintow et al. among the first to examine COVID-19 conditions across a variety of jail types and sizes.

Beyond COVID-19, jails serve as poorly executed social and health care safety nets for structurally marginalized people[2] because of the lack of resources in communities. For instance, jails are among the largest providers of mental health care in the country, with Los Angeles County Jail in California, Cook County Jail in Illinois, and Riker's Island in New York each housing more people with mental illness than the largest psychiatric hospital in the United States. In fact, one report estimated that there are three times as many people with mental illness in prisons and jails as there are in hospitals.[3] Most people with mental illness in jails have been arrested for survival crimes, such as retail theft or breaking and entering to find a place to sleep, which are the result of social problems such as poverty and unaffordable housing and health care.[4] Once people with mental illness are inside jails, however, the jails lack the resources to provide adequate care for their treatment and safety.

THE ROLE OF JAILS IN US HISTORY

Jails existed as early as 1635 in the American colonies for people who committed crimes, but they were not used as punishment.[5] Instead, they were small, holding only a few people at a time as they awaited their corporal punishment (e.g., whipping post, hanging, branding iron). "Poorhouses" were separate institutions for housing "vagabonds, beggars, idle persons, and those without manual crafts" and "other dissolute persons," such as people with mental illness.[5] These early institutions of confinement were characterized by high rates of infectious disease transmission, mortality, and violence.[6] The Walnut Street Jail in Philadelphia, Pennsylvania, opened in 1776, combining the jail and poorhouse models to become the first penitentiary model in the world. Being confined to a jail, separate from society, and made to do hard labor as punishment for a crime—what Thomas Jefferson referred to as a type of "penal slavery"[6]—was seen as a more humanitarian alternative to corporal punishment and the death penalty. For the first time, imprisonment became the regular mode of punishment for the majority of crimes.[5] With the rise of centralized, state-operated penitentiaries, especially after the abolishment of chattel slavery,[7] the role of jails in local communities was transformed.

Today, there are more than 3000 independently operated jails in the United States. Jails are distinct from state and federal prisons, where much of the COVID-19 focus has been concentrated, because they are typically operated at the county level by the county sheriff's department. Jails process about 10 million bookings annually, have a collective average daily population of 750 000 (prepandemic), and cost taxpayers $25 billion per year.[8] Prisons almost exclusively house people who have been convicted of a crime who are more often than not subjected to penal slavery, allowed by the Thirteenth Amendment to the US Constitution, whereas two thirds of people held in jails are awaiting adjudication (disposition of their case), meaning they have not yet been convicted of a crime but remain incarcerated, often because they cannot afford bail. Even short-term stays in jail as part of pretrial detention can have negative social, economic, and health consequences for individuals and their families. Of course, the collateral consequences of incarceration are not evenly distributed among social groups, nor have they ever been. One study found that 26.8% of Black men and 16.2% of

Latino men have been jailed by age 38 years, compared with 3% of White men,[9] which is compelling evidence of structural racism.[10] Nevertheless, the United States continues to respond to social issues such as poverty, homelessness, trauma resulting from interpersonal violence, mental illness, and substance use with jails. It is within this sociohistorical context that structurally marginalized people continue to be at heightened risk for COVID-19.

JAIL RESPONSES TO COVID-19

Levintow et al. found variable implementation of Centers for Disease Control and Prevention–recommended COVID-19 mitigation strategies and generally low testing coverage across jails in the first year of the pandemic. Not surprising, they found that there was almost universal uptake of low-barrier mitigation strategies (e.g., symptom screening, temperature check, increased cleaning, symptomatic testing) and low uptake of high-barrier strategies (e.g., asymptomatic testing, mask requirements, depopulation). What is surprising is that at the time of the survey, only 50% of jails had ever conducted at least one COVID-19 test. The authors note that one of the limitations of their study is lack of data on barriers to testing. Did jails not test because administrators felt it was unnecessary? Because they lacked testing kits and resources for testing and treatment? Because they did not want to disrupt the jail by responding to a known positive case (e.g., through lockdowns, increased health checks)?

THE FUTURE OF JAILS

As the COVID-19 pandemic continues and jails start to report cases of monkeypox,[10] depopulation of jails (i.e., reducing the number of people behind bars) remains the best approach from a public health perspective, but it will also require corresponding community supports. For example, a housing-first approach—connecting people with stable housing with no preconditions—has been shown to break the homelessness–jail cycle.[11] As the authors noted, slowing transmission in jails will directly protect incarcerated persons and staff and confer indirect benefits to the general population.

More broadly, this is a moment to rethink the role of jails, and our larger system of punishment, in US society. Are jails obsolete?[12] The Ending Police Violence Collective (www.endingpoliceviolence.com) has proposed a range of policies, endorsed by the American Public Health Association, that would "decrease reliance on the criminal legal system and move towards an abolitionist future, centering the public's health and wellbeing." In this future, jails are rendered unnecessary because social problems are adequately addressed and people have the resources they need to live healthy lives. However, for the 10 million people who pass through jails this year, effectively implementing evidence-based infectious disease mitigation strategies is the least we can demand. AJPH

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Associations of 4 Geographic Social Vulnerability Indices With US COVID-19 Incidence and Mortality

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See also COVID-19 & Monkeypox, pp. 1564–1620.

Objectives. To examine and compare how 4 indices of population-level social disadvantage—the Social Vulnerability Index (SVI), the Area Deprivation Index (ADI), the COVID-19 Community Vulnerability Index (CCVI), and the Minority Health–Social Vulnerability Index (MH-SVI)—are associated with COVID-19 outcomes.

Methods. Spatial autoregressive models adjusted for population density, urbanicity, and state fixed effects were used to estimate associations of county-level SVI, MH-SVI, CCVI, and ADI values with COVID-19 incidence and mortality.

Results. All 4 disadvantage indices had similar positive associations with COVID-19 incidence. Each index was also significantly associated with COVID-19 mortality, but the ADI had a stronger association than the CCVI, MH-SVI, and SVI.

Conclusions. Despite differences in component measures and weighting, all 4 of the indices we assessed demonstrated associations between greater disadvantage and COVID-19 incidence and mortality.

Public Health Implications. Our findings suggest that each of the 4 disadvantage indices can be used to assist public health leaders in targeting ongoing first-dose and booster or third-dose vaccines as well as new vaccines or other resources to regions most vulnerable to negative COVID-19 outcomes, weighing potential tradeoffs in their political and practical acceptability. (*Am J Public Health*. 2022;112(11): 1584–1588. https://doi.org/10.2105/AJPH.2022.307018)

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In a remarkable turn in public health history, the majority of US states followed national guidance on equitable COVID-19 vaccine allocation by adding place-based social disadvantage indices in allocation plans.[1] Social disadvantage indices matter for general public health goals and equity because they prioritize resource allocation to subpopulations with a higher risk of experiencing infections and negative health outcomes from the virus.

Planners used a range of indices for COVID-19 vaccine distribution, increasing vaccine allocations to more socioeconomically disadvantaged areas.[1] However, the indices differ on important dimensions, including the numbers and types of social variables or constructs incorporated and the geographic level.[2]

The most widely adopted index, used by 28 states, is the Centers for Disease Control and Prevention (CDC) 2011 Social Vulnerability Index (SVI), which comprises 15 variables from the American Community Survey.[3] The 2020 COVID-19 Community Vulnerability Index (CCVI), used by 5 states, is based on the SVI and integrates 40 variables, including COVID-19-specific items.[4] The 2013 Area Deprivation Index (ADI), used by 2 states, is a general policy tool comprising 17 variables.[5] The 2011 Minority Health–Social Vulnerability Index (MH-SVI), developed by the Office of Minority Health and the CDC, extends the SVI by incorporating 33 American Community Survey variables, including expanded racial/ethnic minority statistics.[6] The ADI operates at the census block group level (600–3000 people), the SVI's and CCVI's lowest resolution is the census tract (1200–8000 people), and the MH-SVI operates at the county level.[2]

Unlike the SVI, MH-SVI, and CCVI, the ADI does not include race/ethnicity, which can matter for legal and political issues associated with prioritization. For example, targeting underserved populations with use of the SVI has been challenged by policymakers in several states with concerns regarding the legal precedent for using race/ethnicity in health resource allocation and allegations of reverse discrimination.[7,8]

In previous work, we found that the SVI was significantly associated with COVID-19 incidence and mortality[9] and intensity of hospital treatments.[10] However, despite this greater burden, areas with high SVI values are less likely to have robust vaccination rates.[11,12]

An important question for public health practitioners and policymakers making vaccine allocation decisions is whether differences in the design of social disadvantage indices affect their association with COVID-19 incidence and mortality. With new COVID-19 variants potentially requiring new vaccines, the initial vaccine supply is not likely to be able to meet demand, and questions regarding optimal prioritization in distribution plans will arise again. In this study, we examined how the SVI compares with the ADI, CCVI, and MH-SVI in predicting COVID-19 outcomes using updated data to inform future policy and resource allocation decisions regarding the use of disadvantage indices.

METHODS

We used data from the CDC (SVI and MH-SVI), Surgo Ventures (CCVI), the University of Wisconsin (ADI), and the *New York Times* (COVID-19 incidence and mortality data, aggregated from state and local health departments). The sample included 3125 counties or county equivalents in the 50 US states and Washington, DC. Five boroughs of New York City and some smaller counties and boroughs in Alaska were excluded from the analysis because only aggregated COVID-19 data at geographic levels larger than counties and boroughs were reported; 10 other county equivalents with missing data were also excluded. We calculated county-level incidence and mortality rates per 100 000 population by dividing cumulative COVID-19 cases and deaths (as of July 31, 2021) by the total county population and multiplying by 100 000. Rates were log transformed to satisfy normality assumptions for analysis.

Because nationwide COVID-19 data are not available at more granular geographic levels, all disadvantage index data were harmonized at the county level. We transformed ADI data from the census block group level to the county level using a population-weighted average; data for the SVI, MH-SVI, and CCVI were already available at the county level. All indices and subindices are available as percentile rankings, with the SVI, MH-SVI, and CCVI ranging from 0 to 1 and the ADI ranging from 0 to 100. We multiplied SVI, MH-SVI, and CCVI values by a factor of 10 and divided ADI values by a factor of 10 so that the resulting regression coefficients for each index were comparable. Each index or subindex was examined in a separate regression model to avoid multicollinearity.

We used spatial autoregressive models to estimate associations between county-level SVI, MH-SVI, CCVI, and ADI values and COVID-19 incidence and mortality rates with a generalized spatial 2-stage least squares estimator that accounted for spatial autocorrelation and controlled for spillover effects from neighboring counties. An inverse-distance spatial matrix denoting decreasing effects with increasing distance was used for each model, with a spatial lag for the outcome variable and residual errors. Covariates included population density, rural–urban classification, and state fixed effects accounting for differences in pandemic management policies. After analysis, regression coefficients were exponentiated for ease of interpretation to reflect the percentage change in COVID-19 outcomes for a disadvantage index increase of 10 percentile ranks (i.e., 1 decile).

We conducted sensitivity analyses to ensure the robustness of our findings, including New York City as an aggregate county in the analysis, limiting the time period to before vaccine rollout in December 2020, adjusting for community mobility, and assessing temporal trends with serial cross-sectional analyses. All of these analyses produced findings similar to those of the main analyses.

RESULTS

All 4 disadvantage indices had similar positive associations with COVID-19 incidence and mortality. For every index decile increase, the incidence rate increased by 4% for the CCVI, 3% for the ADI, 3% for the SVI, and 3% for the MH-SVI (Table 1). The ADI had a stronger association with COVID-19 mortality than the other indices, increasing by 20% for each decile increase in the index, compared with 9% for the CCVI, 7% for the SVI, and 6% for the MH-SVI. Each SVI, MH-SVI, and CCVI subindex was significantly associated with COVID-19 incidence, and most were significantly associated with mortality (Table 1).

DISCUSSION

Despite differences in component measures, all 4 indices we assessed demonstrated an association between

TABLE 1— Associations Between Disadvantage Indices and US COVID-19 Incidence and Mortality as of July 31, 2021

Disadvantage Index	Incidence, b (95% CI)	Mortality, b (95% CI)
ADI[a]	1.03 (1.03, 1.04)	1.20 (1.17, 1.22)
SVI[b]	1.03 (1.03, 1.03)	1.07 (1.06, 1.08)
Socioeconomic status subindex	1.02 (1.02, 1.03)	1.08 (1.06, 1.09)
Household characteristics and disability subindex	1.01 (1.00, 1.01)	1.06 (1.05, 1.07)
Minority status and language subindex	1.03 (1.03, 1.04)	1.02 (1.01, 1.03)
Housing type and transportation subindex	1.02 (1.02, 1.02)	1.03 (1.02, 1.04)
MH-SVI[c]	1.03 (1.03, 1.03)	1.06 (1.04, 1.07)
Socioeconomic status subindex	1.02 (1.02, 1.03)	1.08 (1.06, 1.09)
Household characteristics and disability subindex	1.01 (1.00, 1.01)	1.06 (1.05, 1.07)
Minority status and language subindex	1.02 (1.01, 1.02)	0.99 (0.98, 1.00)
Housing type and transportation subindex	1.02 (1.02, 1.02)	1.03 (1.02, 1.04)
Health care infrastructure subindex	1.00 (0.99, 1.00)	0.99 (0.98, 1.00)
Medical vulnerability subindex	1.02 (1.02, 1.03)	1.08 (1.07, 1.09)
CCVI[d,e]	1.04 (1.03, 1.04)	1.09 (1.08, 1.11)
Socioeconomic status subindex	1.02 (1.01, 1.02)	1.06 (1.05, 1.07)
Minority status and language subindex	1.03 (1.03, 1.04)	1.02 (1.01, 1.03)
Housing type, transportation, household composition, and disability subindex	1.03 (1.02, 1.03)	1.05 (1.04, 1.06)
Epidemiological factors subindex	0.98 (0.97, 0.98)	1.05 (1.04, 1.07)
Healthcare system factors subindex	1.03 (1.02, 1.03)	0.99 (0.98, 1.01)
High risk environments subindex	1.02 (1.01, 1.02)	1.06 (1.05, 1.07)
Population density subindex[e]	1.02 (1.01, 1.03)	0.99 (0.98, 1.01)

Note. ADI = Area Deprivation Index; CCVI = COVID-19 Community Vulnerability Index; CI = confidence interval; MH-SVI = Minority Health–Social Vulnerability Index; SVI = Social Vulnerability Index. The regression coefficient was exponentiated from log-transformed data representing the percentage change in COVID-19 outcomes for a disadvantage index increase of 10 percentile ranks.

[a]ADI includes 17 census/American Community Survey (ACS) measures. National rankings for US census block groups are provided as a percentile ranging from 1 to 100. In this analysis, ADI rankings were divided by 10 to aid in comparisons with the SVI, MH-SVI, and CCVI.
[b]SVI includes 4 subindices composed of 15 ACS measures. The overall SVI and each subindex are percentile ranks ranging from 0 to 1, with higher values indicating greater social vulnerability/disadvantage. Each index was multiplied by 10 to aid in comparisons with the ADI, MH-SVI, and CCVI.
[c]MH-SVI is an extension of the SVI and incorporates 4 indices included in the SVI and 2 additional indices composed of 33 ACS measures. Similar to the SVI, the overall MH-SVI and each subindex are percentile ranks ranging from 0 to 1, with higher values indicating greater social vulnerability/disadvantage. Each index was multiplied by 10 to aid in comparisons with the ADI, SVI, and CCVI.
[d]CCVI includes 7 subindices composed of 40 measures derived from the ACS; the Behavioral Risk Factor Surveillance System; the National Cancer Institute; the National Center for HIV, STD and TB Prevention; the Centers for Medicare & Medicaid Services; the Bureau of Labor Statistics; and other government and nonprofit organizations. The overall CCVI and each subindex are percentile ranks ranging from 0 to 1, with higher values indicating greater social vulnerability/disadvantage. Each index was multiplied by 10 to aid in comparisons with the ADI, MH-SVI, and SVI.
[e]Models incorporating the overall CCVI and the CCVI population density subindex did not include additional covariates to avoid multicollinearity.

greater disadvantage and COVID-19 incidence of a similar magnitude. Although all of the indices were associated with COVID-19 mortality, there was more variation in the magnitudes of the relationships, suggesting that the different social variables used to construct each index may mediate or moderate other pathways relevant to illness severity and death.

Although the CCVI was developed to tailor the SVI to COVID-19 by incorporating additional variables, neither the CCVI nor the MH-SVI produced stronger mortality or incidence associations. The mortality association was weakest for the MH-SVI and strongest for the ADI, the index that offers the most fine-grained geographic resolution and involves the lowest risk of legal challenges given its exclusion of race variables. Yet, as a CDC-issued index, the SVI commands significant authority among public health practitioners nationally.

Policymakers should consider data availability and practical application when selecting an index for use in ensuring equitable COVID-19 testing, treatment, and vaccine resources.

For federal and state policymakers who frequently have data available at the census tract or county level, the SVI, MH-SVI, and CCVI may all be similarly effective. However, there may be political tradeoffs in areas where debates about the use of race in resource allocation limit use of these indices. For county health department or health system planners who may have neighborhood-level data, the ADI can be used to target concentrated areas of social disadvantage for resource allocation. Targeting these smaller geographic units may be advantageous for ensuring equitable testing or other local resources within counties, although there may be tradeoffs in accuracy because margins of errors are greater in smaller geographic areas. Thus, each index might be applied at different geographic levels and in different policy contexts to promote equitable COVID-19 testing, treatment, and vaccine resources.

A potential limitation of this study is that our county-level analyses did not incorporate individual-level patient risk factors such as medical comorbidities, nor did they focus on more granular neighborhood-level effects. These county-level analyses were conducted to harmonize the geographic level of data across indices for comparison purposes, but they may not have accounted for heterogenous areas of disadvantage within counties. In addition, our use of rates as outcome variables disregarded differences in county population size, which may have biased or reduced the efficiency of our estimates. This is a limitation of spatial autoregression methods because programs in commonly used software packages do not currently allow analytic weights to be included in model estimations.

PUBLIC HEALTH IMPLICATIONS

Overall, our findings suggest that despite differences in design, each of the social disadvantage indices assessed in this study can be used in different ways to assist public health leaders' efforts to promote efficient and equitable vaccine allocation, weighing potential tradeoffs in their political and practical acceptability. AJPH

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CONTRIBUTORS

R. Tipirneni led the conceptualization and design of the study and wrote the first draft of the article. H. Schmidt and P. M. Lantz contributed to the conceptualization and design of the study and revised the article to add important scientific and public health content. M. Karmakar led the analysis and revised the article to add important methodological content.

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The authors have no relevant conflicts of interest to disclose.

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

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SARS-CoV-2 Mitigation Strategies, Testing, and Cases at 254 Jails in the US Southeast, October 2020 to May 2021

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See also COVID-19 & Monkeypox, pp. 1564–1620.

Objectives. To characterize severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) mitigation strategies, testing, and cases across county jails in the Southeastern United States, examining variability by jail characteristics.

Methods. We administered a 1-time telephone survey to personnel of 254 jails in Alabama, Georgia, North Carolina, and South Carolina between October 2020 and May 2021.

Results. Some SARS-CoV-2 mitigation strategies (e.g., screening at intake, isolation and masking for symptomatic persons) were commonly reported (≥ 75% of jails). Other measures, such as masking regardless of symptoms (52%) and screening at release (26%), were less common and varied by jail state or population size. Overall, 41% of jails reported no SARS-CoV-2 testing in the past 30 days. Jails with testing (59%) tested a median of 6 per 100 incarcerated persons; of those jails, one third reported 1 or more cases of positive tests. Although most jails detected no cases, in the 20% of all jails with 1 or more case in the past 30 days, 1 in 5 tests was positive.

Conclusions. There was low testing coverage and variable implementation of SARS-CoV-2 mitigation strategies in Southeastern US jails during the first year of the COVID-19 pandemic. (*Am J Public Health*. 2022;112(11):1589–1598. https://doi.org/10.2105/AJPH.2022.307012)

Jails are common outbreak sites for COVID-19, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).[1] Jails' crowded, confined spaces greatly inhibit social distancing, and access to hygiene products and protective equipment is often inadequate.[2,3] Early in the COVID-19 pandemic, mass testing among incarcerated persons in jails across the United States revealed SARS-CoV-2 infection prevalence as high as 87%,[4] and more recent studies have reported COVID-19 case rates up to 3 times as high for incarcerated populations and staff compared with the general population.[1,5,6] As Black, Latinx, and other persons of color are overrepresented in the criminal justice system, the high COVID-19 burden in these settings further contributes to ongoing racial health disparities.[1,7–9] And, although efficacious COVID-19 vaccines are now available, preventive effects may be suboptimal in jails because vaccine hesitancy and limited delivery slow uptake[10,11] while constant population churn and emerging variants can reseed infection.[12–14]

The Centers for Disease Control and Prevention (CDC) issued guidance on COVID-19 management in correctional and detention facilities in March 2020, with updates in 2021.[15] Recommendations include suspending transfers and visitation, providing hygiene supplies and protective equipment, and instituting social distancing, symptom screening, quarantine, and isolation. Though measures such as suspending visitation have been successfully adopted in some jails,[16] jail administrators have faced challenges in implementing others, particularly because of constraints of dormitory housing and limited capacity for isolation and quarantine.[17] The CDC also

recommends that jails use diagnostic testing for persons with COVID-19 symptoms or exposure and screening testing to identify asymptomatic cases.[15] However, early reports from some jails suggest that testing may be largely symptom-driven, without regular asymptomatic screening.[6,18] While some prisons have instituted mass testing for SARS-CoV-2, the few studies reporting testing in jails suggest considerably lower testing rates in these settings.[4,6,19]

Understanding COVID-19 disease burden and control measures is critical to reducing morbidity and mortality in the highly vulnerable populations associated with jails. Little is known about SARS-CoV-2 cases, testing, and mitigation measures in jails in the US Southeast, where incarcerated populations are predominantly Black[20] and there have been high COVID-19 case rates[1] as well as suboptimal vaccination uptake.[21] Furthermore, the limited jail-related research on SARS-CoV-2 conducted in the United States has generally focused on single jails or a collection of facilities within a single county or state.[10,17] Against this backdrop, we aimed to characterize SARS-CoV-2 mitigation strategies and to estimate testing rates and test positivity in all county jails across 4 Southeastern US states. By examining variability by jail characteristics, we sought to identify potential predictors of successful SARS-CoV-2 mitigation and testing implementation in these settings.

METHODS

We invited jail administrators, health care leadership, and health care providers at all county jails in Alabama (n = 66), Georgia (n = 143), North Carolina (n = 93), and South Carolina (n = 44) on a rolling basis between October 2020 and May 2021 to participate in a 1-time telephone survey on internal and community health care resources available to Southeastern jails. Temporary holding facilities (often referred to as city jails) were excluded. The survey lasted 45 to 60 minutes, and, when allowable by the jail, respondents received remuneration of $35.

Measures

With SARS-CoV-2 emerging during survey development, a section was designed specifically to address jails' COVID-19 policies and practices. Items were developed based on CDC recommendations for COVID-19 management in jails[15] and the general state of knowledge in the first 6 months of the pandemic. The survey was refined through qualitative interviews with 8 jails and tested in 2 cognitive interviews and 2 pilot surveys.

The COVID-19 items assessed the use of SARS-CoV-2 mitigation measures in respondents' jails. These measures included screening (via symptom reports and temperature checks), along with isolation and mask use after a positive screen or upon subsequent development of symptoms. Other mitigation measures assessed were facility cleaning, availability of soap and hand sanitizer, off-site transport, telemedicine, cohorting (in which incarcerated persons are grouped together based on day of admission), masking regardless of symptoms, and reductions to the jail population size.

In addition to mitigation measures, the survey addressed SARS-CoV-2 testing practices and reported positive cases. Respondents were asked about the frequency of testing for incarcerated persons, including after a positive screen or close contact with a case, and whether all staff were tested after a case in the incarcerated population. They also reported on the jail's use of isolation and early release following a positive SARS-CoV-2 test, as well as screening and quarantine for contacts of SARS-CoV-2 cases. Finally, respondents were asked to report the numbers of incarcerated persons tested and cases that had been detected at the jail in the past 30 days.

Other survey items concerned characteristics of jails (population size, health care staffing) and of respondents (demographics, current position, and duration of employment at the jail).

Statistical Analysis

We performed descriptive analyses to summarize jail and respondent characteristics across facilities. Prevalence of each SARS-CoV-2 mitigation measure was calculated as the percentage of jails reporting the measure's implementation, stratified by state (AL, GA, NC, or SC) and jail population size (≤ 50, 51–200, or ≥ 201 incarcerated persons). A mitigation measure was considered to be commonly adopted if reported by at least 75% of jails in each state and size stratum. For measures reported by fewer than 75% of jails in any state or size stratum, we assessed meaningful variability, which we defined as a difference of at least 10 percentage points between at least 2 state or size categories.

We calculated SARS-CoV-2 testing rates by dividing the reported number of incarcerated persons tested in the past 30 days by the total currently incarcerated at the jail. Respondents reported the population size at the time of the survey, which we assumed to be stable over the past 30 days. Rates were multiplied by 100 to correspond to the number tested per 30-day period per 100 incarcerated persons. We calculated

SARS-CoV-2 test positivity percentages by dividing the number of persons who tested positive in the past 30 days by the total persons tested in the past 30 days at the jail, multiplying by 100. We stratified both testing rates and test positivity percentages by state and population size.

To facilitate rough comparison of testing rates and test positivity percentages calculated at the level of individual jails—which were spread broadly across each state—with state-level metrics, we calculated SARS-CoV-2 testing rates and test positivity percentages for each state's general population during the study period. We used publicly available data on state population sizes from the US Census Bureau, along with daily SARS-CoV-2 tests and rolling averages of 7-day test positivity from the CDC COVID Data Tracker.[22] We calculated 30-day testing rates daily by dividing the number of tests reported for the past 30 days by the state's population size, multiplying by 100. We calculated test positivity percentages daily by taking the mean of rolling 7-day test positivity percentages reported by the state for the past 30 days. We conducted all analyses with R version 4.1.1.[23]

RESULTS

The study population comprised 254 jails in Alabama, Georgia, North Carolina, and South Carolina, out of 346 jails total in those states. The number of jails participating and response rates (percentage of all jails) by state were 84 (90%) in North Carolina, 48 (73%) in Alabama, 32 (73%) in South Carolina, and 90 (63%) in Georgia. The median jail population size was 100 to 115 incarcerated persons at the time of the survey, with one quarter reporting 50 persons or fewer. Population size was similar across states, although Alabama and South Carolina jails were somewhat more likely to have more than 200 persons than were jails in Georgia and North Carolina. Approximately half of Alabama and South Carolina respondents reported that the jail's population size exceeded its capacity in the past 30 days (vs 28% in NC and 19% in GA; Table A, available as a supplement to the online version of this article at https://ajph.org).

Mitigation

Some mitigation measures were commonly adopted across jails, regardless of state or population size (Table 1). Respondents at all jails reported screening incarcerated persons for SARS-CoV-2 at intake, with most (97%) reporting use of temperature checks and symptom questionnaires. Overall, 87% of jails reported that screening via temperature checks and symptom questionnaires also occurred during incarceration. For persons reporting symptoms, 97% and 91% of respondents reported that isolation (alone or with other symptomatic persons) and mask use were typically required, respectively. Most jails (87%) instituted screening among staff, generally with daily temperature checks and symptom questionnaires. Other common measures were increasing cleaning (98% of all jails) and availability of soap and hand sanitizer (95%), limiting transport off-site (88%), and making masks available to all incarcerated persons (86%).

Less common mitigation measures, all of which had meaningful variation by jail population size or state, were mask requirements (regardless of symptoms) for both incarcerated persons and staff (separately), use of cohorting, reductions in population size, use of telemedicine, and screening at time of community release (Table 1). Universal mask use by incarcerated persons was more commonly required by larger jails (62% of those with ≥ 201 persons vs 51% and 46% of those with ≤ 50 and 51–200 persons, respectively) and jails in South Carolina (72% vs 48% to 54% in other states). Mask requirements were more common for staff than for incarcerated persons, with slightly less variability for staff versus incarcerated persons by size and state.

Cohorting was more frequently reported by larger jails (74% of jails with ≥ 201 persons vs 53% and 56% of jails with ≤ 50 and 51–200 persons, respectively), and reductions in population size were more likely at jails in Georgia (78%) compared with other states (56%–63%). Telemedicine use varied by state, with 41% to 48% of jails in South Carolina and Alabama reporting increases, as compared with 29% to 32% of jails in Georgia and North Carolina. Although screening at intake and during incarceration was common, screening at release was reported by only 26% of jails, with considerable differences by state (ranging from 7% in GA to 63% in AL) and size (16%, 22%, and 39% in jails with ≤ 50, 51–200, and ≥ 201 persons, respectively).

Testing

Respondents at most jails (94%) reported that SARS-CoV-2 testing typically would be performed for any incarcerated person following report of symptoms. The majority (81%) did not conduct asymptomatic testing, except in circumstances of known contact with a case. If an incarcerated person tested positive for SARS-CoV-2, few jails (5%)

TABLE 1— Prevalence of SARS-CoV-2 Mitigation Measures in Jails: 4 Southeastern US States, October 2020–May 2021

	Overall, No. or %	State, No. or %				Population Size, No. or %		
		AL	GA	NC	SC	≤50	51–200	≥201
No. of jails	254	48	90	84	32	57	120	76
Measures commonly adopted across states and population sizes								
Screening at intake	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Screening during incarceration	87.0	87.5	91.1	79.8	93.8	84.2	83.3	94.7
Staff screening	86.6	93.8	80.0	90.5	84.4	84.2	85.8	90.8
Isolation if symptomatic	96.9	93.8	97.8	98.8	93.8	94.7	97.5	97.4
Mask use if symptomatic	91.3	85.4	86.7	97.6	96.9	91.2	92.5	89.5
More frequent routine cleaning	98.0	95.8	97.8	100.0	96.9	96.5	97.5	100.0
Available soap, hand sanitizer	94.5	95.8	94.4	95.2	90.6	96.5	92.5	96.1
Available masks to all incarcerated persons	85.8	75.0	88.9	90.5	81.3	87.7	84.2	86.8
Limiting transport off-site	87.8	79.2	92.2	86.9	90.6	89.5	89.2	84.2
Measures less common and varying by state or size								
Screening at release	26.0	62.5	6.7	25.0	28.1	15.8	21.7	39.5
Requiring all incarcerated persons wear masks	52.0	54.2	47.8	47.6	71.9	50.9	45.8	61.8
Requiring all staff wear masks	83.1	83.3	74.4	88.1	93.8	80.7	80.0	89.5
Cohorting	60.6	70.8	47.8	67.9	62.5	52.6	55.8	73.7
Reduced jail population	66.9	60.4	77.8	63.1	56.3	71.9	66.7	63.2
More frequent telemedicine	35.0	47.9	32.2	28.6	40.6	29.8	38.3	32.9

Note. SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2. Population size was missing for 1 jail.

reported that all other persons at the facility would be tested.

In the 30 days before the survey, 59% of jails reported testing 1 or more incarcerated person for SARS-CoV-2, with testing rates varying by state and population size (Table 2). Jails in South Carolina and jails with at least 201 incarcerated persons were most likely to have performed any testing and had the highest median numbers of persons tested per facility. Accounting for population size, median testing rates in the 149 jails with any testing were highest for those with 50 or fewer incarcerated persons (median 10 persons tested in past 30 days per 100 incarcerated persons). Median rates were similar for South Carolina and North Carolina (9 persons tested per 100 incarcerated) but lower for Georgia (6 persons tested per 100 incarcerated) and Alabama (2 persons tested per 100 incarcerated). Testing rates across states' jails straddled estimates for the general population over the 7-month study period (Figure 1).

Cases

At the time of survey administration, respondents from 51% of jails reported that there had ever been a SARS-CoV-2 case detected within their incarcerated population. In jails with at least 1 reported case, most (80%) reported medical observation and isolation for persons with a positive SARS-CoV-2 test, in addition to screening (88%) and quarantine (96%) for their contacts. Respondents at 29% of jails reported that early release of persons with a positive SARS-CoV-2 test was typical.

In the 30 days before survey administration, at least 1 incarcerated person tested positive for SARS-CoV-2 at 20% of jails in this study. When restricted to jails with testing in the past 30 days, one third reported at least 1 case overall, with the percentage reporting cases varying by state and population size (Table 2). Cases were most likely to be reported by jails in South Carolina and jails with at least 201 incarcerated persons. As the state with the lowest testing rate, Alabama jails were least likely to report cases.

Although testing at most jails detected few or no SARS-CoV-2 cases, there were notable exceptions in which most tests

TABLE 2— SARS-CoV-2 Testing and Test Positivity in Jails, Stratified by State and Population Size: 4 Southeastern US States, October 2020–May 2021

	Overall, No. (%) or Median (IQR)	State, No. (%) or Median (IQR)				Population Size, No. (%) or Median (IQR)		
		AL	GA	NC	SC	≤ 50	51–200	≥ 201
No. of jails	254	48	90	84	32	57	120	76
≥ 1 test in past 30 d	149 (58.7)	22 (45.8)	51 (56.7)	52 (61.9)	24 (75.0)	23 (40.4)	66 (55.0)	59 (77.6)
Subset of 149 jails with ≥ 1 SARS-CoV-2 test in past 30 d								
Persons tested per jail	5.8 (2.0–37.0)	2.0 (1.0–8.5)	5.0 (3.0–20.0)	9.0 (2.5–53.8)	12.0 (3.0–114.8)	3.0 (2.0–8.3)	4.5 (1.3–29.0)	15.0 (3.8–77.5)
Testing rate per jail	6.2 (1.6–28.0)	2.0 (0.6–7.4)	6.4 (2.1–17.6)	9.1 (2.3–52.8)	9.0 (1.8–53.2)	10.0 (6.2–32.4)	6.0 (1.7–29.1)	4.4 (1.0–14.9)
≥ 1 case in past 30 d	50 (33.6)	5 (22.7)	18 (35.3)	17 (32.7)	10 (41.7)	3 (13.0)	15 (22.7)	31 (52.5)
Cases per jail	0.0 (0.0–2.0)	0.0 (0.0–0.0)	0.0 (0.0–3.0)	0.0 (0.0–2.0)	0.0 (0.0–5.5)	0.0 (0.0–0.0)	0.0 (0.0–0.0)	1.0 (0.0–7.0)
Test positivity per jail	0.0 (0.0–6.7)	0.0 (0.0–0.0)	0.0 (0.0–18.3)	0.0 (0.0–2.6)	0.0 (0.0–7.5)	0.0 (0.0–0.0)	0.0 (0.0–0.0)	0.6 (0.0–18.8)
Subset of 50 jails with ≥ 1 case of a positive SARS-CoV-2 test in past 30 d								
Cases per jail	4.0 (2.0–18.8)	2.0 (2.0–6.0)	6.0 (2.5–18.8)	3.0 (2.0–12.0)	7.5 (4.3–40.0)	2.0 (1.5–3.0)	2.0 (1.5–17.0)	7.0 (3.0–23.0)
Test positivity per jail	18.8 (7.5–49.3)	50.0 (31.2–57.1)	46.5 (17.5–65.8)	10.0 (3.0–16.0)	10.0 (5.4–34.4)	10.0 (7.1–55.0)	28.6 (10.0–52.3)	17.5 (7.5–46.5)

Note. IQR = interquartile range; SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2. Testing information was missing for 7 jails; population size was missing for 1 jail. Testing rate per jail is the number of persons tested per 30-day period per 100 incarcerated persons. SARS-CoV-2 test positivity per jail is the percentage of SARS-CoV-2 tests that were positive in the past 30 days.

were positive at a jail. In the subset of 50 jails reporting at least 1 case, median test positivity was lowest for jails in North Carolina and South Carolina and those with 50 or fewer persons (10% of tests were positive in each stratum). In that same subset of 50 jails, median test positivity was higher for jails in Alabama (50% positive, although based on only 5 jails with cases), in Georgia (47% positive), and with 51 to 200 incarcerated persons (29% positive). Among all jails with testing, test positivity again straddled state-level estimates (Figure 2).

DISCUSSION

To our knowledge, this is the first study of SARS-CoV-2 mitigation, testing, and cases in jails across the US Southeast. We examined CDC-recommended management strategies in the first year of the COVID-19 pandemic, finding that some measures (e.g., symptom screening, availability of masks, limiting transport off-site) were adopted almost universally, and others (e.g., mask requirements, cohorting, size reductions) varied by state or jail population size. Although screening for COVID-19 signs and symptoms at admission and during incarceration was common, jails were much less likely to report screening at the time of release. SARS-CoV-2 testing practices during incarceration were symptom-driven, with few jails reporting asymptomatic testing outside of known exposures. Notably, more than 40% of jails had not conducted a SARS-CoV-2 test in the past 30 days, with testing less likely in jails with smaller populations. Even among jails reporting tests, testing rates were low (median 6 persons tested in past 30 days per 100 incarcerated). Most jails did not report any SARS-CoV-2 cases in the past 30 days (median test positivity 0% among all jails with any testing). In the 20% of jails reporting at

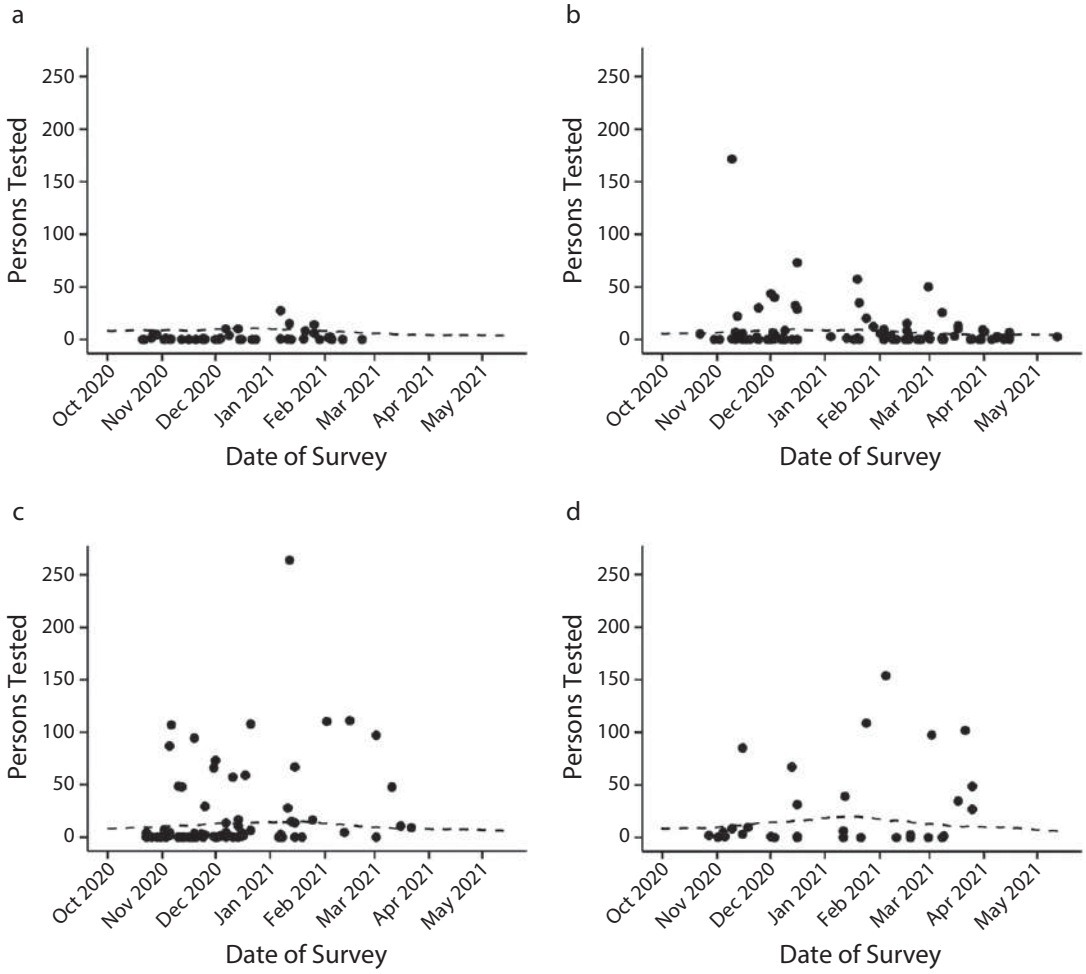

FIGURE 1— Incarcerated Persons Tested for SARS-CoV-2 in the Past 30 Days per 100 Population Among Jails in (a) Alabama, (b) Georgia, (c) North Carolina, and (d) South Carolina: October 2020–May 2021

Note. SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2. There were 246 jails with nonmissing data on population size and testing. Each point corresponds to 1 jail at the time of survey administration (with estimates corresponding to the past 30 days), and dashed lines correspond to the tests in the past 30 days per 100 persons in each state's general population.

least 1 SARS-CoV-2 case, test positivity was lowest for jails in North Carolina and South Carolina and those with 50 or fewer persons.

Our findings are consistent with previous research documenting SARS-CoV-2 mitigation approaches and testing, and COVID-19 disease burden in jails in other parts of the United States[6,17] and in prisons.[19] Previous work in Louisiana jails found that some CDC recommendations (e.g., providing hygiene supplies, instituting screening) were readily implemented, but uptake of others (e.g., use of isolation, quarantine, and cohorting) varied, with space constraints cited as the key barrier.[17] Although assessed during an earlier stage of the pandemic (April–July 2020), similar testing rates (approximately 8 tests per 100 persons per 30-day period) were estimated among Massachusetts jails that reported any testing.[6] In a study of SARS-CoV-2 testing in prisons,[19] the overall rate across Alabama prisons (2 per 100 persons incarcerated) matched our median estimate for Alabama jails with any testing, while the overall rate across North Carolina prisons (27 per 100 persons incarcerated) was higher than our median estimate for North Carolina jails.

Routine testing to detect asymptomatic SARS-CoV-2 infections was lacking in the jails we surveyed in this study. Given the short lengths of stay and constant population churn that are typical in jails,[24–27] the limited asymptomatic testing and lack of symptom screening at release reported by survey respondents could facilitate spillover of infection between jails and surrounding

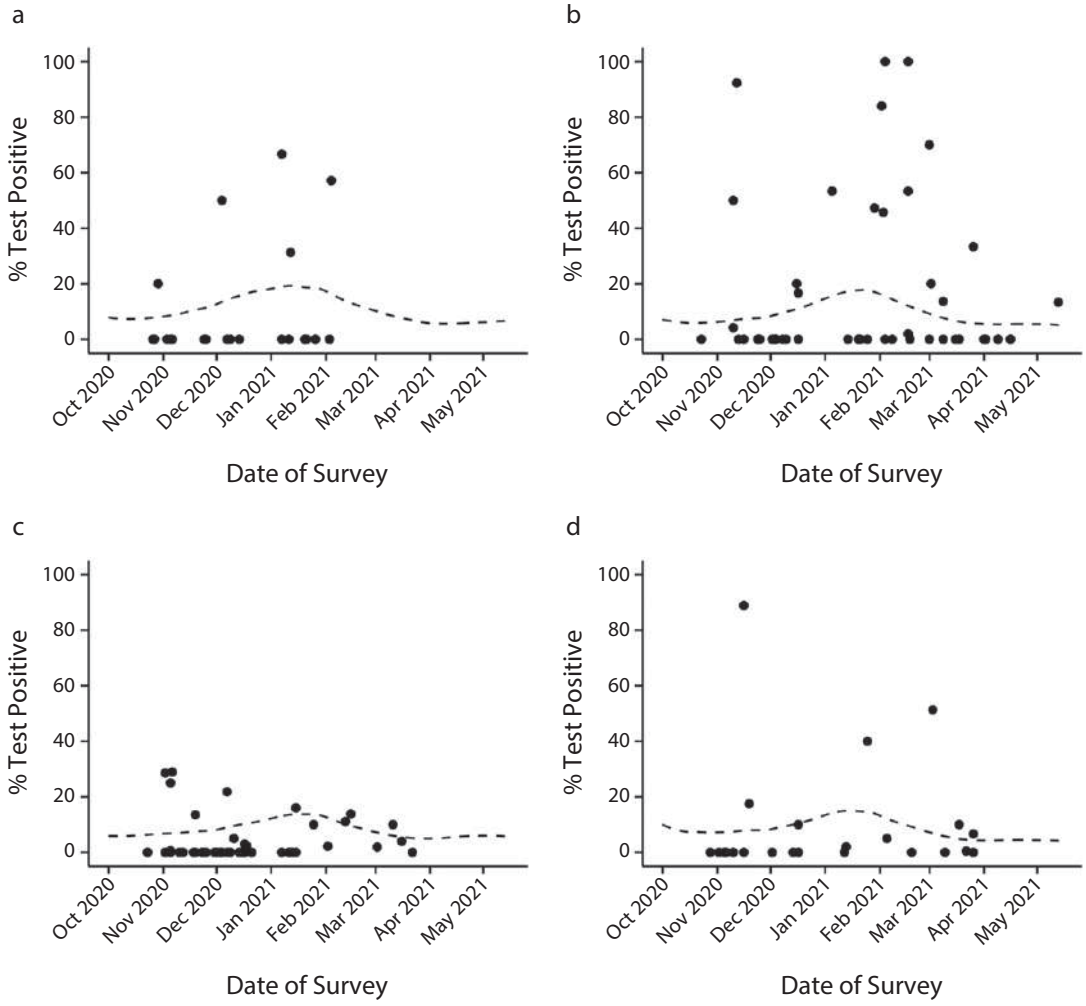

FIGURE 2— SARS-CoV-2 Test Positivity Percentages in the Past 30 Days, Among Jails in (a) Alabama, (b) Georgia, (c) North Carolina, and (d) South Carolina: October 2020–May 2021

Note. SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2. There were 149 jails reporting ≥ 1 SARS-CoV-2 test. Each point corresponds to 1 jail at the time of survey administration (with estimates corresponding to the past 30 days), and dashed lines correspond to the mean test positivity in the past 30 days reported for each state's general population.

communities. Opt-out mass testing was conducted early in the pandemic in jails in New York City[18] and Cook County, Illinois.[16] In New York City, test positivity was 23% among asymptomatic persons tested in March through April 2020; in that same period, Cook County jail reported 10% positivity in asymptomatic persons, with 24% of all cases at the jail being asymptomatic. In our study, many jails had both low testing rates and low test positivity; in others, no tests were conducted. It is unclear if jails with few or no reported cases represent environments in which little SARS-CoV-2 infection was present, symptoms were ignored, or cases were asymptomatic. Our study did not collect data on barriers to testing, which could have included lack of test kits and personnel, differences in state-level policies or federal funding allocations, limited awareness of testing protocols, and concerns over positive test results extending short jail stays. Nonetheless, our findings highlight an unmet need for greater testing in incarcerated populations and the importance of dedicating federal, state, and county resources to this effort.

Since the start of the pandemic, SARS-CoV-2 cases in prisons across the United States have been reported by each state's department of corrections and compiled and analyzed by the COVID Prison Project.[28] In contrast, because jails are independently operated at the county level and lack a centralized reporting system, it is difficult to aggregate COVID-19 data across jails

and provide coordinated guidance on mitigation measures. Improving the dissemination of public health guidance is important, particularly as available interventions and our understanding of their effectiveness evolves.

For example, since the initial release of CDC guidance for COVID-19 management in jails, key changes to the prevention landscape have included widespread availability of vaccines, a strengthened evidence base for mask use, increased use of broad-based testing, and shorter durations of recommended quarantine and isolation periods.[15] Greater information sharing across jails could facilitate uptake of interventions and improve the safety of these settings. Increasing the availability of jails' data on COVID-19 outcomes (e.g., hospitalizations and deaths) would enable a fuller assessment of disease burden. Given that Black, Latinx, and other persons of color are disproportionately incarcerated, it is also crucial for future work to identify and address racial disparities in COVID-19 outcomes arising from jail settings.

Because our study began before the availability of COVID-19 vaccines, we did not assess jail vaccination practices or attitudes toward vaccination among incarcerated persons and staff. Now that safe and effective vaccines against COVID-19 are widely available,[29–31] future studies should examine vaccination access and uptake in jail populations. Most prisons routinely report vaccination uptake among incarcerated persons and staff[28]; without comparable reporting among jails, little is known about vaccine uptake in their populations. In addition, although studies have explored vaccine willingness and delivery strategies in jail populations,[10,11,13] research is needed on the implementation and effectiveness of efforts to increase COVID-19 vaccination for incarcerated persons and staff.

Limitations

To enable a comprehensive assessment of COVID-19 burden and control measures in Southeastern US jails, our study recruited nearly three quarters of all county jails across a 4-state region. The survey underwent extensive pilot testing, and telephone administration allowed for clarification of responses and nuances in how information was shared. However, a limitation was that jails with ongoing COVID-19 outbreaks may have been less likely to respond; 71 of 92 nonresponding jails were in Georgia and Alabama, where high test positivity in surveyed jails with cases may indicate ongoing transmission in similar facilities. Furthermore, the timing of survey administration varied somewhat by state, such that differences across states may partially be a function of the pandemic stages in which surveys were conducted and rapid evolution in the resources available for prevention and treatment.

When interpreting study findings, it is important to note that jails' policies do not necessarily equate to control measures' implementation. Because the survey was conducted at the jail level, there were no individual-level data available on compliance with policies among incarcerated persons and staff or any differences by their individual characteristics. Furthermore, because of the study's cross-sectional design, we were unable to draw inferences about the effects of jail policies and characteristics on SARS-CoV-2 testing and cases of positive tests. In addition, social desirability bias could have led to underestimates of SARS-CoV-2 cases occurring at the jail or overestimates of testing or CDC-recommended mitigation measures. This bias could be differential by the type of respondent; for example, compared with health care personnel, jail administrators may be less likely to reveal (or be aware of) cases or noncompliance with CDC recommendations. We also note that our findings may differ from SARS-CoV-2 caseloads, testing practices, and mitigation measures in the current epidemic era and in Southeastern jails outside our study.

Public Health Implications

Our study suggests that there was variable implementation of COVID-19 mitigation strategies and generally low testing coverage across jails in the US Southeast during the first year of the COVID-19 pandemic. Although some control measures were widely adopted, our findings suggest that improvements to testing practices—in particular, increasing the availability of asymptomatic testing to detect ongoing outbreaks within jails and prevent spillover to surrounding communities—would be beneficial. Given that jails and other facilities that incarcerate people may contribute disproportionately to SARS-CoV-2 transmission,[1,9,14,32] the effects of intervening on infection in these settings are likely to be magnified.

As shown for other infectious diseases,[33] slowing transmission in carceral settings will directly protect incarcerated persons and staff and confer indirect benefits to the general population. Because persons of color are overrepresented in jails' populations, strengthening jails' pandemic response will also help to reduce racial disparities in COVID-19 outcomes. Continued surveillance of SARS-CoV-2 infections, testing, and other mitigation measures, including vaccination, in jail populations is critical to improving understanding of and

informing interventions against SARS-CoV-2 spread. AJPH

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CONTRIBUTORS

D. L. Rosen conceptualized and supervised the study. E. DiRosa, J. Carda-Auten, and D. L. Rosen designed the survey. E. DiRosa, J. Carda-Auten, M. E. Brown, S. Bradley-Bull, and C. Blue implemented data collection. S. N. Levintow conceptualized and conducted the analyses. K. A. Powers assisted with study design and interpretation of data. S. N. Levintow drafted the article, and all authors revised it critically for important intellectual content. All authors gave final approval of the version to be submitted to the current journal and agree to be accountable for all aspects of the work.

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CONFLICTS OF INTEREST

The authors have declared that no conflicts of interest exist.

HUMAN PARTICIPANT PROTECTION

This study was approved by the institutional review board at the University of North Carolina at Chapel Hill. Verbal informed consent was obtained from participants.

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Characteristics Associated With a Previous COVID-19 Diagnosis, Vaccine Uptake, and Intention to Be Vaccinated Among Essential Workers in the US Household Pulse Survey

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See also COVID-19 & Monkeypox, pp. 1564–1620.

Objectives. To explore previous COVID-19 diagnosis and COVID-19 vaccination status among US essential worker groups.

Methods. We analyzed the US Census Household Pulse Survey (May 26–July 5, 2021), a nationally representative sample of adults aged 18 years and older. We compared currently employed essential workers working outside the home with those working at home using adjusted prevalence ratios. We calculated proportion vaccinated and intention to be vaccinated, stratifying by essential worker and demographic groups for those who worked or volunteered outside the home since January 1, 2021.

Results. The proportion of workers with previous COVID-19 diagnosis was highest among first responders (24.9%) working outside the home compared with workers who did not (13.3%). Workers in agriculture, forestry, fishing, and hunting had the lowest vaccination rates (67.5%) compared with all workers (77.8%). Those without health insurance were much less likely to be vaccinated across all worker groups.

Conclusions. This study underscores the importance of improving surveillance to monitor COVID-19 and other infectious diseases among workers and identify and implement tailored risk mitigation strategies, including vaccination campaigns, for workplaces. (*Am J Public Health*. 2022;112(11):1599–1610. https://doi.org/10.2105/AJPH.2022.307010)

Multiple factors contribute to increased COVID-19 transmission in workplaces.[1,2] Workplace and worker risk factors vary by industry and occupation; they include difficulty with physical distancing, not maintaining proper hygiene and infection control practices, nonpaid sick leave, long work hours, exposure to high customer volumes, limited personal protective equipment, and lack of testing, training on health protocols, and guidance materials in workers' languages.[3] Recognizing the risk to the public and to workers, early COVID-19 pandemic mitigation efforts included strategies such as physical distancing and transitioning to remote work when possible. However, these strategies were not possible for all workplaces. The Department of Homeland Security Cybersecurity and Infrastructure Security Agency (CISA) provided guidance to government entities on who should access worksites during stay-at-home orders and on reduced movement of the population.[4] Many essential workers, as defined by CISA, continued to report to their workplaces, sometimes working in close proximity to coworkers and the public throughout the COVID-19 pandemic.

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Systematically monitoring COVID-19 infection and vaccination rates among workers has been challenging. Investigations by the Centers for Disease Control and Prevention (CDC), jurisdictions, and academic researchers report that several groups of essential workers experienced high rates of COVID-19 relative to the overall working-age population. Some of these groups include workers in health care,[5] meat and poultry processing,[6,7] corrections,[8] emergency medical services, and firefighting.[9] Workplace-related outbreaks were also reported in education and child care settings.[10,11] Some serosurveys show that those working outside the home full-time experienced an increased risk of COVID-19[12,13] compared with adults not working outside the home. Several reports illustrate that workers in racial/ethnic minority groups are disproportionately affected by COVID-19.[14–16] In Utah, for example, only 24% of workers in industries with COVID-19 outbreaks were Hispanic and non-White, but these workers represented 73% of the workplace COVID-19 cases.[16]

In December 2020, when COVID-19 vaccines were in short supply, the Advisory Committee on Immunization Practices (ACIP) recommended vaccine allocation,[17] partially based on the CISA categories,[18] using a phased approach. Phase 1a included health care personnel and residents of long-term care facilities. Phase 1b included frontline essential workers (i.e., first responders and workers in corrections, food and agriculture, grocery stores, education, public transit, manufacturing, and the US Postal Service) and those aged 75 years and older. CISA and ACIP defined frontline essential workers as the subset of essential workers likely at highest risk for work-related exposure to the virus that causes COVID-19, because their work-related duties must be performed on-site and involve being in proximity (< 6 feet) to the public or to coworkers. Phase 1c included the remaining essential workers (i.e., workers in transportation and logistics, food service, energy, shelter and housing, information technology and communication, news media, finance, legal services, water and wastewater, public safety, public health, and other types of essential workers not explicitly mentioned by CISA), persons aged 65 to 74 years, and those aged 18 to 65 years with high-risk medical conditions.[17,18] In addition, President Biden announced a special effort with the aim that all educators, school staff members, and child care workers be prioritized to receive at least 1 dose of COVID-19 vaccine by the end of March 2021.[19]

Limited data are available on vaccination rates among essential workers over the course of the vaccine rollout because employment information is not collected systematically with vaccine administration. Population-based surveys fill gaps in our understanding of the burden of the COVID-19 pandemic among US workers. Our study objectives were to use the US Census Household Pulse Survey (HPS) to (1) estimate the proportion of workers reporting previous COVID-19 diagnoses among essential worker groups and (2) assess essential worker vaccination uptake and intent by demographic characteristics during early summer 2021.

METHODS

The HPS is a rapid-response online survey using a probability-based sample design to measure the social and economic impact of the COVID-19 pandemic in the United States. Samples for the HPS are drawn from the Census Bureau's Master Address File, which includes e-mail and mobile telephone numbers of approximately 118 million US housing units. The HPS data include sample weights for use in analyses to make results representative of US households.[20,21] The response rate for survey weeks 31 through 33 (May 26–July 5, 2021) ranged between 6.3% and 6.7%, and final sample sizes averaged 68 394 per survey week.[22]

Relevant Household Pulse Survey Questions

Starting April 14, 2021, phase 3.1 of the HPS included the question, "Since **January 1, 2021**, have you worked or volunteered **outside your home**?" [emphasis in original]. Those who responded yes were asked, "Since January 1, 2021, which best describes the primary location/setting where you worked or volunteered outside your home?" This question had 16 response categories matching essential worker groupings based on ACIP recommendations:

- Phase 1a health care
  1. Health care (e.g., hospital, doctor, dentist or mental health specialist office, outpatient facility, long-term care, home health care, pharmacy, medical laboratory);
  2. Social service (e.g., child, youth, family, elderly, disability services);
  3. Death care (e.g., funeral home, crematory, cemetery);
- Phase 1b education
  4. Preschool or day care;
  5. Kindergarten through 12th grade (K-12) school;
  6. Other schools and instructional settings (e.g., college, university, professional,

business, technical or trade school, driving school, test preparation, tutoring);

- Phase 1b noneducation
  7. First response (e.g., police or fire protection, emergency relief services);
  8. Correctional facility (e.g., jail, prison, detention center, reformatory);
  9. Food and beverage store (e.g., grocery store, warehouse club, supercenter, convenience store, specialty food store, bakery);
  10. Agriculture, forestry, fishing, or hunting;
  11. Food manufacturing facility (e.g., meat processing, produce packing, food or beverage manufacturing);
  12. Nonfood manufacturing facility (e.g., metals, equipment and machinery, electronics);
  13. Public transit (e.g., bus, commuter rail, subway, school bus);
  14. US Postal Service;
- 15. Other job deemed "essential" during the COVID-19 pandemic; and
- 16. Other job not deemed essential.

There was no option for being more specific if they answered, "other job deemed essential" or "other job not deemed essential."

Questions to measure the outcomes of interest were as follows:

1. Has a doctor or other health care provider ever told you that you have COVID-19? (yes, no, not sure)
2. Have you received a COVID-19 vaccine? (yes, no)
3. (If unvaccinated) Once a vaccine to prevent COVID-19 is available to you, would you— Definitely get a vaccine? Probably get a vaccine? Be unsure about getting a vaccine? Probably NOT get a vaccine? Definitely NOT get a vaccine?
4. In the last 7 days, did you do ANY work for either pay or profit? (yes, no)

We examined previous COVID-19 diagnosis and vaccination status and intent relative to essential worker groups and demographic characteristics: age, gender, race/ethnicity, education, geographic region, marital status, household income, employment status in the past 7 days, and health insurance status. We analyzed previous COVID-19 diagnosis both for those working in the past 7 days either at home or outside the home, and for all who worked or volunteered outside the home since January 1, 2021, regardless of current employment status.

Data Analyses

We analyzed HPS data for May 26 through July 5, 2021 (survey weeks 31–33). Data and weights are publicly available on the US Census Web site.[21] Analyses include sample adults aged 18 years and older.

For respondents employed in the past 7 days, we compared the proportion reporting previous COVID-19 diagnosis among essential worker groups who worked outside the home to that of employed adults not working outside the home. We computed prevalence ratios, adjusting for age, gender, race/ethnicity, education, number of people in household, region, and survey week.

For respondents working outside the home since January 1, 2021, we present weighted proportions of essential workers with a previous COVID-19 diagnosis, vaccination status (at least 1 dose), and intention to be vaccinated for employed respondents in essential worker groups stratified by demographic characteristics. We performed the *t* test to examine differences in COVID-19 diagnosis between essential workers and those working from home. Where estimates did not meet the CDC National Center for Health Statistics (NCHS) standards of reliability,[23] we combined essential worker groups.

We used SAS version 9.4 (SAS Institute, Cary, NC) and SAS-callable SUDAAN version 11.0.3 (RTI International, Research Triangle Park, NC) for analyses.

RESULTS

Among HPS respondents from May 26 through July 5, 2021 (n = 118 191), 15.1% of adults who worked in the past 7 days reported having ever been told by a health care provider that they had COVID-19 (Table 1). Previous COVID-19 diagnosis was 13.3% among adults employed at the time of the survey who had not worked or volunteered outside the home since January 1, 2021, and 15.9% among employed adults who had worked or volunteered outside the home. Among the latter, prevalence was highest among essential workers in first response (24.9%); corrections (22.4%); health care (18.4%); agriculture, forestry, fishing, or hunting (18.2%); and preschool or day care (17.0%).

Compared with adjusted prevalence among employed adults who had not worked or volunteered outside the home, adjusted prevalence ratios (APRs) remained elevated among essential workers in first response (APR = 1.89); corrections (APR = 1.72); agriculture, forestry, fishing, or hunting (APR = 1.44); health care (APR = 1.40); social service (APR = 1.22); K-12 school (APR = 1.22); and food and beverage stores (APR = 1.18; Table 1).

TABLE 1— Previous COVID-19 Diagnosis Among Essential Worker Groups Compared With Employed Adults Working From Home for Those Who Worked in the Past 7 Days: Household Pulse Survey, United States, May 26–July 5, 2021

Primary Work/Volunteer Group	Sample Distribution, Unweighted No. (Weighted %)	Previous COVID-19 Diagnosis	
		Weighted % (95% CI)	APR[a] (95% CI)
Total (all who worked in the last 7 d)	118 191 (100.0)	15.1 (14.7, 15.5)	
Employed, but did not work/volunteer outside the home	39 247 (32.1)	13.3 (12.6, 14.1)	1 (Ref)
All who worked outside the home since January 1, 2021 (of those who worked in last 7 d)	78 944 (68.0)	15.9 (15.5, 16.4)[b]	1.20 (1.13, 1.27)[b]
Essential worker phase 1a health care	18 599 (13.3)	18.0 (16.9, 19.2)[b]	1.37 (1.26, 1.48)[b]
Health care	15 568 (11.2)	18.4 (17.1, 19.7)[b]	1.40 (1.28, 1.52)[b]
Social service	2 894 (2.0)	16.0 (13.7, 18.6)[b]	1.22 (1.05, 1.42)[b]
Death care	137 (0.1)	16.5 (9.4, 25.9)	1.28 (0.80, 2.07)
Essential worker phase 1b education	11 883 (7.4)	14.7 (13.3, 16.1)	1.15 (1.04, 1.28)[b]
Preschool or day care	953 (0.7)	17.0 (13.5, 21.0)	1.19 (0.97, 1.46)
K-12 school	7 286 (4.4)	15.6 (13.7, 17.5)[b]	1.22 (1.07, 1.39)[b]
Other schools and instructional settings	3 644 (2.4)	12.3 (10.3, 14.6)	1.01 (0.85, 1.21)
Essential worker phase 1b noneducation	11 324 (13.5)	17.0 (15.9, 18.0)[b]	1.25 (1.14, 1.37)[b]
First response	1 292 (1.3)	24.9 (19.7, 30.7)[b]	1.89 (1.52, 2.35)[b]
Correctional facility	317 (0.3)	22.4 (15.5, 30.6)[b]	1.72 (1.25, 2.38)[b]
Food and beverage store	3 684 (5.4)	16.6 (14.6, 18.8)[b]	1.18 (1.02, 1.36)[b]
Agriculture, forestry, fishing, or hunting	1 237 (1.0)	18.2 (12.7, 24.9)	1.44 (1.03, 2.00)[b]
Food manufacturing facility	703 (0.8)	13.9 (9.8, 18.9)	1.00 (0.72, 1.39)
Nonfood manufacturing facility	3 186 (3.6)	14.9 (13.3, 16.7)	1.12 (0.97, 1.29)
Public transit	539 (0.6)	16.8 (11.6, 23.1)	1.27 (0.91, 1.76)
US Postal Service	366 (0.4)	15.0 (10.1, 21.2)	1.11 (0.77, 1.61)
Other job deemed "essential" during the COVID-19 pandemic	17 387 (17.7)	16.0 (14.9, 17.1)[b]	1.17 (1.08, 1.28)[b]
Worked/volunteered outside the home in job not deemed "essential"	19 751 (16.1)	13.9 (12.8, 14.9)	1.05 (0.96, 1.15)

Note. APR = adjusted prevalence ratio; CI = confidence interval; K-12 = kindergarten through 12th grade.

[a]PRs adjusted for age, gender, race/ethnicity, educational status, number of people in household, region, and survey week.
[b]$P < .05$ by *t* test for comparisons with the indicated reference level.

Previous COVID-19 Diagnosis by Demographics

For respondents working outside the home, previous COVID-19 diagnosis was highest among Hispanic workers (21.5%), which was consistent across worker groups (Table 2). Those with a college degree or less were more likely to report a COVID-19 diagnosis than those with education above a college graduate level. Workers aged 65 years and older were less likely to report a previous COVID-19 diagnosis than younger workers. These differences were all statistically different from the other ethnicity, education, and age categories based on nonoverlapping confidence intervals.

Vaccination Status and Intent

Of all who worked outside the home, 77.8% reported receiving at least 1 COVID-19 vaccine dose (Table 3). At least 84% of phase 1a health care and phase 1b education workers reported vaccination; for phase 1b noneducation groups combined, 72.4% reported vaccination. Workers in agriculture, forestry, fishing, and hunting (67.5%); nonfood manufacturing facilities (70.6%); and food and beverage stores (72.2%; phase 1b subgroups) had the lowest proportions vaccinated.

Only 1.5% of all workers indicated that they were definitely planning to be vaccinated; an additional 2.1% stated

TABLE 2— Previous COVID-19 Diagnosis Among Essential Worker Groups by ACIP-Recommended Vaccination Phase and Select Characteristics for Those Who Worked Outside the Home Since January 1, 2021: Household Pulse Survey, United States, May 26–July 5, 2021

Individual Characteristics	Unweighted No.	Weighted % (95% CI)				
		All Who Worked Outside the Home Since Jan 1, 2021 (n = 99 473)	Phase 1a Health Care (n = 23 272)[a]	Phase 1b Education (n = 15 140)[b]	Phase 1b Noneducation (n = 13 495)[c]	Other Job Deemed "Essential" During COVID-19 Pandemic (n = 19 271)
All who worked outside the home since January 1, 2021	99 473	15.8 (15.4, 16.2)	17.6 (16.6, 18.6)	15.5 (14.1, 17.0)	16.6 (15.6, 17.7)	16.4 (15.3, 17.4)
Age, y						
18–29	8 427	17.2 (16.0, 18.4)	19.6 (16.6, 22.9)	16.1 (12.7, 20.0)	16.8 (14.5, 19.2)	17.6 (14.4, 21.2)
30–44	29 264	16.5 (15.7, 17.4)	17.8 (16.2, 19.5)	15.1 (13.0, 17.3)	16.8 (14.7, 19.0)	16.7 (14.7, 18.8)
45–64	43 682	15.9 (15.3, 16.6)	18.4 (16.9, 20.0)	16.0 (14.1, 18.1)	17.8 (16.0, 19.8)	16.0 (14.8, 17.2)
≥ 65	18 100	11.4 (10.6, 12.2)	11.4 (9.6, 13.5)	13.6 (11.0, 16.5)	11.3 (8.5, 14.6)	13.5 (11.4, 15.9)
Gender						
Male	41 225	14.9 (14.4, 15.5)	16.5 (14.1, 19.1)	14.6 (12.5, 16.8)	16.1 (14.8, 17.5)	15.5 (14.2, 16.9)
Female	58 248	16.7 (16.1, 17.3)	18.1 (17.0, 19.2)	15.9 (14.4, 17.6)	17.6 (15.6, 19.7)	17.9 (16.3, 19.6)
Race/ethnicity						
Non-Hispanic White	76 273	14.8 (14.3, 15.3)	16.4 (15.4, 17.5)	14.7 (13.3, 16.2)	16.3 (15.1, 17.6)	15.1 (14.2, 16.1)
Non-Hispanic Black	6 843	15.7 (14.3, 17.1)	18.6 (15.5, 22.0)	15.8 (12.2, 19.9)	14.2 (11.5, 17.3)	16.6 (13.7, 20.0)
Hispanic	8 600	21.5 (20.1, 23.0)	24.8 (20.8, 29.3)	20.0 (15.5, 25.2)	20.9 (18.0, 24.0)	22.6 (19.0, 26.6)
Non-Hispanic Asian	4 169	10.4 (8.8, 12.3)	11.9 (9.5, 14.5)	11.1 (5.8, 18.9)	12.9 (7.2, 20.8)	6.5 (4.1, 9.7)
Non-Hispanic other/multiple races	3 588	16.1 (14.3, 18.0)	16.7 (12.9, 21.1)	18.2 (11.8, 26.1)	15.6 (11.0, 21.1)	15.8 (12.1, 20.1)
Educational status						
High school or less	11 101	16.4 (15.3, 17.5)	20.2 (16.4, 24.5)	21.6 (17.2, 26.6)	15.3 (13.5, 17.3)	16.6 (14.4, 19.1)
Some college or college graduate	60 149	16.6 (16.0, 17.2)	18.7 (17.4, 20.1)	15.4 (13.8, 17.2)	18.2 (16.8, 19.6)	16.7 (15.6, 18.0)
Above college graduate	28 223	12.0 (11.4, 12.7)	12.7 (11.6, 14.0)	12.7 (11.5, 14.0)	14.8 (12.2, 17.6)	12.5 (10.6, 14.5)
Region						
Northeast	14 948	15.0 (13.9, 16.2)	18.1 (15.6, 20.7)	13.0 (10.3, 16.0)	17.1 (13.6, 21.1)	15.0 (12.6, 17.7)
Midwest	31 027	17.2 (16.5, 17.9)	17.5 (15.8, 19.2)	18.8 (16.6, 21.1)	17.3 (15.9, 18.7)	18.8 (17.1, 20.7)
South	22 005	15.9 (15.2, 16.7)	18.6 (17.1, 20.2)	15.6 (13.6, 17.9)	15.8 (13.7, 18.1)	16.3 (14.4, 18.3)
West	31 493	13.9 (13.1, 14.7)	16.4 (14.8, 18.2)	11.8 (9.6, 14.4)	16.2 (13.6, 19.0)	12.9 (11.0, 15.1)
Marital status[d]						
Married	59 242	15.6 (15.1, 16.1)	17.1 (15.8, 18.4)	15.6 (14.0, 17.4)	17.6 (16.0, 19.2)	15.4 (14.3, 16.5)
Widowed/divorced/separated	19 557	16.2 (15.2, 17.2)	18.7 (16.3, 21.3)	13.2 (11.0, 15.7)	17.5 (14.7, 20.6)	17.3 (14.7, 20.2)
Never married	20 133	16.0 (15.1, 16.8)	18.1 (15.9, 20.4)	16.4 (13.3, 19.9)	15.2 (13.5, 17.0)	17.6 (15.2, 20.1)
2019 total household Income, $						
< 35 000	10 983	16.5 (15.1, 18.1)	21.2 (17.7, 24.9)	21.0 (16.0, 26.8)	13.4 (11.5, 15.5)	17.5 (14.2, 21.2)
35 000–49 999	7 551	16.4 (14.5, 18.5)	21.8 (17.8, 26.1)	17.3 (12.4, 23.2)	13.9 (11.1, 17.2)	19.6 (15.3, 24.5)
50 000–74 999	13 030	15.7 (14.6, 16.7)	17.7 (15.7, 19.9)	14.3 (11.7, 17.2)	18.0 (14.8, 21.6)	15.1 (12.5, 17.9)
≥ 75 000	43 056	14.5 (13.9, 15.1)	14.8 (13.6, 16.0)	14.5 (13.0, 16.1)	18.1 (16.1, 20.2)	14.2 (12.8, 15.7)
Did not report	24 853	16.7 (15.9, 17.6)	18.1 (16.3, 20.0)	15.1 (12.8, 17.6)	17.2 (15.4, 19.1)	17.8 (15.8, 20.0)
Employment status (last 7 d)[d]						
Employed	79 511	15.9 (15.5, 16.4)	18.0 (16.9, 19.2)	14.7 (13.3, 16.1)	17.0 (15.9, 18.0)	16.0 (14.9, 17.1)

Continued

TABLE 2— Continued

Individual Characteristics	Unweighted No.	Weighted % (95% CI)				
		All Who Worked Outside the Home Since Jan 1, 2021 (n = 99 473)	Phase 1a Health Care (n = 23 272)[a]	Phase 1b Education (n = 15 140)[b]	Phase 1b Noneducation (n = 13 495)[c]	Other Job Deemed "Essential" During COVID-19 Pandemic (n = 19 271)
Not employed/not in work force	19 837	15.3 (14.5, 16.2)	15.8 (13.4, 18.4)	18.6 (15.5, 22.0)	15.1 (12.5, 18.0)	20.1 (16.2, 24.4)
Health insurance status[d]						
Insurance	77 536	15.4 (14.8, 15.9)	17.3 (16.1, 18.4)	15.5 (14.0, 17.1)	17.0 (15.6, 18.5)	15.3 (14.1, 16.5)
No insurance	4 114	15.8 (13.4, 18.4)	16.4 (12.6, 20.7)	16.2 (9.2, 25.6)	12.1 (8.7, 16.2)	19.6 (14.0, 26.3)

Note. ACIP = Advisory Committee on Immunization Practices; CI = confidence interval. The essential worker categories (1a, 1b education, 1b noneducation) are based on the ACIP's Updated Interim Recommendation for Allocation of COVID-19.[17]

[a]Phase 1a healthcare: healthcare, social service, and death care.
[b]Phase 1b education: preschool or day care, kindergarten through 12th grade (K-12) school, and other schools and instructional settings.
[c]Phase 1b noneducation: first response; correctional facility; food and beverage store; agriculture, forestry, fishing, or hunting; food manufacturing facility; nonfood manufacturing facility; public transit; US Postal Service.
[d]Question seen but category not selected or missing for some respondents.

they probably would, and 5.4% were unsure about getting vaccinated. More than 10% said they probably would not (4.7%) or definitely would not (8.5%) get vaccinated. Phase 1b noneducation essential worker groups varied in their intention to get vaccinated, with higher proportions reporting they definitely would not get vaccinated (Table 3).

Vaccination Status and Intent by Demographics

Among all adults who worked outside the home, COVID-19 vaccination was lower among workers aged 18 to 29 years (70.9%), non-Hispanic Black workers (71.6%) and non-Hispanic other and multiple race workers (66.6%), respondents with a high school education or less (67.8%), workers with a household income less than $35 000 (70.5%), those with a previous COVID-19 diagnosis (67.5%), and those without health insurance (59.2%; Table 4). This pattern was seen for each of the essential worker groups, though with variability between groups. For example, non-Hispanic Black workers and non-Hispanic other and multiple race workers in the phase 1b noneducation group had the lowest percentage vaccinated (61.5% and 54.9%, respectively); proportions among these groups were also low compared with other racial/ethnic groups in the phase 1a health care (75.4% and 79.7%) and the phase 1b education group (80.1% and 74.4%; Table A, available as a supplement to the online version of this article at http://www.ajph.org). Over 93% of non-Hispanic Asian workers were vaccinated in all worker groups. For phase 1b noneducation and the other-job-deemed-essential group, Hispanic workers were the racial/ethnic group second most likely to be vaccinated; rates among Hispanic workers were not different from those of non-Hispanic White workers in phase 1a health care and phase 1b education.

Differences in vaccination by worker groups without health insurance compared with those with health insurance were large; less than half of respondents (48.5%) in the other-job-deemed-essential category without health insurance were vaccinated versus 75.1% of those with health insurance. For phase 1b noneducation workers, the difference was 64.3% versus 75.1%; for phase 1b education workers, 76.3% versus 87.6%; for phase 1a health care, 70.1% versus 86.0%.

Patterns of intention to be vaccinated were consistent across worker groups, although they differed in scale because there were more unvaccinated workers in phase 1b noneducation, and the other-job-deemed-essential groups. For phase 1b noneducation, the highest proportions of workers saying they probably would get or were unsure about getting the vaccine were as follows: non-Hispanic Black workers, 17.4%; workers with a high school education or less, 12.3%; workers who were never married, 13.3%; workers without health insurance, 13.0%; and workers with a previous COVID-19 diagnosis, 14.2%.

DISCUSSION

To the best of our knowledge, this is the first report to estimate the

TABLE 3— Vaccination Status and Intention to Be Vaccinated for Those Who Worked Outside the Home Since January 1, 2021, by ACIP-Recommended Vaccination Phase: Household Pulse Survey, United States, May 26–July 5, 2021

	Sample Distribution, No. (Weighted %)	Received a COVID-19 Vaccination, Weighted % (95% CI)	Intent to Receive COVID-19 Vaccination, Weighted % (95% CI)				
			Definitely Will	Probably Will	Unsure	Probably Will Not	Definitely Will Not
All	99 473 (100.0)	77.8 (77.2, 78.3)	1.5 (1.3, 1.7)	2.1 (1.9, 2.4)	5.4 (5.1, 5.7)	4.7 (4.5, 5.0)	8.5 (8.1, 8.9)
Essential worker vaccination phase 1a[a]	23 272 (19.5)	84.0 (82.9, 85.0)	1.2 (0.8, 1.8)	1.3 (1.1, 1.7)	3.8 (3.3, 4.5)	3.7 (3.1, 4.3)	5.9 (5.3, 6.6)
Health care	18 132 (15.5)	84.0 (82.7, 85.2)	1.0 (0.7, 1.5)	1.3 (1.0, 1.7)	3.9 (3.2, 4.6)	3.7 (3.2, 4.3)	6.2 (5.4, 7.0)
Social service and death care	5 140 (4.0)	84.1 (81.6, 86.3)	2.2 (0.7, 4.9)	1.6 (1.0, 2.4)	3.8 (2.8, 5.0)	3.4 (2.1, 5.2)	5.0 (4.0, 6.1)
Phase 1b education[b]	15 140 (11.4)	86.3 (85.2, 87.4)	0.7 (0.5, 1.1)	1.5 (0.9, 2.3)	3.5 (3.0, 4.0)	3.1 (2.6, 3.7)	4.8 (4.2, 5.5)
Preschool or day care and K-12 school	10 646 (7.8)	85.7 (84.4, 87.0)	0.7 (0.4, 1.2)	1.4 (0.8, 2.4)	3.8 (3.2, 4.4)	3.1 (2.6, 3.7)	5.2 (4.5, 6.0)
Other schools and instructional settings	4 494 (3.6)	87.6 (85.5, 89.5)	0.7 (0.4, 1.3)	1.7 (0.7, 3.3)	3.0 (2.2, 3.9)	3.1 (2.2, 4.3)	4.0 (3.0, 5.2)
Phase 1b noneducation[c]	13 495 (19.1)	72.4 (70.7, 74.0)	1.8 (1.4, 2.3)	3.0 (2.3, 3.8)	7.0 (6.1, 7.9)	5.9 (5.1, 6.9)	10.0 (9.0, 11.0)
Food and beverage store	4 396 (7.8)	72.2 (69.4, 74.9)	2.1 (1.5, 2.8)	4.1 (2.9, 5.7)	8.3 (6.8, 10.0)	5.4 (4.2, 6.9)	7.8 (6.3, 9.6)
Agriculture, forestry, fishing, or hunting	1 747 (1.7)	67.5 (62.5, 72.2)	1.5 (0.5, 3.6)	2.3 (1.1, 4.2)	7.0 (4.6, 10.1)	8.8 (6.4, 11.9)	12.9 (9.9, 16.5)
Food manufacturing facility	819 (1.2)	74.8 (69.1, 80.0)	2.2 (1.1, 3.9)	0.9 (0.3, 2.0)	7.4 (4.7, 11.0)	4.8 (2.6, 8.1)	9.8 (6.7, 13.8)
Nonfood manufacturing facility	3 513 (4.8)	70.6 (67.3, 73.6)	1.7 (1.0, 2.5)	2.7 (1.7, 3.9)	5.7 (4.2, 7.5)	6.9 (5.3, 8.9)	12.5 (9.8, 15.6)
Other phase 1b[d]	3 020 (3.5)	76.6 (73.3, 79.7)	1.4 (0.5, 2.9)	1.9 (1.1, 3.1)	5.6 (3.6, 8.1)	4.6 (3.6, 5.9)	9.9 (8.0, 12.0)
Other job deemed "essential" during the COVID-19 pandemic	19 271 (23.5)	71.2 (70.0, 72.4)	1.8 (1.5, 2.2)	2.6 (2.1, 3.1)	7.3 (6.5, 8.2)	6.0 (5.2, 6.8)	11.2 (10.3, 12.1)
Other job, not categorized as "essential"	28 295 (26.5)	79.2 (78.2, 80.1)	1.5 (1.2, 1.9)	2.0 (1.7, 2.4)	4.6 (4.1, 5.1)	4.3 (3.9, 4.8)	8.4 (7.7, 9.1)

Note. ACIP = Advisory Committee on Immunization Practices; CI = confidence interval; K-12 = kindergarten through 12th grade. The essential worker categories (1a, 1b education, 1b noneducation) are based on the ACIP's Updated Interim Recommendation for Allocation of COVID-19.[17]

[a]Phase 1a: health care, social service, and death care.
[b]Phase 1b education: preschool or day care, K-12 school, and other schools and instructional settings (e.g., college, university, professional, business, technical or trade school, driving school, test preparation, and tutoring).
[c]Phase 1b noneducation: first response; correctional facility; food and beverage store; agriculture, forestry, fishing, or hunting; food manufacturing facility; nonfood manufacturing facility; public transit; US Postal Service.
[d]Phase 1b noneducation other phase 1b: first response, correctional facility, public transit, and US Postal Service.

TABLE 4— Vaccination Status (≥ 1 Dose) and Intention to Receive COVID-19 Vaccine Among Those Working Outside the Home by Select Characteristics: Household Pulse Survey, United States, May 26–July 5, 2021

	Unweighted No.	Intention to Be Vaccinated,[a] Weighted % (95% CI)			
		Vaccinated (≥ 1 Dose)	Definitely	Probably or Unsure	Probably Not or Definitely Not
All who worked outside the home since January 1, 2021	99 473	77.8 (77.2, 78.3)	1.5 (1.3, 1.7)	7.5 (7.2, 7.9)	13.2 (12.7, 13.7)
Age, y					
18–29	8 427	70.9 (69.3, 72.5)	2.5 (1.9, 3.2)	11.4 (10.3, 12.6)	15.2 (13.8, 16.5)
30–44	29 264	71.5 (70.2, 72.7)	1.6 (1.3, 1.9)	9.8 (9.1, 10.6)	17.1 (16.1, 18.1)
45–64	43 682	82.7 (81.8, 83.5)	1.3 (1.0, 1.5)	5.3 (4.8, 5.7)	10.8 (10.2, 11.4)
≥ 65	18 100	90.6 (89.5, 91.6)	0.3 (0.1, 0.5)	1.9 (1.6, 2.4)	7.2 (6.3, 8.2)
Gender					
Male	41 225	76.6 (75.7, 77.5)	1.7 (1.4, 2.0)	7.3 (6.7, 8.0)	14.4 (13.7, 15.2)
Female	58 248	79.0 (78.3, 79.6)	1.3 (1.1, 1.5)	7.7 (7.3, 8.2)	12.0 (11.5, 12.4)
Race/ethnicity					
Non-Hispanic White	76 273	77.9 (77.2, 78.5)	1.0 (0.8, 1.2)	6.9 (6.4, 7.4)	14.2 (13.7, 14.8)
Non-Hispanic Black	6 843	71.6 (69.6, 73.6)	3.3 (2.4, 4.3)	12.6 (10.9, 14.5)	12.5 (10.7, 14.4)
Hispanic	8 600	79.0 (77.4, 80.4)	2.7 (2.0, 3.5)	7.9 (6.9, 8.9)	10.5 (9.3, 11.8)
Non-Hispanic Asian	4 169	94.3 (92.5, 95.8)	0.7 (0.3, 1.2)	2.4 (1.7, 3.3)	2.6 (1.5, 4.2)
Non-Hispanic other/multiple races	3 588	66.6 (63.9, 69.1)	2.0 (1.1, 3.3)	9.4 (7.8, 11.3)	22.0 (19.4, 24.8)
Educational status					
High school or less	11 101	67.8 (66.3, 69.3)	2.5 (2.1, 3.0)	11.0 (10.0, 12.1)	18.7 (17.5, 20.0)
Some college or college graduate	60 149	80.0 (79.5, 80.6)	1.1 (1.0, 1.3)	6.8 (6.4, 7.1)	12.0 (11.5, 12.6)
Above college graduate	28 223	92.0 (91.5, 92.4)	0.5 (0.4, 0.7)	2.4 (2.2, 2.7)	5.0 (4.6, 5.5)
Region					
Northeast	14 948	82.8 (81.5, 84.1)	1.8 (1.2, 2.5)	5.9 (5.1, 6.9)	9.4 (8.6, 10.3)
Midwest	31 027	73.5 (72.3, 74.7)	1.8 (1.5, 2.2)	9.1 (8.4, 9.8)	15.6 (14.6, 16.6)
South	22 005	77.3 (76.3, 78.3)	1.1 (0.9, 1.4)	7.8 (7.0, 8.7)	13.8 (13.0, 14.7)
West	31 493	81.6 (80.7, 82.5)	1.1 (0.9, 1.4)	5.9 (5.3, 6.4)	11.4 (10.7, 12.0)
Marital status[b]					
Married	59 242	80.3 (79.6, 80.9)	1.0 (0.8, 1.2)	5.9 (5.4, 6.3)	12.9 (12.3, 13.5)
Widowed/divorced/separated	19 557	77.6 (76.1, 79.0)	1.7 (1.2, 2.3)	7.4 (6.6, 8.2)	13.4 (12.3, 14.5)
Never married	20 133	73.2 (71.8, 74.5)	2.4 (2.0, 2.9)	10.7 (9.8, 11.7)	13.6 (12.6, 14.8)
2019 total household income, $					
< 35 000	10 983	70.5 (68.9, 72.0)	2.5 (1.9, 3.2)	12.2 (11.2, 13.3)	14.8 (13.4, 16.3)
35 000–49 999	7 551	73.0 (70.9, 75.0)	1.9 (1.3, 2.5)	9.0 (7.8, 10.2)	16.2 (14.5, 18.0)
50 000–74 999	13 030	76.8 (75.0, 78.6)	1.2 (0.8, 1.7)	8.2 (7.0, 9.6)	13.7 (12.6, 15.0)
≥ 75 000	43 056	85.3 (84.5, 86.0)	0.5 (0.4, 0.6)	3.6 (3.2, 4.1)	10.6 (9.9, 11.4)
Did not report	24 853	74.6 (73.4, 75.8)	2.2 (1.7, 2.7)	9.0 (8.3, 9.7)	14.3 (13.3, 15.3)
Employment status (last 7 d)[b]					
Employed	79 511	78.1 (77.5, 78.7)	1.3 (1.1, 1.5)	7.3 (6.9, 7.7)	13.3 (12.7, 13.9)
Not employed/not in workforce	19 837	76.2 (74.7, 77.6)	2.4 (1.8, 3.2)	8.7 (7.6, 9.8)	12.7 (11.7, 13.8)
Health insurance status[b]					
Insurance	77 536	80.8 (80.2, 81.4)	1.0 (0.9, 1.2)	6.4 (6.0, 6.8)	11.8 (11.3, 12.3)
No insurance	4 114	59.2 (56.0, 62.3)	4.2 (2.9, 6.0)	12.7 (10.9, 14.7)	23.9 (21.5, 26.4)
Previous COVID-19 diagnosis					
Yes	13 414	67.5 (65.9, 69.0)	2.4 (1.9, 3.0)	11.8 (10.6, 13.0)	18.3 (17.0, 19.6)

Continued

TABLE 4— Continued

	Unweighted No.	Intention to Be Vaccinated,[a] Weighted % (95% CI)			
		Vaccinated (≥ 1 Dose)	Definitely	Probably or Unsure	Probably Not or Definitely Not
No	85 294	79.9 (79.3, 80.5)	1.3 (1.1, 1.5)	6.7 (6.2, 7.1)	12.1 (11.6, 12.6)
Not sure	667	60.1 (53.8, 66.1)	—	12.6 (7.5, 19.6)	24.2 (18.4, 30.8)

Note. CI = confidence interval. All estimates shown meet the National Center for Health Statistics standards of reliability (https://www.cdc.gov/nchs/data/series/sr_02/sr02_175.pdf). Dash (—) indicates that estimate does not meet these criteria.

[a]All who worked outside the home since January 1, 2021.
[b]Question seen, but category not selected or missing for some respondents.

proportion of workers reporting a previous COVID-19 diagnosis adjusted for age, gender, race/ethnicity, educational status, number of people in household, region, and survey week among essential worker groups, and COVID-19 vaccination status and intention among essential worker groups, in a nationally representative sample. These data suggest that specific groups of workers deemed essential by CISA since the beginning of the COVID-19 pandemic and recommended for vaccine prioritization by ACIP have experienced a high burden of COVID-19. It also suggests that vaccination has been inconsistent among designated essential worker groups and that opportunities exist for more complete vaccination of these workers.

Previous COVID-19 Diagnosis

Health care workers and social service workers were among the first workers to be recognized for increased risk of COVID-19 because of their close contact with COVID-19 patients[5] and shortages of personal protective equipment. On December 1, 2020, ACIP recommended that health care personnel and long-term care facility residents be prioritized to receive COVID-19 vaccine while demand was expected to exceed supply. They based their recommendation on data indicating that health care personnel are at high risk for exposure to and transmission of the virus that causes COVID-19; CDC reports of 245 000 cases and 858 deaths caused by COVID-19 among health care workers before December 1, 2020; and health care personnel's importance in caring for patients with severe disease and keeping health care systems functioning.[24] Our finding of elevated adjusted prevalence ratios for health care (APR = 1.40) and social service workers (APR = 1.22) compared with respondents who were employed but did not work outside the home supports the basis of this policy.

On December 20, 2020, ACIP released further recommendations on allocation of COVID-19 vaccines based on CISA guidance for workers who may be exempt from stay-at-home orders. We found that, compared with respondents who were employed but did not work outside the home, a higher proportion of essential workers employed in the last 7 days in first response; corrections; agriculture, forestry, fishing, or hunting; K-12 schools; and food and beverage stores had a previous COVID-19 diagnosis. Other phase 1b workers, except those in food manufacturing and other schools and instructional settings, also had elevated but statistically nonsignificant proportions with a previous COVID-19 diagnosis.

High burdens of COVID-19 among first response[25,26] and corrections workers were previously reported. By November 2020, the COVID-19 prevalence among prison staff in US federal and state prisons was 3.2 times greater than the US population prevalence; nationally, 9% of prison staff had confirmed cases of COVID-19.[8]

We did not find that food manufacturing workers had an elevated APR for previous COVID-19 diagnosis based on the HPS, even though outbreaks in meat and poultry processing facilities were widely reported, with working conditions and structural, sociocultural, and economic factors contributing to the enormity of the outbreaks.[6,7] Our finding may be explained by the concentration of these facilities in a few states with a workforce consisting, in large part, of immigrant workers who may be less likely to be contacted or to participate in an Internet-based survey.[6,7]

In this survey, older workers working outside the home were less likely to report a previous COVID-19 diagnosis than younger workers. It is possible that this is because older workers who experienced COVID-19 were more likely to have left the workforce through death, disability, or retirement prior to January 1, 2021. Also, this age group was most likely to have received at least 1 COVID-19 vaccine.

Vaccination Status and Intent

Limited data are available on vaccination rates among essential worker groups because employment information is not collected systematically at vaccine administration sites. Current findings indicate that a large proportion of essential workers remain unvaccinated, but some still show a willingness to be vaccinated.

As of May 26 through July 5, 2021, over 80% of phase 1b education workers and phase 1a health care personnel reported receiving at least 1 COVID-19 vaccine (education: 86.3%; health care: 84.0%). Respondents in phase 1b education may have benefited from the president's initiative to vaccinate education sector workers in March 2021 and from access to the Federal Retail Pharmacy Program. However, there remains a small percentage of workers who are unsure about the vaccine or plan to get it but have not yet.

The agriculture, forestry, fishing, and hunting group had the highest proportion of respondents saying they definitely would not get vaccinated, suggesting that additional strategies are needed to improve vaccine confidence among unvaccinated persons in this occupational group.

Our findings of differences among essential workers in different demographic categories mirror results from other surveys conducted in the general US population, which show that Black persons, those of lower educational attainment, and those of lower income report the lowest COVID-19 vaccine uptake.[27–29] Only 1 previous study has reported that people without health insurance reported lower vaccination coverage.[27] It is important that vaccination campaigns emphasize the message that there is no cost for receiving the vaccine if that is the case and provide information about how to access vaccination for uninsured persons.

Our analysis provides evidence that demographic patterns of vaccination uptake among essential workers overall are consistent with patterns among the general population, but they vary by ACIP vaccination phase categories, with phase 1a health care and phase 1b education workers more likely to report being vaccinated and phase 1b noneducation and other essential workers less likely to report vaccination.

Prior to vaccine availability, a county community vaccine taskforce collected data on willingness to be vaccinated, occupation, and demographic characteristics in a sample of 26 324 respondents. They found that first responders were least willing to be vaccinated, followed by construction, maintenance, and landscape workers; housekeeping, cleaning, and janitorial workers; and retail and food service workers. Workers most willing to be vaccinated were in health care; office, professional, and technical jobs; and education.[29] These findings roughly reflect the higher vaccination coverage we found in health care and education workers and lower vaccination uptake in the phase 1b noneducation group, including first responders. Unfortunately, our sample size was not sufficient to estimate vaccination for the first responder group by itself.

On the basis of reported intention to be vaccinated, opportunities exist to improve COVID-19 vaccination among workers. Workers aged 18 to 29 years and 30 to 44 years, non-Hispanic Black workers, workers with a high school education or less, and those never married, without health insurance, and with a previous COVID-19 diagnosis have at least 10% prevalence of being "unsure about receiving the vaccine" and might be convinced to get COVID-19 vaccination by a trusted source.[30] Convenient workplace vaccination opportunities may also increase vaccination among these populations. Vaccination mandates for employees have also been announced by government and private entities, especially health care organizations, and might improve uptake for workers in those industries.[31]

Limitations

This study has several limitations. HPS estimates of COVID-19 vaccination are substantially biased upwards. To illustrate the overestimation bias in HPS related to COVID-19 vaccination, estimated COVID-19 vaccination coverage (receipt of ≥ 1 dose) among adults aged 18 years and older was 80.9% from HPS data collected June 23 through July 5, 2021,[32] and 66.2% based on COVID-19 vaccine administration data[33] reported as of the middle of the HPS data collection period (June 29, 2021). Additionally, the US Census Bureau considers the HPS to be an experimental data product; responses are voluntary. With the sample sizes used in the survey a response rate of 9% was anticipated, slightly higher than what was achieved. Nonresponse was in part compensated for by weights that adjust by age, gender, Hispanic origin, race, and educational attainment. The US Census Bureau determined that weighting reduced bias, using the American Community Survey to evaluate it.[21,22]

In addition, although the survey sample size was large, small subsamples for some essential worker groups required combining specific groups to meet NCHS standards of reliability. Responses including previous COVID-19 diagnosis,

essential worker category designation, and vaccination status were self-reported and not verified. Results are based on information reported at the time of the survey and may have changed owing to current circumstances (e.g., because of vaccine availability, jurisdictional or company vaccine requirements, and increased prevalence of variants of the virus that causes COVID-19). Other limitations include the following: the cross-sectional nature of the survey only allowed us to report associations; the workplace settings may include a wide range of occupations with different levels of exposure; questions used different time periods for current employment (7 days), employment as an essential worker (since January 1, 2021), and COVID-19 diagnosis (since beginning of the COVID-19 pandemic); and different essential worker groups may have had different nonresponse rates.

The HPS, although not ideal, provided an opportunity to explore COVID-19 diagnosis and vaccine hesitancy in essential workers. Future pandemic responses would benefit from dedicated surveys developed specifically to understand impacts on workers by industry as well as occupation.

Public Health Implications

This study underscores the importance of improved surveillance to monitor the impact of COVID-19 and other infectious diseases among workers and the use of mitigation measures, including COVID-19 vaccination, improved building ventilation, wearing well-fitting masks, physical distancing, hand washing, cleaning and disinfection, screening testing, isolation of cases, and quarantine of unvaccinated close contacts. Targeted interventions to provide information and assistance with vaccine access may improve vaccine uptake, especially among those who are hesitant but not opposed to the vaccine. CDC resources are available for building vaccine confidence in the workplace and in the community.[34,35] Any interventions should include consideration of structural inequities; for example, a company's exclusion of temporary or contract workers from on-site vaccination campaigns might exacerbate differences between types of employees. AJPH

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CONTRIBUTORS

A. L. Steege conceptualized the study and led the data analysis and interpretation and the drafting and revision of the article. S. E. Luckhaupt, R. J. Guerin, J. A. Singleton, and M. H. Sweeney contributed substantially to the study design. S. E. Luckhaupt, R. J. Guerin, T. A. Santibanez, and M. R. Groenewold contributed substantially to methods development. M.-C. Hung and P.-J. Lu contributed substantially to data analysis. S. E. Luckhaupt, R. J. Guerin, and A. H. Okun contributed to article drafting. S. E. Luckhaupt, R. J. Guerin, A. H. Okun, M.-C. Hung, G. Syamlal, P.-J. Lu, T. A. Santibanez, M. R. Groenewold, R. Billock, J. A. Singleton, and M. H. Sweeney contributed substantially to data interpretation and revision of the article.

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CONFLICTS OF INTEREST

The authors do not have any potential or actual conflicts of interest to disclose.

HUMAN PARTICIPANT PROTECTION

This activity was reviewed by the CDC and was conducted consistent with applicable federal law and CDC policy. (See, e.g., 45 CFR part 46, 21 CFR part 56; 42 USC §241(d); 5 USC §552a; 44 USC §3501 et seq.) This activity was determined to be nonresearch and did not require Human Research Protection Office review.

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Trends in COVID-19 Vaccine Acceptance in Spain, September 2020–May 2021

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See also COVID-19 & Monkeypox, pp. 1564–1620.

Objectives. To analyze factors associated with COVID-19 vaccine acceptance in Spain, over time.

Methods. We used data from a national study that included 5 online surveys carried out every 2 months from September 2020 to May 2021. Each round recruited a sample of 1000 participants aged 18 years or older. We performed a multivariable logistic regression with vaccination acceptance as the dependent variable. We evaluated time trends through the interaction terms of each of the explanatory variables and the time.

Results. Vaccination acceptance increased from 43.1% in September 2020 to 84.5% in May 2021. Sex, age, concerns about disease severity, health services overload, and people not wearing a face mask, together with adherence to preventive behavior, health literacy, and confidence in scientists, health care professionals' information, and adequacy of governmental decisions, were variables associated with vaccination acceptance.

Conclusions. In a changing situation, vaccine acceptance factors and time trends could help in the design of contextualized public health messages. It is important to strengthen the population's trust in institutions, health care professionals, and scientists to increase vaccination rates, as well as to ensure easy access to accurate information for those who are more reluctant. (*Am J Public Health*. 2022;112(11): 1611–1619. https://doi.org/10.2105/AJPH.2022.307039)

COVID-19 has become a global health pandemic with more than 171 049 741 cases and 3 549 710 deaths reported worldwide at the time of this study in May 2021.[1]

Vaccination is one of the most cost-effective health interventions to prevent most infections. Since COVID-19 vaccination started in the European Union (EU) in December 2020, the cumulative vaccine uptake in adult population reached up to 51.2% with at least 1 vaccine dose and 26.8% with full vaccination.[2] However, only 5.7% of the world's population had been fully vaccinated against COVID-19 by May 2021[3]

Spain is now one of the leading countries in COVID-19 vaccination adherence with 93% of the population aged 12 years or older fully vaccinated.[4] The country started vaccinating in late December 2020 and accelerated its vaccination efforts in early 2021, overtaking countries that had made better progress earlier, like the United States and the United Kingdom.[5] At that time, Spanish vaccination strategy focused on vaccinating the largest number of people possible with 2 doses, instead of a single dose as other countries prioritized.[2] At the time of this study, in May 2021, Spain had administered at least 1 COVID-19 vaccine dose to nearly 40% of its population, and more than 20% had received 2 doses.[4]

Vaccine hesitancy is defined by World Health Organization (WHO) as "delay in acceptance or refusal of vaccines despite availability of vaccination services"[6(p7)] Vaccine hesitancy and misinformation are major obstacles to achieve a high vaccine coverage. COVID-19 vaccination is one of the measures for controlling the pandemic and reducing infection risk, disease severity, and mortality.[7] Therefore, it is of great importance to understand peoplés willingness to be vaccinated.[8]

Individual and context determinants influence immunization behavior.[8] Knowledge and risk perception are frequently described as key factors in protective behavior adherence.[9] Similarly, concerns, misperceptions, and prejudices can also negatively affect vaccination decisions and practices.[10] These insights are critical to understand individual reasons behind vaccine acceptance and to designing effective messages to achieve positive outcomes.[11]

Health authorities have a critical role in vaccination support and promotion, ensuring equitable access to vaccination services and updated science-based information,[8] while mass media play an important role in risk communication, avoiding unfounded discussions, misinformation, and fake news.[12] A high level of confidence in institutions and science to address the challenges created by the COVID-19 pandemic usually implies more vaccine acceptance.[13] Studying population knowledge, attitudes, practices, and concerns about COVID-19 vaccination becomes essential in a long-term pandemic. The aim of this study was to analyze the factors associated with COVID-19 vaccination intention and its time trends. This information will be very useful for designing adequate public health messages addressed at clarifying the population's doubts, fighting misinformation, and promoting vaccination.

METHODS

The COVID-19 Snapshot Monitoring study survey in Spain (COSMO-Spain) is based on the WHO tool for behavioral insights on COVID-19,[14] carried out in different countries worldwide. This protocol has been used to conduct periodic surveys on knowledge, attitudes, and practices throughout the pandemic in Spain.[15] Questionnaire details can be found on the COSMO-Spain homepage[16] and in the COSMO-WHO repository.[14]

Setting and Study Population

We conducted analyses with data from the September 2020 to May 2021 COSMO-Spain study[16] (Figure 1), including the periods between the second and fourth country epidemic waves. A consumer research company carried out 5 cross-sectional panel survey rounds every 2 months.[16] In each round, they recruited a sample of around 1000 participants aged 18 years or older from a panel. The sample was representative of the Spanish general population in terms of sex, age, education, and area of residence. The research company e-mailed to these panel members an invitation to answer an online questionnaire. Methodological aspects have been previously published.[16–18]

The first-round survey was conducted between September 22 and 25, 2020, during the second wave, when the new school year had already started and schools reopened, and the measures adopted to restrict activity and mobility in different cities and autonomous communities were in place. The cumulative incidence (cases per 100 000 inhabitants) during the previous 2 weeks was 282.29.[19]

The second round was conducted between November 24 and 27, 2020, at the end of the second wave in Spain, with mobility restrictions and capacity limitations in commercial establishments still present. At the time, the cases detected reached a cumulative incidence of 307.30 for the last 14 days.[19]

Vaccination started on December 27 in Spain. The study third round was held 1 month later, from January 25 to February 1, 2021. The cases detected during the previous 14 days reached a cumulative incidence of 783.25.[19] Mobility restrictions, opening hours of bars and restaurants, and capacity limitations in commercial establishments in different autonomous communities were maintained. A total of 2.64% of the population had received at least 1 vaccination dose, and 0.75% had the full regimen of 2 doses.[4]

The fourth study round was conducted from March 22 to 26, 2021, just before the Easter holidays. The cases detected during the previous 14 days reached a cumulative incidence of 138.63.[19] There were mobility restrictions and time and capacity limitations in commercial establishments in different autonomous communities. A total of 9.62% of the population had received at least 1 vaccination dose, and 5.28% had the full 2-dose regimen.[4]

The last study round was conducted from May 24 to June 3, 2021. The cumulative incidence during the previous 14 days was 198.60 cases.[19] About 39.46% of the Spanish population had at least 1 dose of the COVID-19 vaccine, and 21.04% had 2 doses.[4]

Variables

The online questionnaire collected information on basic sociodemographic data (e.g., sex, age, education level, job status, household members), COVID-19 self-reported infection status, and family members or relatives infected by and deceased from COVID-19. The variables have been described in previous publications.[18]

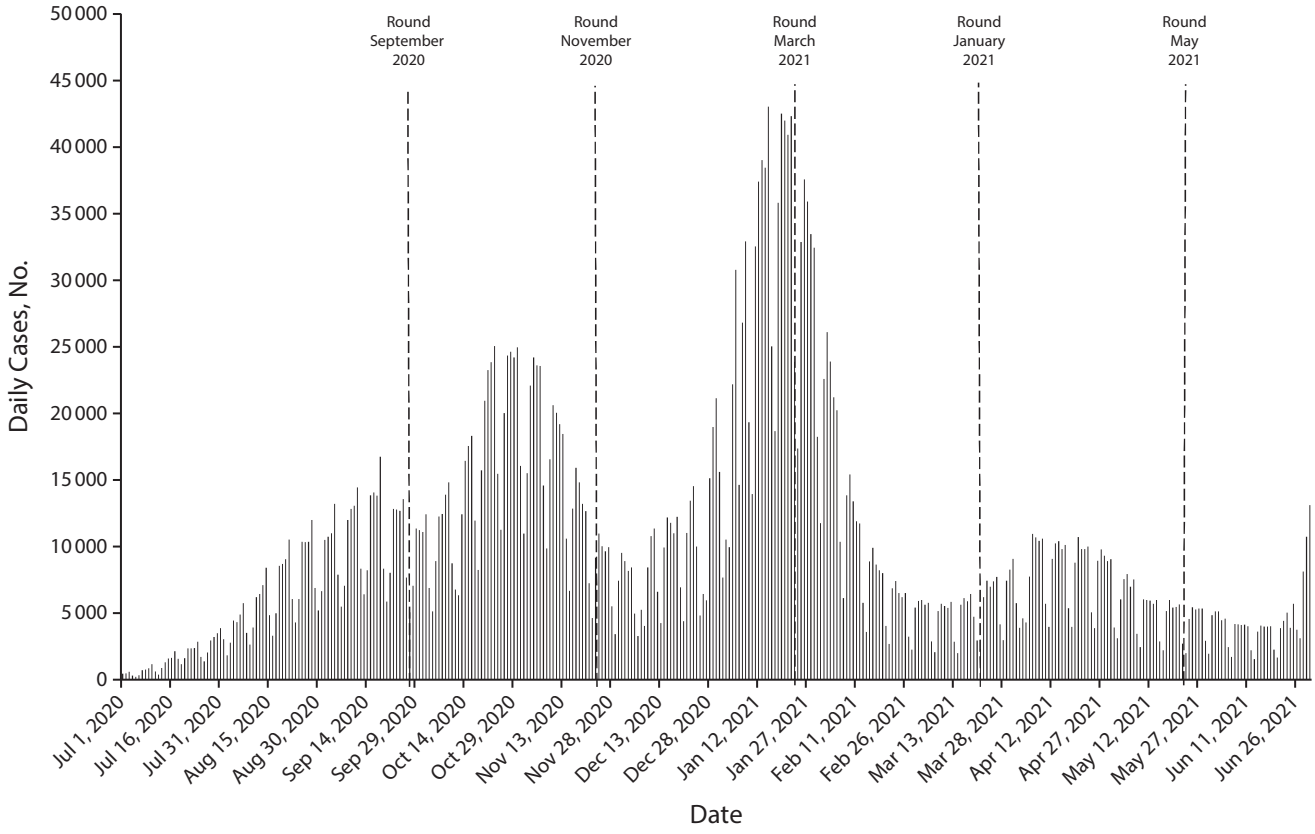

FIGURE 1— Epidemic Curve of the Pandemic in Spain With the Dates of the Different Rounds Carried Out From September 2020 to May 2021

Source. Data were obtained from individualized data notified to RENAVE (National Epidemiological Surveillance Network in Spain).

We measured vaccine intention with the question, "If you were offered vaccination against COVID-19 tomorrow, would you get vaccinated?" Answers were rated from 1 ("I would not get the vaccine") to 5 ("I would get the vaccine for sure").

Data and Statistical Analysis

We conducted a descriptive analysis of participants' characteristics and included variables. We described categorical variables with frequency and percentages and continuous variables using median and interquartile range. We recoded the question about vaccination acceptance, considering answers from 1 to 3 as "I disagree with being vaccinated" and 4 and 5 as "I agree with being vaccinated" to assess COVID-19 vaccination acceptance–related factors. People who had already received a vaccine were recorded as agreeing with being vaccinated. The bivariate analysis using the χ^2 test can be found in Appendix A (available as a supplement to the online version of this article at https://ajph.org). We included independent variables that were significantly associated with COVID-19 vaccine acceptance at a *P* value of less than .05 in the multivariable analysis.

We performed a multivariable logistic regression analysis using a backward stepwise procedure to assess factors associated with vaccination acceptance. We computed the odds ratios (ORs) and 95% confidence intervals (CIs), and considered *P* values of less than .05 to be statistically significant.

We performed time-based trend analysis to measure the effect of the independent variables on the probability of agreement with being vaccinated changing over time. For this purpose, we performed interactions between time and each of the independent variables obtained in the final logistic regression model. We analyzed the significant interactions through margin plots. We used Stata version 15

(StataCorp LP, College Station, TX) to perform all statistical analyses.

RESULTS

Out of 5080 adults included in this analysis, 3156 (62.1%) agreed to be vaccinated against COVID-19 (Table 1). More than half of people who agreed to be vaccinated were men (53.4%), with a median age of 48 (interquartile range = 23) years, were working (54%), and 62.4% had family members or relatives infected by COVID-19, with an increasing trend in vaccination acceptance from September 2020 (43.1%) to May 2021 (84.5%).

Factors Associated With Vaccine Acceptance

According to the multivariable logistic regression analysis (Appendix B, available as a supplement to the online version of this article at https://ajph.org), vaccine acceptance increased from November 2020 (OR = 0.78) to May 2021 (OR = 13.14; 95% CI = 10.25, 16.84; $P < .001$). Among the sociodemographic characteristics, women were less likely to be vaccinated (OR = 0.63; $P < .001$), while acceptance increased with age (OR = 1.01; $P < .001$). Other factors associated with disagreement with vaccination were a high perceived probability of infection when going to a health center (OR = 0.62; $P < .001$), being worried about not being able to pay their bills (OR = 0.82), and having a low self-efficacy (OR = 0.81).

Being concerned about COVID-19 (OR = 1.29) and people not wearing a face mask (OR = 1.31) were associated with vaccine acceptance. Adherence to preventive behaviors such as using hydroalcoholic gel and other hand disinfectants (OR = 1.32) and using face masks following national recommendations (OR = 1.75; $P < .001$), as well as having a high confidence in scientists (OR = 1.72; $P < .001$) and schools to address the challenges of the COVID-19 pandemic (OR = 1.36; $P < .001$), were also associated with vaccine acceptance.

Time-Based Trends in Vaccine Acceptance

Respondents worried about people not wearing a face mask agreed with being vaccinated to a much larger extent in March 2021 (OR = 2.1; 95% CI = 1.4, 3.1; $P < .001$) and in May 2021 (OR = 2.0; 95% CI = 1.3, 3.1; $P = .002$). We observed the same time trend in people who normally used a face mask in March 2021 (OR = 2.7; 95% CI = 1.5, 4.7; $P = .001$) and May 2021 (OR = 3.7; 95% CI = 2.1, 6.6; $P < .001$) or used hydroalcoholic gel in May 2021 (OR = 2.4; 95% CI = 1.5, 3.7; $P < .001$), and in those who considered it very easy to find information about coronavirus (March 2021: OR = 2.0; 95% CI = 1.4, 2.7; $P < .001$ and May 2021: OR = 1.9; 95% CI = 1.3, 2.8; $P < .001$). Similarly, people who were more confident in scientists agreed with vaccination to a much larger extent in January 2021 (OR = 2.0; 95% CI = 1.4, 2.7; $P < .001$), March 2021 (OR = 1.9; 95% CI = 1.4, 2.7; $P < .001$), and May 2021 (OR = 2.5; 95% CI = 1.7, 3.8; $P < .001$), while respondents who were worried about paying their bills had less agreement to be vaccinated in January 2021 (OR = 0.61; 95% CI = 0.5, 0.8; $P = .002$; Figure 2).

DISCUSSION

Vaccination acceptance increased in Spain from September 2020 to May 2021. Understanding vaccine acceptance factors is crucial, even in contexts with high COVID-19 vaccination rates.[4] In this study, factors such as being male, older age, better health literacy, high pandemic concern, and high risk perception, as well as high adherence to preventive measures and confidence in scientists and institutions, were associated with greater vaccination acceptance.

Being a woman was associated with less agreement to be vaccinated in Spain, as has been found in other studies.[20] Vaccination acceptance could have been negatively affected in younger women by rumors regarding COVID-19 vaccines and menstrual cycle problems, infertility, and pregnancy and breastfeeding concerns that had circulated widely on diverse social media.[21] Concerns about adverse events such as venous thromboembolism or thrombocytopenia may have also influenced their vaccine hesitancy.[22] Women's higher caregiving burden might have played a role, too.

Age was also associated with increasing vaccination acceptance. Older adults agreed with being vaccinated as they are at higher risk of developing a severe disease and dying from potential complications of COVID-19.[23] Different concerns have been associated with vaccination acceptance. Having high perceived risk of infection in home gatherings with friends or family, high-perceived severity if infected, and high concern about unmasked people were factors associated with higher vaccination acceptance in Spain. Worries about the pandemic were also associated with higher vaccination intention in many other countries.[20,24]

Regarding the factors associated with disagreeing with vaccination, people very worried about paying their bills

TABLE 1— Participants' Sociodemographic Characteristics by Vaccination Acceptance and Agreement: Spain, September 2020–May 2021

Variables	No. (%) or Median (IQR)			OR (95% CI)
	Total	Agree	Disagree	
Total	5080 (100)	3156 (62.1)	1924 (37.9)	
Rounds				
Sep 2020	1057 (20.8)	456 (43.1)	601 (56.9)	1 (Ref)
Nov 2020	1018 (20.0)	394 (38.7)	624 (61.3)	0.83 (0.70, 0.99)
Jan 2021	1002 (19.7)	722 (72.1)	280 (27.9)	3.40 (2.83, 4.09)
Mar 2021	1002 (19.7)	738 (73.7)	264 (26.3)	3.68 (3.06, 4.44)
May 2021	1001 (19.7)	846 (84.5)	155 (15.1)	7.19 (5.83, 8.88)
Sex				
Men	2534 (49.9)	1685 (53.4)	849 (44.1)	1 (Ref)
Women	2546 (50.1)	1471 (46.6)	1075 (55.9)	0.69 (0.62, 0.77)
Age, y	46 (22)	48 (23)	43 (21)	1.02 (1.02, 1.03)
Education level				
Primary studies (aged up to 10 or 11 y)	503 (9.9)	1430 (45.3)	824 (42.8)	1 (Ref)
Secondary studies and above	4577 (90.1)	1726 (54.7)	1100 (57.2)	0.90 (0.81, 1.01)
Job status				
Not working	2826 (55.6)	1430 (45.3)	824 (42.8)	1 (Ref)
Working	2254 (44.4)	1726 (54.7)	1100 (57.2)	0.90 (0.81, 1.01)
Household members				
Living with another person aged 0–13 y	1524 (30.0)	876 (27.8)	648 (33.7)	0.76 (0.67, 0.86)
Living with another person aged 14–60 y	4496 (88.5)	2700 (85.6)	1796 (93.3)	0.42 (0.34, 0.52)
Living with another person aged >60 y	1740 (34.3)	1190 (37.7)	550 (28.6)	1.51 (1.34, 1.71)
Respondents' self-reported COVID-19–infection status				
No	4675 (92.0)	2895 (91.7)	1780 (92.5)	1 (Ref)
Yes	405 (8.0)	261 (8.3)	144 (7.5)	0.90 (0.73, 1.11)
Family members or relatives infected by COVID-19				
No	2088 (41.1)	1188 (37.6)	900 (46.8)	1 (Ref)
Yes	2992 (58.9)	1968 (62.4)	1024 (53.2)	0.69 (0.61, 0.77)
Family members or relatives deceased from COVID-19				
No	2079 (69.5)	1360 (69.1)	719 (70.2)	0.95 (0.81, 1.12)
Yes	913 (30.5)	608 (30.9)	305 (29.8)	1 (Ref)

Note. CI = confidence interval; IQR = interquartile range; OR = odds ratio.

were less likely to accept vaccination. Although COVID-19 vaccine was provided free of charge, adults who found it hard to pay their bills were less likely to be vaccinated, possibly because of their low socioeconomic status, fearing side effects that could impair their income-earning capabilities, and other structural barriers such as access to vaccination facilities and opening schedules.[23,25] Other factors related with vaccination disagreement in Spain were having high perception of contagion in health centers and a low self-efficacy. Trust in the vaccines has shown to be critically dependent on governments' ability to explain the benefits of vaccination and to deliver the vaccines safely and effectively.[26]

People who always used face masks and cleaned their hands frequently showed a higher level of vaccination acceptance. The association between adherence to preventive measures and acceptance to be vaccinated has been found in other countries.[24] In Spain, this association may be related to the population's willingness to follow all disease prevention–related recommendations.[17]

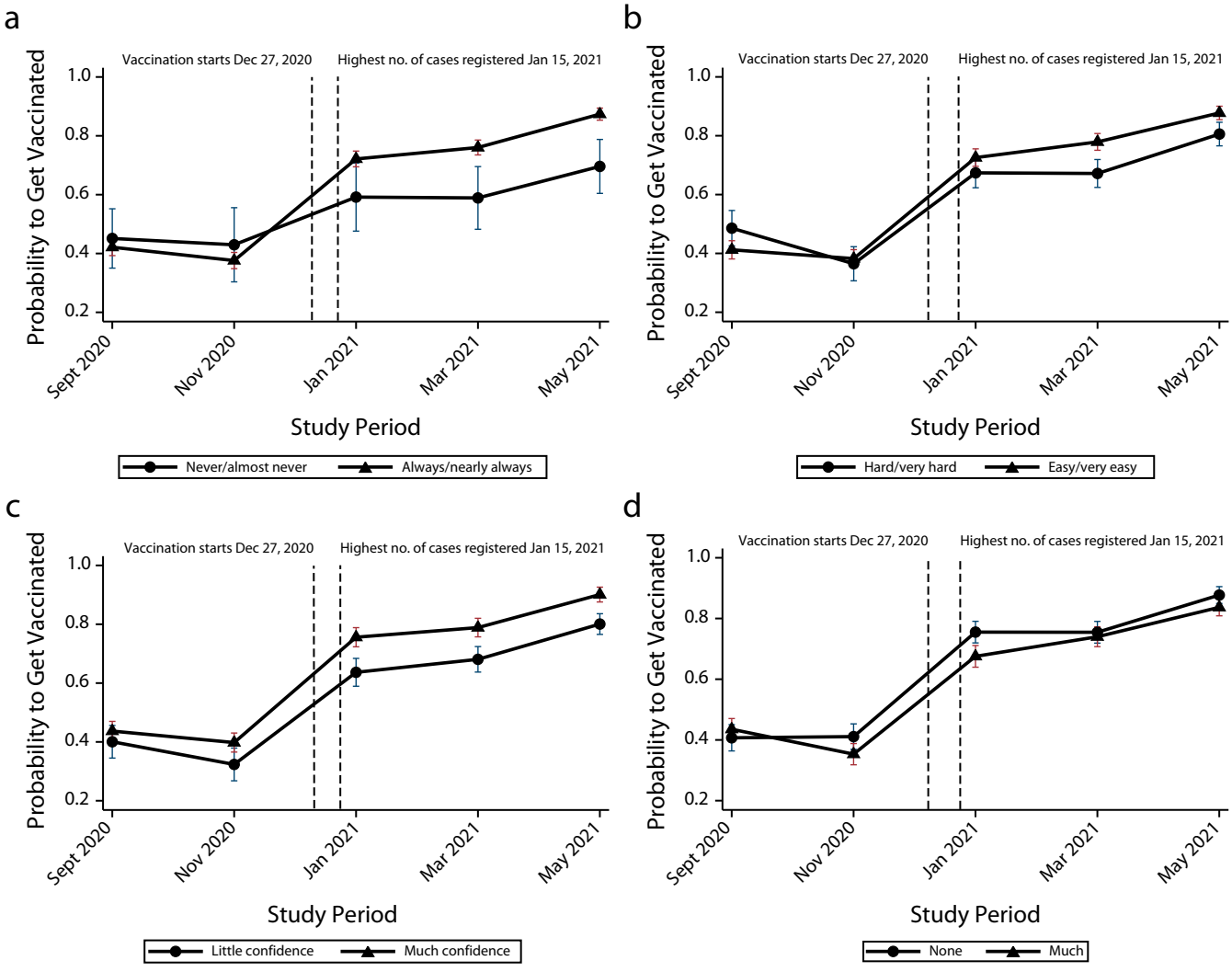

FIGURE 2— Time-Based Trend Differences in Agreement With Being Vaccinated Against COVID-19 and (a) Use of Masks, (b) Finding Information About COVID-19, (c) Confidence in Scientists, and (d) Concern About Not Being Able to Pay Bills: Spain, September 2020–May 2021

Note. Adjusted predictions from multivariable logistic regression with interaction between concerns and perceived disease severity about COVID-19, preventive behaviors, health literacy, and confidence in scientists over time during the study period.

However, some studies have shown a decreasing agreement to accept COVID-19 vaccine in participants who regarded their good use of masks and other preventive attitudes as substitutes for COVID-19 vaccination.[27]

Respondents who had higher health literacy and who often looked for COVID-19 information also showed higher vaccination acceptance. Providing health education and tailoring messages to the community's needs are of capital importance to fight this pandemic. In the Spanish population, a greater COVID-19 vaccination awareness has contributed to increased vaccination rates.[28] Health literacy plays a key role in understanding and applying the information provided by governments and health authorities about available COVID-19 vaccines. Promoting acceptance of a vaccine against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) essentially involves increasing individuals' ability to detect fake news, improving their health literacy through education, and consistent vaccine communication strategies by institutions.[29]

Gathering information from reliable sources such as WHO was associated with higher COVID-19 vaccine acceptance.[24] Confidence in the national press has been also associated with vaccination acceptance, as has been seen in other studies, where knowing

the latest COVID-19 vaccine news implied more willingness to receive it.[30] Given that misinformation has been associated with lower acceptability of COVID-19 vaccination,[26] receiving adequate information on disease risks and vaccination benefits is very important.

Moreover, higher confidence in scientists increased vaccination acceptance in Spain. In contrast to other countries,[31] the relevance of science for the Spanish population increased during the pandemic because most of the population believed that people should follow scientific advice to contain the virus and considered science to be very important for society.[13] Confidence in health care professionals' recommendations was also higher in Spain than in the rest of the European Union,[24] another key factor and top facilitator of vaccine acceptance in Spain. This confidence, together with a universal public health system, have been some of the reasons why Spain has a high acceptance of COVID-19 vaccination. This may also be influenced by the recognized efforts made by the Spanish public health system and health professionals responding to the different waves of the pandemic with dedication and commitment.[13]

Furthermore, people who indicated a higher confidence in institutions such as schools addressing the challenges created by COVID-19 pandemic also showed more vaccine acceptance. Unlike the rest of Europe, Spain chose to keep schools open throughout the pandemic with strict protocols, and become one of the Organisation for Economic Co-operation and Development nations where students have missed the fewest days of in-place class learning and with a low number of coronavirus cases during the studied period.[32]

People's agreement with being vaccinated followed an increasing trend from September 2020 to May 2021, with a drop only being noticed in November 2020, just before vaccination started, when hoaxes and conspiracy theories on social networks increased in Spain and were echoed by some mass media.[33] After COVID-19 vaccination started in December 2020, the acceptance rate increased considerably. Spain was suffering its third COVID-19 wave, and the highest number of cases until then was registered in January 2021.[19] As COVID-19 vaccination advanced, vaccination acceptance kept increasing.

People showed an increasing COVID-19 vaccination acceptance in March and May, always after a wave and just before Easter and the summer holidays. Awareness about the importance of being vaccinated seems to grow after a wave and before the holidays, as vaccines could be seen as a way to ensure it is safer to travel and meet family and friends. Moreover, respondents worried about unmasked people also followed this time trend, especially in May when the mass media started to debate face mask usage outdoors and the government finally lifted the compulsory use of face masks outdoors at the end of June 2021.[33]

Limitations

This study has several limitations. This was a cross-sectional study, and the results may not be generalizable. Despite being representative at national level, the sample size prevents any assessment of regional differences, and surveys of this type are successive snapshots, each taken at a point in time. Our surveys were conducted in the context of a highly dynamic and changing situation over the pandemic, with daily variations in risk perception and COVID-19 vaccine development itself. Further research is needed to explore in depth the reasons for vaccine hesitancy.

Conclusions

In a changing situation, understanding factors and time trends associated with vaccine acceptance would be helpful to design intervention measures necessary to raise awareness about vaccination's benefits. Findings from this study highlight how older people who comply with preventive measures, with high risk perception and better health literacy, and who have greater confidence in scientists and institutions have the greatest acceptance of vaccination for COVID-19.

Collaborative communication between science and society about COVID-19 becomes essential. Information campaigns should be targeted at people who have less vaccination acceptance such as women, youths, people with economic problems, and people with low self-efficacy liable to be influenced by fake news, making it easier for them to access evidence-based information. Increasing trust in institutions and health care workers may be key to addressing future pandemics. AJPH

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M. Romay-Barja, M. Falcon-Romero, C. Rodríguez-Blázquez, and M. João Forjaz conceptualized the study. M. T. Beca-Martínez, A. Ayala, and M. Romay-Barja analyzed the data. M. T. Beca-Martínez and M. Romay-Barja wrote the initial draft of the article. M. João Forjaz and A. Benito were involved in funding acquisition and project administration. All authors collaborated in writing, review, and editing of the article.

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CONFLICTS OF INTEREST

Authors declare that they do not have any conflicts of interest.

HUMAN PARTICIPANT PROTECTION

This study was approved by ethics committee of Instituto de Salud Carlos III (CEI PI 59_2020-v2). The participants provided their written informed consent. Our report follows the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline for observational cross-sectional studies.

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COVID-19 Vaccine Uptake and Factors Affecting Hesitancy Among US Nurses, March–June 2021

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See also COVID-19 & Monkeypox, pp. 1564–1620.

Objectives. To characterize COVID-19 vaccine uptake and hesitancy among US nurses.

Methods. We surveyed nurses in 3 national cohorts during spring 2021. Participants who indicated that they did not plan to receive or were unsure whether they planned to receive the vaccine were considered vaccine hesitant.

Results. Among 32 426 female current and former nurses, 93% had been or planned to be vaccinated. After adjustment for age, race/ethnicity, and occupational variables, vaccine hesitancy was associated with lower education, living in the South, and working in a group care or home health setting. Those who experienced COVID-19 deaths and those reporting personal or household vulnerability to COVID-19 were less likely to be hesitant. Having contracted COVID-19 doubled the risk of vaccine hesitancy (95% confidence interval [CI] = 1.85, 2.53). Reasons for hesitancy that were common among nurses who did not plan to receive the vaccine were religion/ethics, belief that the vaccine was ineffective, and lack of concern about COVID-19; those who were unsure often cited concerns regarding side effects or medical reasons or reported that they had had COVID-19.

Conclusions. Vaccine hesitancy was unusual and stemmed from specific concerns.

Public Health Implications. Targeted messaging and outreach might reduce vaccine hesitancy. (*Am J Public Health*. 2022;112(11):1620–1629. https://doi.org/10.2105/AJPH.2022.307050)

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In December 2020, the Advisory Committee on Immunization Practices prioritized health care personnel (HCP) to begin receiving 2 COVID-19 mRNA vaccines (Pfizer-BioNTech and Moderna) authorized under emergency use authorizations[1,2]; a third vaccine (Janssen) was authorized in a February 2021 emergency use authorization. There have been substantial challenges in gathering information on the uptake of vaccinations by HCP. The National Healthcare Safety Network, a Centers for Disease Control and Prevention surveillance system,[3] rapidly deployed modules for reporting HCP vaccinations but faced substantial challenges in data collection.[4] The US Department of Health and Human Services launched the Unified Hospital Data Surveillance System in January 2021 for hospitals to report staff vaccinations; reporting is voluntary, however, and less than half of eligible facilities had reported data by September 2021.[5]

Without comprehensive, accurate data to estimate vaccinations among HCP, media coverage of vaccine controversies might contribute to public perceptions that many HCP are skeptical about the safety and effectiveness of COVID-19 vaccines. Because nursing is consistently ranked among the most trusted professions,[6] this might influence public vaccine hesitancy. Several small surveys of HCP conducted before the emergency use authorizations indicated varying levels of vaccine hesitancy, with studies in the United States reporting percentages ranging from 8% to 18% among HCP surveyed between October 2020 and January 2021.[7] These studies indicated that female HCP were more likely to be vaccine hesitant than male HCP, and nurses were more likely to be hesitant

than physicians.[7] However, after the December 2020 emergency use authorization, opinions could have changed as a result of public health messaging, targeted communications to HCP, and HCP observing their colleagues' experiences receiving the vaccine.

We conducted an evaluation of 32 426 female nurses recruited from 3 large national cohort studies to assess vaccination rates, reasons for vaccine hesitancy, and personal and workplace variables associated with receiving a vaccine by spring 2021. This was a period when most HCP had been offered vaccinations but before vaccinations were widely available to the general population.

METHODS

In April 2020, we launched a yearlong series of COVID-19 surveys within 3 preexisting longitudinal national cohorts: the Nurses' Health Study II (NHSII), the Nurses' Health Study 3 (NHS3), and the Growing Up Today Study (GUTS). General cohort methods[8–10] and specific COVID-19 survey methods[11] are fully detailed elsewhere. In brief, Nurses' Health Study participants are recruited through professional nursing associations and credentialing rosters (in 1989 for the closed NHSII cohort and since 2010 for the open NHS3 cohort). The NHSII cohort was restricted to female nurses, whereas the NHS3 includes both male and female nurses. Members of the GUTS cohort were recruited in 1996 from among 9- to 16-year-old children of NHSII participants. All GUTS participants are now adults working in both health care and non–health care occupations.

At the start of the COVID-19 pandemic, 105 662 cohort members from these 3 longitudinal surveys were invited to participate in a COVID-19 substudy regarding their pandemic experiences (those who responded at baseline in March–April 2020 were surveyed again 1, 2, 3, 6, 9, and 12 months later). In total, 58 606 agreed to participate in the substudy (a 55% response rate) by completing the first survey. Each survey was rolled out over 3 weeks; the final spring 2021 (12 months from baseline) survey was rolled out from March 23 through April 13, 2021; 48 356 surveys were returned by the June 22, 2021, deadline (an 83% completion rate).

The spring 2021 survey asked whether participants had received at least 1 dose of COVID-19 vaccine and, if not, whether they planned to receive one when it became available to them (yes, no, or unsure). Those who said that they were unsure or said no were considered vaccine hesitant and were asked to indicate which, if any, of 9 reasons applied to their answer. Covariates we evaluated included age, race/ethnicity, geographic region of residence, nursing education, experiencing deaths from COVID-19 (deaths of patients, coworkers, or loved ones), working status, facility type, previous history of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection, vulnerability to severe COVID-19 disease (among both participants and household members), and contact with patients with COVID-19.

Age and race/ethnicity were recorded at cohort entry. The questions on race evolved over time and between cohorts; for this analysis of the combined cohorts, we were able to classify race as White, Hispanic, Black, Asian, and other. Geographic region was based on state of residence and classified according to US census region. Nursing education and degree were grouped as LPN/LVN/ADN (licensed practical nurse, licensed vocational nurse, or associate degree in nursing), RN/BSN (registered nurse or bachelor of science in nursing), and advanced practice nurse (nurse practitioner, certified nurse midwife, or other certification typically requiring a master's degree or higher in a nursing specialty).

Nurses were asked to specify the type of health care facility in which they worked. SARS-CoV-2 infection was self-reported on multiple questionnaires, with a further question asking whether the infection had been laboratory confirmed via polymerase chain reaction or antibody screening. We used first-reported infections to classify participants as never infected, having a laboratory-confirmed infection in 2020 (i.e., before vaccine availability), having a laboratory-confirmed infection in 2021 (i.e., infections that might have occurred either before or after vaccination was offered), or having a presumed infection that lacked a date or was not laboratory confirmed. Because it predated the rollout of vaccines to HCP, only laboratory-confirmed infection in 2020 was considered as a predictor of vaccine hesitancy.

Vulnerability to severe COVID-19 disease was assessed according to participants' self-reports that they or someone in their household was vulnerable to severe COVID-19 illness because of age (above 65 years) or an underlying medical condition. Working with patients with COVID-19 was self-reported as an "in-person interaction with a patient with current documented or presumed COVID-19" (response options were yes, documented; yes, presumed; and not that I know of); the history of such exposures by month 9 (approximately January 2021) was calculated. Participants were asked about experiencing the death of a patient, coworker, or loved one as a result of COVID-19 at month 6 (approximately October 2020), and this question was updated in the final spring

2021 survey on which vaccine status was queried; because we did not know whether deaths reported in spring 2021 occurred before or after participants were offered vaccinations, we used deaths reported at month 6 in our main analysis.

We restricted our analysis to credentialed current and former nurses living in the United States (67% of the COVID-19 cohort) who were female (99% of the cohort) and who responded to the spring 2021 survey on which vaccination status was queried. From this group of 32 606 nurses, we further excluded those missing data on vaccination status (n = 106), history of SARS-CoV-2 infection (n = 54), or vulnerability to severe COVID-19 (n = 11) and those whose information on work status and site could not be reconciled (n = 9), leaving a final sample of 32 426 individuals.

We examined odds ratios (ORs) for self-reported vaccine hesitancy using logistic regression models adjusted for age and race/ethnicity (a minimally adjusted model, referred to as model 1) and mutually adjusted for all covariates (a fully adjusted model, referred to as model 2). Missing indicators were used because we hypothesized that the reasons for missing any given survey or item might be related to overwork or illness with COVID-19. In this scenario (i.e., "missing not at random"), either multiple imputation or restricting the analysis to complete data could potentially create greater bias than a missing indicator[12]; as noted subsequently, we also conducted a complete case sensitivity analysis of those without missing data.

Among the subset of participants who were vaccine hesitant, we used logistic regression to examine differences in the distribution of specific reasons or explanations for vaccine hesitancy, comparing reasons cited by participants who were unsure whether they planned to be vaccinated and those who did not plan to be vaccinated. Finally, we conducted a secondary analysis to examine vaccine hesitancy among frontline nurses working directly in patient care and nurses who had not cared for patients in person during the pandemic.

We performed several analyses to test the robustness of our methods. A complete case analysis including 29 991 participants yielded results nearly identical to those of the overall analysis of 32 426 participants that included indicators for missing data (data not shown). Results of an analysis restricted to participants currently employed in nursing (n = 16 908) were also very similar to those of the original analysis (data not shown; any departures are noted in the Results section). Finally, we tested the impact of replacing prospective experiences of COVID-19 deaths of patients, coworkers, or loved ones that had been reported in fall 2020 with the cumulative variable through spring 2021 (when we queried vaccine status); although the number of participants reporting such deaths had doubled by spring 2021, the association between experiencing COVID-19 deaths and vaccine hesitancy was unchanged. SAS version 9.4 (SAS Institute Inc, Cary, NC) was used in conducting our analyses.

RESULTS

In spring 2021, 93.3% of our sample of 32 426 active and retired nurses across the United States reported that they had received at least 1 dose of a COVID-19 vaccine or indicated that they planned to be vaccinated when the opportunity became available; 2.4% reported being unsure regarding whether they planned to get vaccinated, and 4.3% did not plan to get vaccinated. Cohort characteristics are presented in Table 1. Receipt of a vaccine was more common among White (91.1%) and Asian (93.4%) nurses than among those who identified as Black (86.7%) or Hispanic (74.8%); however, a relatively substantial percentage of Black nurses (4.9%) indicated that they planned to be vaccinated when the opportunity became available. There was a trend toward increased vaccination with more nursing education, from 86.1% in the LPN/LVN group to 95.9% among nurses with advanced degrees.

Rates of vaccination were higher among nurses who had an increased risk of severe COVID-19 disease or had a household member at high risk (90.7%–94.6%) than among those who did not (81.6%). Participants with no history of SARS-CoV-2 infection were more likely to have been vaccinated (92.4%) than those with a confirmed case before 2021 (83.6%), even accounting for nurses with confirmed cases who planned to get vaccinated (4.0%).

Table 2 shows the odds ratios for vaccine hesitancy associated with each risk factor adjusted for age and race/ethnicity (model 1) and all covariates (model 2). Results were similar between models. Relative to nurses in the Northeast, those in the West and Midwest had slightly higher odds of being vaccine hesitant (30% and 54% higher odds, respectively); however, those in the South had nearly double the odds of vaccine hesitancy (OR = 1.91; 95% confidence interval [CI] = 1.68, 2.18) in the fully adjusted model. More education predicted lower odds of vaccine hesitancy: those in the LPN/LVN/ADN group were more hesitant (OR = 1.59; 95% CI = 1.18, 2.12) than RNs and those with a bachelor's nursing degree, whereas advanced practice

TABLE 1— Age-Standardized Characteristics of 32 426 US Nurses, by Vaccination Status: Spring 2021

Variable	Already Received Vaccine, No. (%) or Mean ±SD	Plan to Get Vaccinated, No. (%) or Mean ±SD	Unsure About Getting Vaccinated, No. (%) or Mean ±SD	Do Not Plan to Get Vaccinated, No. (%) or Mean ±SD
Participants	29 506 (91.0)	733 (2.3)	791 (2.4)	1 396 (4.3)
Age, y	61.0 ±10.7	55.0 ±13.0	58.2 ±11.6	59.3 ±11.3
Cohort				
Nurses' Health Study II	23 951 (91.9)	448 (1.7)	587 (2.3)	1075 (4.1)
Nurses' Health Study 3	5 381 (87.5)	278 (4.6)	194 (3.0)	309 (4.9)
Growing Up Today Study	174 (86.3)	7 (3.1)	10 (4.9)	12 (5.8)
Race and ethnicity				
White	28 612 (91.1)	695 (2.2)	763 (2.4)	1 346 (4.3)
Hispanic	61 (74.8)	3 (1.4)	6 (10.2)	5 (13.6)
Black	300 (86.7)	22 (4.9)	12 (3.0)	21 (5.4)
Asian	374 (93.4)	8 (1.9)	5 (2.3)	12 (2.5)
Other race[a]	159 (88.3)	5 (2.3)	5 (3.4)	12 (6.0)
Residential census region				
Northeast	8 087 (93.2)	181 (2.1)	161 (1.9)	244 (2.8)
Midwest	8 659 (90.3)	216 (2.2)	277 (2.9)	445 (4.6)
South	6 932 (88.6)	208 (2.7)	240 (3.1)	441 (5.7)
West	5 828 (92.0)	128 (1.9)	113 (1.9)	266 (4.3)
Nursing education				
LPN/LVN/ADN	398 (86.1)	17 (3.4)	17 (3.5)	39 (7.1)
BSN or RN	25 057 (90.2)	652 (2.5)	719 (2.7)	1 276 (4.7)
Advanced practice degree	4 051 (95.9)	64 (1.1)	55 (1.2)	81 (1.8)
Working status				
Front line	9 208 (92.8)	122 (1.2)	240 (2.1)	428 (3.9)
Remote patient care	1 276 (91.1)	59 (2.8)	40 (2.7)	54 (3.5)
Not in direct patient care	2 138 (90.5)	76 (3.0)	55 (2.1)	100 (4.4)
Working outside health care	1 294 (84.5)	71 (7.2)	45 (3.1)	78 (5.2)
Retired, on leave, or at home	13 440 (86.1)	346 (5.4)	333 (3.5)	590 (5.1)
Missing information	2 150 (89.0)	59 (2.0)	78 (3.0)	146 (5.9)
Clinical site				
ER, operating room, or ICU	1 790 (92.4)	24 (1.1)	47 (2.3)	83 (4.2)
Dedicated COVID-19 unit	415 (93.4)	4 (0.6)	10 (2.0)	19 (4.1)
Other hospital inpatient unit	1 850 (91.2)	30 (1.4)	52 (2.6)	98 (4.8)
Outpatient clinic in hospital	1 526 (93.5)	16 (1.1)	39 (2.6)	42 (2.8)
Outpatient clinic outside hospital	1 771 (93.8)	18 (1.0)	38 (2.1)	58 (3.2)
Congregate care facility	382 (85.8)	9 (1.8)	13 (3.2)	35 (9.1)
Home health	419 (89.5)	4 (0.5)	15 (3.4)	31 (6.6)
School clinic	471 (92.0)	4 (1.0)	16 (3.5)	20 (3.5)
Other clinical site	584 (88.9)	13 (2.5)	10 (1.5)	42 (7.1)
COVID-19 patient interactions[b]				
Patients with known infection	5 208 (92.1)	83 (1.2)	153 (2.4)	266 (4.4)
Patients with presumed infection	1 006 (89.5)	21 (1.1)	29 (3.9)	51 (5.6)
No known COVID-19 patient interactions	6 238 (92.0)	110 (1.5)	166 (2.2)	310 (4.3)

Continued

TABLE 1— Continued

Variable	Already Received Vaccine, No. (%) or Mean ±SD	Plan to Get Vaccinated, No. (%) or Mean ±SD	Unsure About Getting Vaccinated, No. (%) or Mean ±SD	Do Not Plan to Get Vaccinated, No. (%) or Mean ±SD
Experienced COVID-19 death				
No	26 409 (90.6)	668 (2.4)	725 (2.5)	1 284 (4.5)
Yes	3 097 (93.6)	65 (1.7)	66 (1.7)	112 (3.1)
Vulnerability to severe COVID-19				
None	8 421 (81.6)	339 (3.0)	704 (5.0)	396 (10.5)
Self only	8 408 (91.8)	176 (2.6)	297 (2.0)	161 (3.7)
Other household members only	4 527 (90.7)	116 (2.0)	201 (2.8)	121 (4.5)
Self and other household members	8 150 (94.6)	102 (1.6)	194 (1.5)	113 (2.3)
Previous SARS-CoV-2 infection status[c]				
Confirmed infection before 2021	1 474 (83.6)	70 (4.0)	85 (4.8)	134 (7.6)
Never infected	26 903 (92.4)	538 (1.9)	596 (2.1)	1 073 (3.7)

Note. ADN = associate degree in nursing; BSN = bachelor of science in nursing; ER = emergency room; ICU = intensive care unit; LPN = licensed practical nurse; LVN = licensed vocational nurse; RN = registered nurse; SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2. With the exception of age, percentages are standardized to the age distribution of the study population. The spring 2021 survey was rolled out from March 23 through April 13, 2021; surveys had to be returned by June 22, 2021, to be accepted.

[a]Depending on the cohort, other race includes American Indian or Alaska Native, Native Hawaiian or other Pacific Islander, self-reported other race/ethnicity, or multiracial with otherwise unspecified race/ethnicity.
[b]Excludes 846 nurses working in clinical settings who were not involved in direct patient care and 1079 nurses working in patient treatment facilities who were missing information on whether they had interacted with patients with COVID-19 infection.
[c]Information is not presented for 1020 presumed COVID-19 cases (which could not be dated) and 533 confirmed cases in 2021 because these cases did not clearly precede the rollout of the vaccine.

TABLE 2— Numbers of Vaccine-Hesitant Participants and Odds Ratios for Vaccine Hesitancy: 32 426 US Nurses, Spring 2021

Variable	Vaccine Hesitant, No./Total No.	Model 1,[a] OR (95% CI)	Model 2,[b] OR (95% CI)
Residential census region			
Northeast	405/8 673	1 (ref)	1 (ref)
Midwest	722/9 597	1.64 (1.45, 1.86)	1.54 (1.36, 1.75)
South	681/7 821	1.93 (1.70, 2.20)	1.91 (1.68, 2.18)
West	379/6 335	1.26 (1.09, 1.46)	1.30 (1.12, 1.51)
Nursing education			
LPN/LVN/ADN	56/471	1.68 (1.26, 2.23)	1.59 (1.18, 2.12)
BSN or RN	1 995/27 704	1 (ref)	1 (ref)
Advanced practice degree	136/4 251	0.38 (0.32, 0.46)	0.42 (0.35, 0.50)
Worksite and status			
ER, operating room, or ICU	130/1 944	1 (ref)	1 (ref)
Dedicated COVID-19 unit	29/448	0.97 (0.64, 1.47)	1.01 (0.66, 1.54)
Other hospital inpatient unit	150/2 030	1.17 (0.92, 1.49)	1.17 (0.91, 1.50)
Outpatient clinic in hospital	81/1 623	0.82 (0.61, 1.09)	0.83 (0.61, 1.11)
Outpatient clinic outside hospital	96/1 885	0.81 (0.62, 1.07)	0.97 (0.72, 1.29)
Congregate care facility	48/439	1.98 (1.39, 2.81)	2.08 (1.44, 2.98)
Home health	46/469	1.84 (1.29, 2.63)	1.80 (1.24, 2.60)

Continued

TABLE 2— Continued

Variable	Vaccine Hesitant, No./Total No.	Model 1,[a] OR (95% CI)	Model 2,[b] OR (95% CI)
School clinic	36/511	1.24 (0.84, 1.82)	1.16 (0.78, 1.73)
Other clinical site	52/649	1.48 (1.05, 2.07)	1.63 (1.14, 2.32)
Remote patient care	94/1 429	1.13 (0.86, 1.49)	1.33 (0.97, 1.83)
Patient treatment facility but not direct patient care	155/2 369	1.21 (0.94, 1.54)	1.32 (1.00, 1.75)
Outside health care	123/1 488	1.65 (1.27, 2.15)	1.91 (1.39, 2.63)
Retired, on leave, or at home	923/14 709	1.31 (1.06, 1.61)	1.75 (1.34, 2.28)
Missing worksite	224/2 433	1.62 (1.29, 2.03)	1.50 (1.15, 1.97)
COVID-19 patient interactions			
Patients with known infection	419/5 710	1 (ref)	1 (ref)
Patients with presumed infection	80/1 107	1.03 (0.80, 1.32)	0.95 (0.73, 1.23)
No known COVID-19 patient interactions	476/6 824	1.06 (0.92, 1.21)	0.95 (0.81, 1.11)
Experienced COVID-19 death			
No	2 009/29 086	1 (ref)	1 (ref)
Yes	178/3 340	0.68 (0.58, 0.79)	0.69 (0.58, 0.82)
Vulnerability to severe COVID-19			
None	1 100/9 860	1 (ref)	1 (ref)
Self only	458/9 042	0.38 (0.33, 0.43)	0.37 (0.32, 0.42)
Other household members only	322/4 965	0.52 (0.45, 0.59)	0.51 (0.45, 0.59)
Self and household members	307/8 559	0.26 (0.22, 0.30)	0.25 (0.22, 0.29)
Previous SARS-CoV-2 infection status[c]			
Never infected	1 669/29 110	1 (ref)	1 (ref)
Confirmed infection before 2021	219/1 763	2.23 (1.92, 2.60)	2.17 (1.85, 2.53)

Note. ADN = associate degree in nursing; BSN = bachelor of science in nursing; CI = confidence interval; ER = emergency room; ICU = intensive care unit; LPN = licensed practical nurse; LVN = licensed vocational nurse; OR = odds ratio; RN = registered nurse; SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2. The spring 2021 survey was rolled out from March 23 through April 13, 2021; surveys had to be returned by June 22, 2021, to be accepted. Data include unvaccinated nurses who answered "no" or "unsure" to the question, "Do you plan to receive a COVID-19 vaccine when it becomes available to you?"

[a]Model 1 (minimally adjusted model) included covariates for age in years (continuous) and dichotomized race/ethnicity (White, other).
[b]Model 2 (fully adjusted model) included all covariates: age in years (continuous), dichotomized race/ethnicity (White, other), residential census region, nursing education, worksite and status, COVID-19 patient interactions, experiences of COVID-19 deaths, vulnerability to severe COVID-19, and COVID-19 history.
[c]This variable also included categories for the 533 individuals who had laboratory-confirmed cases in 2021 (model 2 OR = 4.12; 95% CI = 3.30, 5.14) and the 1020 individuals who had presumed cases that were undated (model 2 OR = 3.46; 95% CI = 2.92, 4.12). These COVID-19 cases could have occurred after the nurse was offered vaccination and therefore could have been the result of vaccine hesitancy.

nurses were less hesitant (OR = 0.42; 95% CI = 0.35, 0.50). Relative to nurses working in emergency rooms, operating rooms, or intensive care units, nurses working in home health (OR = 1.80; 95% CI = 1.24–2.60) or congregate care facilities (OR = 2.08, 95% CI = 1.44, 2.98) had higher odds of vaccine hesitancy after adjustment for other covariates.

Working with COVID-19 patients did not affect nurses' vaccine hesitancy. However, nurses who reported that a patient, coworker, loved one, or someone important to them had died from COVID-19 had lower odds of vaccine hesitancy (OR = 0.69; 95% CI = 0.58–0.82) than others who had not experienced COVID-19 deaths. Similarly, vaccine hesitancy odds were lower among those who considered themselves (OR = 0.37; 95% CI = 0.32, 0.42), other household members (OR = 0.51; 95% CI = 0.45, 0.59), or both (OR = 0.25; 95% CI = 0.22, 0.29) to fall into a high-risk category for severe COVID-19. In an analysis restricted to currently employed nurses, we saw a similar inverse association of perceived COVID-19 vulnerability with vaccine hesitancy, although the odds ratios were modestly closer to the null: 0.52 (95% CI = 0.43, 0.63) for participants' own vulnerability, 0.63 (95% CI = 0.53, 0.75) for vulnerability of household

members, and 0.36 (95% CI = 0.28, 0.46) for both.

Finally, having had COVID-19 was strongly associated with vaccine hesitancy. Nurses reporting a laboratory-confirmed SARS-CoV-2 infection occurring before 2021 were twice as likely to be vaccine hesitant (OR = 2.17; 95% CI = 1.85, 2.53) as those who had never been infected; this was also true among currently employed nurses with a history of infection (OR = 2.08; 95% CI = 1.71, 2.53).

Table 3 documents the reasons cited by the 6.7% (n = 2187) of nurses who were vaccine hesitant. The most common concerns were safety and side effects. A third of those who were vaccine hesitant were skeptical that the vaccine was effective, and 25% reported that they were not worried about COVID-19. Eighteen percent self-reported having already had COVID-19 as a reason for not getting vaccinated. Medical reasons, religious or ethical reasons, and "other" reasons were each indicated by roughly 12% of those who were vaccine hesitant. Five percent of vaccine-hesitant nurses cited pregnancy or breastfeeding.

Most (64%) vaccine-hesitant nurses indicated no plan to be vaccinated; 36% were unsure whether they planned to be vaccinated. The middle 2 columns of Table 3 show the percentages of nurses reporting each reason for hesitancy among those who were unsure and those who did not plan to be vaccinated. When we restricted the analysis to participants currently employed as nurses, slightly higher percentages cited pregnancy (7.1%) and having already had COVID-19 (20.9%) as reasons for hesitancy. After adjustment for age, vaccine safety concerns ($P = .03$), belief that the vaccine was not effective ($P = .001$), lack of worry about COVID-19 ($P < .001$), and religious or ethical reasons for not being vaccinated ($P < .001$) distinguished those who did not plan to be vaccinated from those who were unsure. In contrast, similar proportions of those who did not plan to be vaccinated and those who were unsure cited concerns about side effects, having had COVID-19, medical reasons, pregnancy or breastfeeding, or other reasons for not being vaccinated.

In a secondary analysis, we compared vaccine hesitancy among nurses who worked on the front line (i.e., directly with patients) and those who did not. Nurses working remotely (OR = 1.04; 95% CI = 0.83, 1.31) and those employed in health care facilities but not in direct patient care (OR = 1.11; 95% CI = 0.92, 1.33) had odds of vaccine hesitancy similar to those of frontline nurses; however, women trained as nurses who were working outside health care (OR = 1.51; 95% CI = 1.23, 1.85) or who were retired, on leave, or at home (OR = 1.19; 95% CI = 1.06, 1.34) were more likely to be vaccine hesitant after adjustment for age and race/ethnicity.

Except as noted, results from multivariable models were very similar in sensitivity analyses (1) restricted to participants with complete data for all covariates, (2) restricted to currently employed nurses, or (3) adjusted for experiences of close COVID-19 deaths through spring 2021 (the odds ratio in the latter analysis was 0.68; 95% CI = 0.58, 0.80).

TABLE 3— Reasons Cited by 2187 US Nurses Who Said That They Were Unsure or That They Did Not Plan to Be Vaccinated: Spring 2021

Reason Cited by Those Who Were Vaccine Hesitant[a]	All Vaccine-Hesitant Nurses (n = 2 187), No. (%)	Unsure (n = 791), No. (%)	Do Not Plan to Be Vaccinated (n = 1 396), No. (%)	P[b]
Safety concerns	1 466 (67.0)	507 (64.1)	959 (68.7)	.03
Side effects	1 260 (57.6)	458 (57.9)	802 (57.4)	.86
Vaccine is not effective	699 (32.0)	220 (27.8)	479 (34.3)	.001
Not worried about COVID-19	537 (24.6)	121 (15.3)	416 (29.8)	< .001
Already had COVID-19	394 (18.0)	155 (19.6)	239 (17.1)	.18
Medical reasons	273 (12.5)	97 (12.3)	176 (12.6)	.9
Religious or ethical reasons	253 (11.6)	55 (7.0)	198 (14.2)	< .001
Pregnant or breastfeeding	98 (4.5)	40 (5.1)	58 (4.2)	.77
Other	270 (12.3)	85 (10.7)	185 (13.3)	.11

Note. The spring 2021 survey was rolled out from March 23 through April 13, 2021; surveys had to be returned by June 22, 2021, to be accepted.

[a]Reasons are not mutually exclusive; a participant could choose all that applied.
[b]Derived from a logistic regression model (adjusted for age) comparing the likelihood of citing the reason for vaccine hesitancy among those who were unsure whether they planned to be vaccinated and those who did not plan to be vaccinated.

DISCUSSION

We found that 93% of participating nurses had received at least 1 dose of COVID-19 vaccine or intended to receive the vaccine during March through June 2021. It is important to note that, at the time of the survey, vaccines were available only under an emergency use authorization. No mandates had yet been passed for HCP vaccination, although there were discussions that mandates might be required after full Food and Drug Administration approval.

Our results are consistent with those of a survey conducted by the American Nurses Foundation in February 2021 showing that 80% of respondents had received at least 1 vaccine dose and another 10% intended to get vaccinated, for an overall vaccine acceptance rate of 90%.[13] Surveys of HCP have reported varying rates of vaccine hesitancy; in general, however, hesitancy has declined over time.[4,14–19]

Our estimates are higher than those reported in the Unified Hospital Data Surveillance System, in which only 70% of staff members in reporting hospitals were fully vaccinated as of September 2021.[5] However, the authors of that report noted that they likely underestimated vaccine coverage because they accounted only for staff members receiving vaccinations directly from their employers, and only 41% of eligible hospitals reported.[5,7] The Unified Hospital Data Surveillance System estimate also includes nonclinical staff (e.g., administrative or clerical, dietary, and cleaning staff) and clinical staff with an associate degree or less (e.g., nursing assistants or orderlies and allied health staff)[5]; our study and others have shown that vaccine acceptance tends to be lower both among staff members who do not have patient contact and among those with less education.[7]

This report is subject to several limitations. People who participate in research studies (particularly longitudinal studies) might have a higher degree of trust in the scientific research process than those who decline to participate, which might also result in higher vaccine acceptance relative to the general population of nurses. Those who agreed to participate in the COVID-19 substudy might have also been more concerned about the newly declared COVID-19 pandemic than those who declined to participate and thus might not represent all nurses. Participants in these cohorts underrepresent licensed practical nurses and licensed vocational nurses in comparison with the working population of nurses in the United States. The fact that vaccination rates were lower in the LPN/LVN/AND group suggests that our results might slightly overestimate vaccine acceptance among the general population of nurses, although even among this group vaccine acceptance was still very high at 89.5%.

Most participants were White and female, further limiting generalizability to all nurses. Our descriptive results in Table 1 indicate differences in vaccine hesitancy by race and ethnicity, but we were unable to perform stratum-specific analyses to explore these differences fully. Because of small sample sizes, we had to dichotomize race and ethnicity (non-Hispanic White vs other) in our multivariable models, which may have obscured important differences within specific groups. Because race was solicited at the time of entry into the NHSII, NHS3, and GUTS cohorts, the race/ethnicity variables varied between questionnaires and over time; this may have led to misclassification of people who identified as multiracial or multiethnic. Additional research in more racially/ethnically diverse populations is needed to understand reasons for vaccine hesitancy that might be unique to a specific group.

Finally, our findings represent one point in time in a changing landscape. We assessed only initiation of vaccination in the spring of 2021. We do not know whether the individuals in our sample went on to become fully vaccinated or receive recommended booster shots; similarly, we do not know whether those who were vaccine hesitant in spring 2021 may have later become vaccinated. Further research is needed to understand the impact of later events (including full Food and Drug Administration authorization of vaccines, emerging SARS-CoV-2 variants, travel restrictions for unvaccinated individuals, and emerging employer and school vaccine mandates) on nurses' COVID-19 vaccination.

Our study also benefited from several significant strengths. Because participants were recruited to the parent cohorts before the pandemic and recruited to the COVID-19 substudy during its earliest days, their original involvement in the COVID-19 questionnaire series was unlikely to have been influenced by later public debate or polarization about COVID-19 vaccines or public health mandates. This study had a very large sample size and national reach. Data on characteristics that could influence vaccine hesitancy were collected prospectively and included information on participants' experiences of the COVID-19 pandemic in their personal lives, communities, and workplaces.

Because the relationships between individual factors affecting COVID-19 experiences are complex, we constructed both a minimally adjusted model for each predictor of COVID-19

vaccine hesitancy (i.e., model 1, which examined each predictor while adjusting for race and ethnicity) and a fully adjusted model (i.e., model 2, which examined each predictor while adjusting for all other covariates) to provide greater insight into the factors that may have contributed to participants' attitudes toward COVID-19 vaccines. Most odds ratios showed little change between the minimally adjusted and fully adjusted models, indicating that these variables were robust and independent predictors of vaccine hesitancy. Likewise, sensitivity analyses yielded very similar results when analyses were restricted to participants with complete data for all covariates, restricted to those currently employed as nurses, or updated to include experiences of close COVID-19 deaths through spring 2021.

Our data on reasons for vaccine hesitancy might inform future educational campaigns in several ways. First, emphasizing the very high uptake of vaccines among nurses could be used to help balance news coverage; reporting that heavily covers protests or resignations might lead the public to believe that HCP resistance to vaccines is more pervasive than it really is, contributing to vaccine hesitancy in the public. Research has shown that media coverage can bias public perceptions of how common a phenomenon is; that is, the more coverage a topic receives, the more common the public tends to perceive it.[20]

Second, our research identified groups of nurses and facility types with substantially lower vaccination acceptance that could be targeted for interventions (e.g., those working in home health or group care facilities and those with less education might benefit from targeted messaging about vaccine safety and benefits).

Finally, comparing the reasons cited by those who were unsure about vaccination and those who did not intend to get vaccinated can help identify information that might be particularly effective in swaying those whose minds are not made up. The 3% of participants who were unsure might have been persuaded by more or earlier information about safety (including while women are pregnant or breastfeeding), side effects, and the utility of the vaccine for those previously infected with COVID-19. Further work assessing participants' unstructured write-in comments regarding vaccinations and reasons for vaccine hesitancy (frontline nurses provided 2724 write-in comments on vaccines) might also lead to additional insights to inform educational campaigns for COVID-19 boosters or other immunizations in the future. AJPH

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J. W. Rich-Edwards, C. M. Rocheleau, A. L. Steege, and C. C. Lawson conceptualized the study. J. W. Rich-Edwards, J. A. Hankins, L. M. Katuska, and X. Kumph led the procurement of data. M. Ding performed the data analysis. J. W. Rich-Edwards and C. M. Rocheleau wrote the initial draft. All of the authors provided critical input and edits to the article and its revisions.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

HUMAN PARTICIPANT PROTECTION

This study was approved by the institutional review board of Brigham and Women's Hospital, which allowed voluntary survey completion to represent participant consent. This activity was reviewed by the Centers for Disease Control and Prevention (CDC) and was conducted in a manner consistent with applicable federal law and CDC policy.

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Differences in Cancer Screening Responses to State Medicaid Expansions by Race and Ethnicity, 2011–2019

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Objectives. To estimate whether state Medicaid expansions' relationships to breast, cervical, and colorectal cancer screening differ by race/ethnicity.

Methods. Analyses conducted in 2021 used 2011–2016 and 2018–2019 Behavioral Risk Factor Surveillance System data on adults aged 40 to 64 years with household incomes below 400% of the federal poverty guideline (FPG; n = 537 250). Triple-difference analyses compared cancer screening in Medicaid expansion versus nonexpansion states, before versus after expansion, among people with incomes above versus below the eligibility cutoff (138% FPG). Race/ethnicity and ethnicity-by-language interaction terms tested for effect modification.

Results. Associations between Medicaid expansions and cancer screening were significant for past-2-year mammograms and past-5-year colorectal screening. Effect modification analyses showed elevated mammography among non-Hispanic Asian women (+9.0 percentage points; 95% confidence interval [CI] = 3.2, 14.8) and Hispanic women (+6.0 percentage points; 95% CI = 2.0, 10.1), and Papanicolaou tests among Hispanic women (+4.2 percentage points; 95% CI = 0.1, 8.2). Findings were not limited to English- or Spanish-speaking respondents and were robust to insurance status controls.

Conclusions. Medicaid expansions yielded statistically significant increases in income-eligible Asian and Hispanic women's mammography and Hispanic women's Pap testing relative to non-Hispanic White women. Neither language proficiency nor insurance status explained these findings. (*Am J Public Health*. 2022;112(11):1630–1639. https://doi.org/10.2105/AJPH.2022.307027)

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Cancer screening has reduced cancer incidence and mortality in the United States, with substantial benefits from mammograms, cervical cytology (i.e., Papanicolaou [Pap] tests), and colorectal screening in particular.[1] Mammography is correlated with a 19% decrease in breast cancer mortality[2]; 1 breast cancer death is averted for every 180 women screened triennially between the ages of 50 and 70 years.[3] Cervical cancer screening has led to a decrease in mortality from 2000 to 2015, with benefits from screening far outweighing any associated harms.[1] For colorectal cancer, the third leading cause of cancer for men and women, consistent screening among adults aged 45 to 75 years could avoid around 24 to 28 deaths per 1000 adults screened.[4]

Yet, the benefits of cancer screening are not distributed evenly throughout the US population: cancer screening rates vary substantially by race and ethnicity. While the incidence of colorectal cancer is elevated among non-Hispanic Black men (27%) and women (22%), non-Hispanic Black adults are less likely to be screened for colorectal cancer than their non-Hispanic White counterparts. Similarly, Hispanic women exhibit the highest cervical cancer incidence but are less likely to be screened for cervical cancer than non-Hispanic White and non-Hispanic Black women.[5]

These differences in screening contribute to disparities in cancer outcomes.[6] For example, non-Hispanic Black women have a higher prevalence of advanced-stage breast tumors than non-Hispanic White women, and the highest mortality rates from cervical cancer, attributable, in part, to later-stage diagnoses.[7,8] Other factors also influence these disparities. For low-income individuals in particular, health care resources and service availability may not match patient needs.[9] With certain ethnic groups, screening rates appear lower for foreign-born relative to US-born individuals.[10] And, critically, physician behaviors and attitudes may reflect racial and ethnic biases,[11] manifesting as differences in patient treatment.[12–14]

Decreasing differences in cancer screening is a key first step toward reducing disparities in cancer-related outcomes. As access to health care remains a dominant reason for racial and ethnic disparities in patient outcomes, initiatives that increase insurance coverage may help close these screening gaps. Indeed, the Affordable Care Act (ACA) has been associated with higher rates of primary care visits and preventive services among young adults[15]; reduced racial and ethnic disparities in insurance coverage,[16,17] particularly for Hispanic individuals who preferred Spanish over English[18]; and fewer uninsured visits to primary care physicians among all racial and ethnic groups, but particularly for Hispanic patients with Medicaid. Still, in Medicaid expansion states, non-Hispanic White patients experienced the largest decreases in uninsured visits.[19]

More than two thirds of US states have implemented ACA Medicaid expansions, largely in 2014, extending program eligibility to most adults with household incomes below 138% of the federal poverty guideline (FPG; according to the US Department of Health and Human Services). As many states' Medicaid programs already covered low-income parents, ACA-related expansions particularly affected coverage among adults without dependent children (henceforth "childless adults"). Research on Medicaid expansions' effects on cancer screening is mixed. Some studies show significant impacts on colorectal cancer screening and Pap tests (i.e., cervical cancer screening) but not mammograms,[20,21] while others find no consequent increase in rates of mammograms or Pap tests in low-income women.[22] Overall screening utilization increased more in traditional cost-sharing programs versus those with enhanced cost-sharing,[23] which might affect disparities if beneficiary characteristics differ between such plans. To our knowledge, none of these studies considered whether screening responses differed by racial and ethnic groups.

To address this gap in the literature, we tested whether state Medicaid expansions' associations with cervical, colorectal, and breast cancer screening differed by race and ethnicity.

METHODS

We analyzed nationally and state-representative annual data on noninstitutionalized adults from the Behavioral Risk Factor Surveillance System (BRFSS), a repeated cross-sectional survey focused on health-related behaviors and outcomes. We considered the 2011–2016 and 2018–2019 waves, dropping 2017 as it omitted cancer-screening questions. Changes in the sampling structure and weighting methodology precluded comparing pre-2011 data to later waves.

Analytic Samples

To assess Medicaid expansion effects, we restricted our analytic samples to adults residing in US states with no minors in their household ("childless adults"), who were not age-eligible for insurance through dependent coverage provisions (older than 25 years) or Medicare (younger than 65 years). We omitted those reporting a household income above 400% of the FPG, because wealthier respondents provide less plausible counterfactuals for the behavior of Medicaid-eligible individuals. We did not consider states that expanded Medicaid or Medicaid-equivalent coverage to adults with household incomes up to 138% of FPG statewide before 2014—that is, Massachusetts (through its 2006 health care reform), Vermont (via the Vermont Health Access Plan), and the District of Columbia (Medicaid expansion; see "Medicaid Expansions" under Appendix section I, available as a supplement to the online version of this article at https://ajph.org). As previous work categorizes New York and Delaware alongside the other 3 as having substantial early expansions,[24] sensitivity tests also omit those states to ensure that estimates reflect the more homogenous set of ACA Medicaid expansions implemented in 2014 and 2015.

Analytic samples are further winnowed by age and gender to consider only those within date-concordant US Preventive Services Task Force (USPSTF) screening recommendations—specifically, adults aged 50 to 64 years for colonoscopies or sigmoidoscopies (2008), women aged 50 to 64 years for mammograms (2009), and women aged 40 to 64 years for Pap tests (2003 and 2012).[25] While USPSTF recommendations suggest beginning cervical cancer screening at age 21,

we limited that outcome's analytic sample to women aged 40 years and older because of a concern that pregnancies might affect screening. (The vast majority of US mothers give birth before the age of 40 years.)

Outcomes of interest were binary indicators for 3 cancer screening variables: whether a respondent had been screened for breast cancer using mammograms in the past 2 years, cervical cancer using Pap testing in the past 3 years, or colon cancer using sigmoidoscopies or colonoscopies in the past 5 years.

Exposures

The exposure of interest was an interaction term between indicators for whether the respondent's state of residence had expanded Medicaid to 138% of FPG by their survey date and whether they would have been income-eligible for Medicaid if their state expanded (i.e., household income < 138% FPG). While most state Medicaid expansions went into effect on January 1, 2014, several were delayed as states pursued waivers (e.g., to pursue a private option where state funds subsidize eligible adults' insurance payments). To capture lasting responses, our exposure variable indicates expansions that went into effect before 2016 only, with specification checks dropping later adopters to clarify if or how their inclusion affects estimates.

To clarify whether responses to the expansion differed by race/ethnicity, the exposure was further interacted with race/ethnicity indicators. First, we used a race/ethnicity variable dividing respondents into mutually exclusive categories: non-Hispanic White, non-Hispanic Black, non-Hispanic Asian, Hispanic, other non-Hispanic race, and missing race/ethnicity. Subsequent analyses considered ethnicity-by-language—distinguishing non-Hispanic respondents, Hispanic respondents who completed the BRFSS survey in English, and Hispanic respondents who completed it in Spanish—to clarify whether findings might reflect reduced language barriers in health care (e.g., related to the Affordable Care Act's requirement that patients be notified of and provided with language services).

Covariates

Analyses adjusted for several sociodemographic covariates: indicators for 10-year age groups, sex (in colorectal screening analyses), household income below 138% of FPG, education (did not graduate high school, graduated high school, attended college or technical school, graduated from college or technical school), the categorical race/ethnicity variables described previously, and an indicator for whether the survey was administered by cell phone (as compared with landline). Other covariates included binary indicators for survey year, state of residence, and, for some robustness checks, having health insurance.

Statistical Analysis

We conducted analyses with Stata version 15.0 (StataCorp LP, College Station, TX). First, a table of summary statistics compared cancer screening rates and insurance coverage in states that did versus did not expand Medicaid, before versus after the Medicaid expansion. Second, multivariable regressions used a triple-difference specification to estimate the relationship between Medicaid expansion and each screening outcome, effectively comparing people below versus at or above 138% of the FPG, in states that did versus did not expand Medicaid, before versus after that expansion.

Covariates adjusted for the aforementioned respondent sociodemographics, year fixed effects (to absorb general time trends), state fixed effects (to adjust for time-invariant state characteristics), an indicator for Medicaid expansion (absorbing effects of unobserved factors correlated with expansion that affected respondents above and below the eligibility cutoff), and 2 sets of interaction terms absorbing screening differences specific to those below 138% of FPG, for 2014 on versus earlier (< 138% FPG * year ≥ 2014) as well as time-invariant differences between expansion versus nonexpansion states (< 138% FPG * expansion state). Thus, the exposure variable's coefficient will not be biased by nationwide changes in the lower income group's screening rates concurrent with the ACA, nor by average (time-invariant) differences in expansion versus nonexpansion states' screening rates (see Appendix section I for further details).

To clarify whether the relationship between Medicaid expansions and cancer screening differed by race/ethnicity, we repeated these analyses with an additional term interacting the primary exposure's effect with respondent race/ethnicity indicators (< 138% FPG * expanded Medicaid * race/ethnicity). Finally, we replicated that specification with ethnicity-by-language indicators in the exposure interaction terms in place of race/ethnicity. Because of concerns about attenuation bias in nonlinear models with large numbers of fixed effects, regression analyses used sample-weighted linear probability

models instead of logistic regressions, with standard errors clustered by state (the level of the policy intervention).[26,27]

Robustness checks added insurance status as a covariate to confirm whether the expansion response was explained by being insured per se as opposed to other factors (e.g., changes in cost-sharing for preventive care, language access requirements). Further sensitivity checks dropped odd survey years (when more than half of US states omitted the BRFSS cancer screening module), excluded states that expanded Medicaid after 2015 to clarify if or how their inclusion affects estimates, dropped respondents in New York and Delaware to consider whether implications vary when omitting the full set of states others categorize as having substantive early expansions,[24] and sequentially dropped states accounting for the largest populations of 3 Hispanic subgroups in the 50 US states (i.e., Florida [Cuban], New York [Puerto Rican], and California [Mexican])—to clarify whether a specific subgroup was responsible for our findings.

This study's protocol was not preregistered.

RESULTS

For each analytic sample, summary statistics show higher rates of cancer screening and insurance coverage among respondents with household incomes at 138% to 400% of FPG relative to below 138% of FPG (Table 1). Within income groups, insurance rates were consistently higher for adults in expansion states compared with nonexpansion states even without differentiating pre- versus postexpansion periods, particularly for those below 138% of FPG. Corresponding differences in screening rates were not statistically significant.

Comparing pre- versus postexpansion trends, triple-difference analyses linked Medicaid expansions to significant 3.3-percentage-point increases in past-2-year mammograms (95% confidence interval [CI] = 0.4, 6.3) among women aged 50 to 64 years under 138% of the FPG, and 3.7-percentage-point increases in past-5-year colorectal screening among adults aged 50 to 64 years under 138% of the FPG (95% CI = 0.4, 7.0), relative to those between 138% and 400% of FPG (Figure 1). Associations with Pap tests among women aged 40 to 64 years were also positive but statistically nonsignificant, at 0.5 percentage points (95% CI = −4.9, 5.9).

To clarify whether screening responses to state Medicaid expansions differed by race/ethnicity, Figure 2 presents coefficients and 95% CIs

TABLE 1— Summary Statistics: United States, Behavioral Risk Factor Surveillance System, 2011–2016 and 2018–2019

	Non–Expansion State		Expansion State		Δ (Expansion – Non-Expansion)	
	<138% FPG, % (95% CI)	138%–400% FPG, % (95% CI)	<138% FPG, % (95% CI)	138%–400% FPG, % (95% CI)	<138% FPG, pp (95% CI)	138%–400% FPG, pp (95% CI)
Pap sample[a]						
Past 3-y Pap	60.4 (58.0, 62.7)	68.2 (66.2, 70.2)	64.1 (60.5, 67.8)	68.0 (65.6, 70.4)	3.8 (−0.6, 8.1)	−0.2 (−3.3, 3.0)
Insured	65.6 (60.1, 71.0)	79.5 (75.8, 83.1)	79.8 (77.6, 82.1)	85.2 (83.6, 86.7)	14.3** (8.3, 20.2)	5.7** (1.8, 9.6)
Mammogram sample[b]						
Past 2-y mammogram	67.0 (64.2, 69.8)	72.3 (70.6, 73.9)	68.8 (65.2, 72.4)	72.5 (70.1, 74.9)	1.8 (−2.8, 6.4)	0.2 (−2.7, 3.1)
Insured	68.7 (63.3, 74.2)	81.8 (78.6, 85.0)	81.2 (78.8, 83.6)	86.7 (85.3, 88.0)	12.5** (6.5, 18.4)	4.9** (1.4, 8.4)
Colorectal screening sample[c]						
Past 5-y colorectal screening	38.7 (35.8, 41.6)	44.7 (41.9, 47.6)	38.7 (36.4, 41.0)	43.5 (40.9, 46.1)	−0.02 (−3.7, 3.7)	−1.2 (−5.1, 2.7)
Insured	67.9 (61.4, 74.5)	80.4 (77.0, 83.9)	78.6 (76.3, 80.8)	84.8 (83.6, 86.0)	10.6** (3.7, 17.5)	4.4* (0.8, 8.0)

Note. CI = confidence interval; Pap = Papanicolaou. pp = percentage points. Sample-weighted averages give rates of each outcome variable for adults without dependent children in the corresponding analytic sample, based on data from the 2011–2016 and 2018–2019 Behavioral Risk Factor Surveillance System on US states other than Massachusetts and Vermont (i.e., the District of Columbia and US territories are also omitted).

[a]Women aged 40–64 y (n = 114 523).
[b]Women aged 50–64 y (n = 97 277).
[c]Respondents aged 50–64 y (n = 174 701).
*$P < .05$; **$P < .01$.

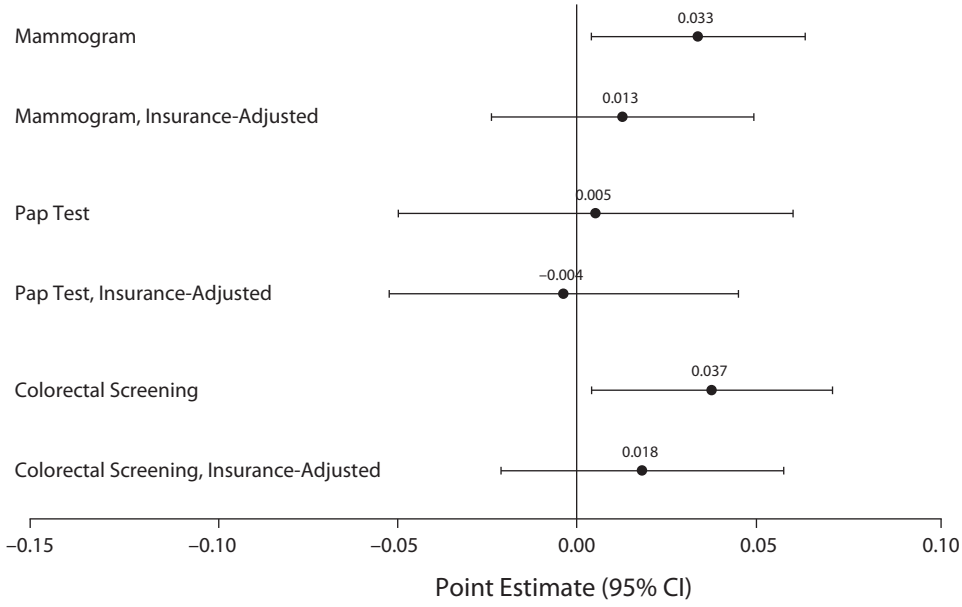

FIGURE 1— Screening Responses to Medicaid Expansions: United States, Behavioral Risk Factor Surveillance System, 2011–2016 and 2018–2019

Note. CI = confidence interval; Pap = Papanicolaou. Sample weighted linear probability models estimated triple-difference specifications to approximate the relationship between state Medicaid expansions and cancer screening indicators among adults without dependent children who are not age-eligible for Medicare—specifically, comparing respondents in states that did vs did not expand Medicaid, before vs after expansions, with incomes below the expanded-access cutoff (138% of the federal poverty guideline [FPG; according to the US Department of Health and Human Services]) vs at or above it but below 400% of FPG. Point estimates and 95% CIs estimated screening responses to Medicaid expansions, with the analytic sample limited to those younger than 65 years for whom the screening was recommended—that is, women aged 50–64 years for biennial mammograms, women aged 40 to 64 years for Pap tests every 3 years, and respondents aged 45–64 years for colorectal screenings (colonoscopies or sigmoidoscopies) every 5 years. See Table A (available as a supplement to the online version of this article at https://ajph.org) for output in tabular form with *P* values.

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estimating how each subgroup's cancer screening response differed from that of non-Hispanic White adults in the same analytic sample. Findings suggest greater responsiveness among Hispanic women for both mammograms (6.0 percentage points; 95% CI = 2.0, 10.1) and Pap tests (4.2 percentage points; 95% CI = 0.1, 8.2). Responses among other racial groups did not show a statistically significant difference from those of non-Hispanic White respondents, except for mammography among non-Hispanic Asian women (9.0 percentage points; 95% CI = 3.2, 14.8). Notably, the non-Hispanic White reference group's screening responses were small and statistically nonsignificant in all cases (results not shown).

To better understand what might drive higher screening responses among Hispanic women, we repeated analyses interacting the Medicaid expansion variable with ethnicity-by-language indicators in place of race/ethnicity indicators (Figure 3), with and without a covariate for observed insurance status, to clarify whether the responses are explained by insurance alone (as opposed to concurrent changes in cost sharing, language accessibility, or cancer prevention outreach). Relative to non-Hispanic women, English-speaking Hispanic women showed a 9.4-percentage-point increase in rates of mammography (95% CI = 6.2, 12.6) and Spanish-speaking Hispanic women showed a 5.5-percentage-point increase in rates of Pap tests (95% CI = 1.6, 9.3) in response to Medicaid expansions. Moreover, for both of these screenings, the coefficient estimates for Spanish- versus English-speaking Hispanic women were statistically different, with *P* values of .01 for mammography and .001 for Pap tests.

These findings held even when the specification explicitly controlled for reported insurance status, suggesting that the drivers extended beyond changes in insurance status alone. Results were similar when we limited consideration to survey waves when cancer screening questions were fielded nationwide (Figure A, available as a supplement to the online version of this article at https://ajph.org) and when we omitted states that expanded Medicaid after 2015 and before 2020 (Figure B, available as a supplement to the online version of this article at https://ajph.org). Omitting states with substantial early Medicaid expansions yielded comparable results for mammography and Pap

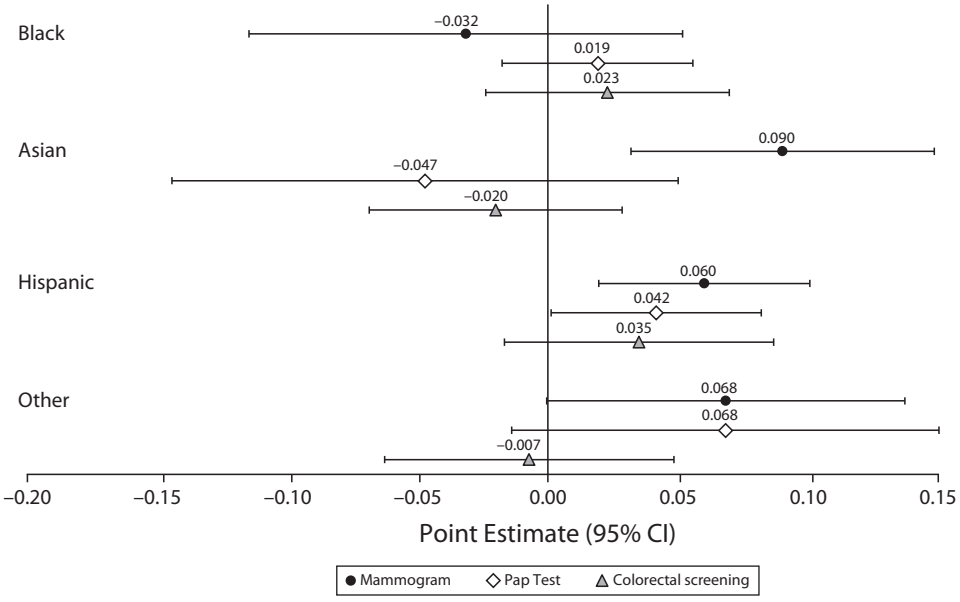

FIGURE 2— Differential Screening Responses to Medicaid Expansions by Race/Ethnicity: United States, Behavioral Risk Factor Surveillance System, 2011–2016 and 2018–2019

Note. CI = confidence interval; Pap = Papanicolaou. Sample weighted linear probability models estimated triple-difference specifications to approximate the relationship between state Medicaid expansions and cancer screening indicators among adults without dependent children who are not age-eligible for Medicare—specifically, comparing respondents in states that did vs did not expand Medicaid, before vs after expansions, with incomes below the expanded-access cutoff (138% of the federal poverty guideline [FPG; according to the US Department of Health and Human Services]) vs at or above it but below 400% of FPG. Point estimates and 95% CIs plotted here estimated whether these screening responses differed by race/ethnicity, relative to the response among non-Hispanic White respondents. For each outcome, the analytic sample was limited to those younger than 65 years for whom the screening was recommended—that is, women aged 50–64 years for biennial mammograms, women aged 40–64 years for Pap tests every 3 years, and respondents aged 45–64 years for colorectal screenings (colonoscopies or sigmoidoscopies) every 5 years. See Table B (available as a supplement to the online version of this article at https://ajph.org) for output in tabular form with *P* values.

tests, as well as significant positive associations between Medicaid expansion and colorectal screening among both English- and Spanish-speaking Hispanic adults: 6.1 percentage points (95% CI = 1.0, 11.2) and 5.2 percentage points (95% CI = 1.0, 9.5), respectively (Figure C, available as a supplement to the online version of this article at https://ajph.org).

To clarify whether findings were related to a specific subgroup of the Hispanic population, we repeated the analyses excluding residents of states with the largest Puerto Rican, Cuban, and Mexican populations—that is, New York, Florida, and California, respectively. Findings were similar to the main specification for mammography and Pap tests. Dropping New York led to significant coefficients for colorectal screening as well, consistent with the no-early-expanders specification that also omitted that state (Figures D–F, available as supplements to the online version of this article at https://ajph.org).

DISCUSSION

To date, most Medicaid expansion studies have observed modest to negligible impacts on cancer screening behaviors despite increases in health care access and reductions in out-of-pocket costs.[28] When we estimated average treatment effects, our study's estimates were consistent with that literature. However, we also expanded upon that work by testing for heterogeneity in these responses. Specifically, Medicaid expansions were associated with greater increases in reported mammography among Asian and Hispanic women, and Pap testing among Hispanic women. Among Hispanic respondents, elevated mammography rates were driven more by English-speaking Hispanic women while greater rates of Pap testing stemmed more from Spanish-speaking Hispanic women. These findings are unique to this study and worth additional exploration.

Critically, differential responses were evident even when we controlled for respondent insurance status, suggesting that factors beyond increased rates of insurance coverage per se may have been important. Considering the US health care landscape between 2011

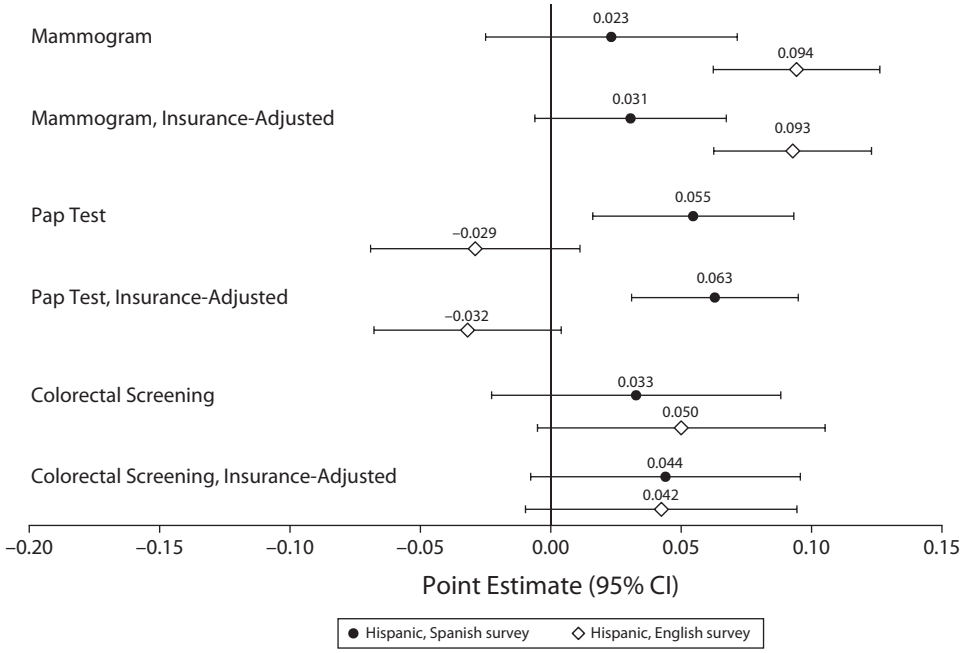

FIGURE 3— Differential Screening Responses to Medicaid Expansions by Ethnicity and Survey Language: United States, Behavioral Risk Factor Surveillance System, 2011–2016 and 2018–2019

Note. CI = confidence interval; Pap = Papanicolaou. Sample weighted linear probability models estimated triple difference specifications to approximate the relationship between state Medicaid expansions and cancer screening indicators among adults without dependent children who are not age-eligible for Medicare—specifically, comparing respondents in states that did vs did not expand Medicaid, before vs after expansions, with incomes below the expanded-access cutoff (138% of the federal poverty guideline [FPG]) vs at or above it but below 400% of FPG. Point estimates and 95% CIs plotted here estimate whether these screening responses differed between Hispanic respondents who completed the survey in English, Hispanic respondents who completed the survey in Spanish, and the non-Hispanic reference group. For each outcome, the analytic sample was limited to those younger than 65 years for whom the screening was recommended—that is, women aged 50–64 years for biennial mammograms, women aged 40–64 years for Pap tests every 3 years, and respondents aged 45–64 years for colorectal screenings (colonoscopies or sigmoidoscopies) every 5 years. See Table C (available as a supplement to the online version of this article at http://ajph.org) for output in tabular form with *P* values.

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and 2019 suggests several potential mechanisms. First, ACA provisions requiring coverage of preventive care without cost sharing, including USPSTF-recommended cancer screening, may have increased screening behavior. Second, increased access to mammography services (e.g., via mobile mammography) may have contributed to increased mammography among Asian and Hispanic women.[21] Third, between 2008 and 2019, several states increased language access services in Medicaid programs,[29] and effective Spanish-language cervical cancer prevention and screening campaigns have been introduced.[30] Similarly, observed increases in colorectal cancer screening coincide with national efforts to increase colorectal cancer screening to 80% among eligible individuals by 2020.[31] By increasing the proportion of particular racial or ethnic groups with access to care, Medicaid expansions might have amplified screening campaigns' impacts on those subgroups.[16,17]

Differential responses, however, help narrow the set of potential explanations. For example, evidence of increased screening among both English- and Spanish-speaking Hispanic women suggests that general changes in language accessibility are unlikely to fully explain these results. Indeed, limited English proficiency might dampen screening responses because language barriers can have a negative impact on health care access and quality,[32,33] but this would not explain increased Pap testing among Spanish-speaking Hispanic women. Spanish language preference could also reflect a lack of US citizenship, a predictor of reduced health care access[16] that may also be correlated with greater prioritization of cervical cancer screening because of Latin America's elevated disease burden.[34] This could help explain postexpansion increases in cervical cancer screening among Spanish- but not English-speaking Hispanic women. Of course, differential changes in Spanish- versus English-language cancer screening campaigns might also affect these results.

Limitations

This study had several limitations. First, reliance on self-reported data may introduce recall and social desirability biases. Reassuringly, this would only prejudice our differential-response estimates if state Medicaid expansions affected consequent misreporting and those biases were both stronger for a particular racial/ethnic subgroup and differentially so for those below 138% of FPG.

Second, while 12% of the BRFSS data on individuals aged 26 to 64 years lack income information, we did not use multiple imputation to address missing income data for 2 reasons: income observations are unlikely to be missing at random, and each round of imputation could alter the analytic sample (because incomes below 400% FPG are an inclusion criterion), creating further issues in comparing estimates across imputations.

Third, use of an indicator for completing the survey in Spanish is an imperfect proxy for language proficiency and may be correlated with citizenship status, which was not asked about in the BRFSS. If Hispanic respondents who completed the BRFSS survey in Spanish were more likely to come from mixed-immigration-status households and, thus, less likely to enroll in Medicaid,[35] we would expect reduced health care utilization in that subgroup relative to those who completed the survey in English. Thus, we might expect our estimates of screening responses among Spanish-speaking Hispanic respondents to be higher if we could limit the sample to citizens and documented residents to ensure that immigration statuses did not restrict respondents' Medicaid eligibility.

Finally, while triple-difference analyses offer a rigorous, quasi-experimental approach to identifying a policy change's effects, they are not randomized controlled trials. The plausibility of a causal interpretation here is bolstered by our data: as BRFSS is administered via random-digit dialing, the timing of a person's survey date relative to their state's Medicaid expansion is effectively random. To bias the overall policy effect estimates presented here, a confounder would need to be correlated with the Medicaid expansions' locations and timing, and apply only to respondents under 138% of the FPG. As unmeasured early expansions might meet this criterion, it is reassuring that findings hold when we omitted states with substantive pre-2014 expansions.

Even if the estimated policy effect were causal, regression specifications allowing it to differ by race/ethnicity would not confirm whether Medicaid expansion effects on cancer screening were modified by race/ethnicity per se, versus a correlate (e.g., trust in the health care system). While the specific mechanism does not change Medicaid expansions' overall implications for racial/ethnic disparities in cancer screening, it is an important avenue for future work: if such correlates are susceptible to intervention, that may provide an alternative approach to reducing racial/ethnic disparities in cancer screening and consequent mortality.

Our findings reinforce the importance of continued examination of heterogeneity in policy effects, not only by sex and race/ethnicity, as is more common, but also in terms of less commonly measured factors like preferred language, language proficiency, and citizenship status. As racial and ethnic groups are heterogeneous, research like the efforts of Alcalá et al. to differentiate ACA impacts among Latino subpopulations is also warranted.[16] Identifying different benefits from and avenues for intervention to increase preventive health care in underserved groups offers a means to improve overall population health while reducing disparities and, thus, should be a key priority for future work.

Public Health Implications

In this study of nationally and state-representative BRFSS data, state Medicaid expansions were associated with varying changes in cancer screening depending on respondent ethnicity and race. Specifically, relative to non-Hispanic White women, expansions were linked to greater increases in mammography among Asian and Hispanic women, and increased Pap testing among Hispanic women. Moreover, these relationships differed between Hispanic women who completed their survey in English versus Spanish. Critically, insurance status per se did not explain these results, suggesting that there may be other consequential avenues for intervention to reduce disparities in cancer screening. Future research and cancer screening surveillance should consider the role of respondent and family citizenship status, as well as how regulations and interventions affecting language accessibility and access to care might affect cancer screening in subgroups experiencing disproportionate morbidity and mortality. AJPH

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CONTRIBUTORS

A. S. Friedman conceptualized the project. A. S. Friedman and S. Thomas conducted the data analysis. S. C. Suttiratana provided key intellectual content to contextualize these results. All authors contributed to the interpretation of statistical findings as well as to writing and revision of the article.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest related to this research.

HUMAN PARTICIPANT PROTECTION

This research used only publicly available de-identified data and, thus, was deemed exempt from human participant review (institutional review board protocol ID 2000032422).

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Equity in Coverage of Local Cannabis Control Policies in California, 2020–2021

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See also Unger, p. 1532.

Objectives. To assess whether cannabis control policies that may protect public health were adopted evenly across California localities with differing sociodemographic compositions.

Methods. From November 2020 to January 2021, we measured cannabis control policies for 241 localities across California and linked them to data on the characteristics of the communities affected by these policies. We evaluated whether disadvantaged communities were more likely to allow cannabis businesses and less likely to be covered by policies designed to protect public health.

Results. Localities with all-out bans on cannabis businesses (65% of localities) were disproportionately high-education (55.8% vs 50.5% with any college) and low-poverty (24.3% vs 34.2%), with fewer Black (4.4% vs 6.9%) and Latinx (45.6% vs 50.3%) residents. Among localities that allowed retail cannabis businesses (28%), there were more cannabis control policies in localities with more high-income and Black residents, although the specific policies varied.

Conclusions. Cannabis control policies are unequally distributed across California localities. If these policies protect health, inequities may be exacerbated.

Public Health Implications. Uniform adoption of recommended cannabis control policies may help limit any inequitable health impacts of cannabis legalization. (*Am J Public Health*. 2022;112(11): 1640–1650. https://doi.org/10.2105/AJPH.2022.307041)

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As of May 2022, 38 states permit medical cannabis and 19 states permit recreational cannabis. These policies have numerous potential implications for public health, including changes in the epidemiology of cannabis consumption and associated health outcomes.[1] States regulate cannabis in varied ways, but many cede substantial powers to local governments.[2] Within the bounds of state law, local authorities may determine the number and type of commercial cannabis businesses allowed, if any. They can also regulate locations of retail cannabis outlets, hours and days of sale, types of products sold, packaging, advertising, tax rates, and clean air requirements. Guidelines for state and local cannabis control policies regulating cannabis are based on alcohol and tobacco research.[3–6] Recommended policies may protect public health by limiting cannabis availability and potency and by encouraging safer modes of use. In states with legal cannabis and local control, city and county governments can advance health equity by adopting health-promoting cannabis control policies and ensuring that they are fairly applied across the population.

Little is known about local variation in cannabis control policies or to whom these policies apply. Previous studies surveyed local cannabis control policies following recreational cannabis legalization in Colorado, Washington, and California.[6–8] All found wide variation, primarily between jurisdictions that banned commercial cannabis businesses and those that allowed all or most commercial activities. However, none of these studies characterized the populations affected by distinct policy approaches. Variation in local laws is important, because if policies that protect public health are adopted in

socially advantaged communities but not in disadvantaged communities, health disparities may be exacerbated. For example, uneven application of smoke-free tobacco laws across localities was linked to racial/ethnic and socioeconomic disparities in tobacco-related disease.[9] Anticipating such disparities can inform appropriate public health responses.

Previous studies show that cannabis outlets, particularly illegal ones, are disproportionately located in less-advantaged communities.[10–12] We investigated whether local policies might play a role in this uneven distribution. Studies from alcohol control show that local governments can play a role in both creating and mitigating undue burden of alcohol outlets in vulnerable communities through local planning, zoning, and public health regulations.[13] Similar provisions could be needed to protect communities from uneven distributions of legal or illegal cannabis outlets.

In this study, we characterized the demographic and socioeconomic characteristics of communities subject to different types of local cannabis control policies. We considered 3 levels of policy measures: overall bans on cannabis businesses, restrictions on cannabis availability, and individual cannabis control policies. We hypothesized that policies designed to protect public health would be less common in socially disadvantaged communities. We focused on 12 counties in California, where adult use of recreational cannabis was legalized on November 9, 2016, and retail sales were implemented on January 1, 2018.

METHODS

We assessed local cannabis control polices for 12 of California's 58 counties (Alameda, Humboldt, Los Angeles, Orange, Riverside, Sacramento, San Bernardino, San Francisco, Santa Barbara, Sonoma, Tulare, and Yuba; Appendix A, Figure A, available as a supplement to the online version of this article at https://ajph.org) and all the incorporated cities within them. These counties were selected to capture a range of sizes, sociodemographic compositions, political orientations, and cannabis policy approaches.[6] City policies apply within incorporated city borders, and county policies apply to areas outside of incorporated cities (hereafter, "unincorporated county areas"). We defined "jurisdictions" as the set of incorporated cities and unincorporated county areas because these are mutually exclusive and collectively exhaustive geographic areas to which distinct policies apply. The 12 counties included 230 distinct cities and 11 unincorporated county areas (San Francisco is a consolidated city–county), covering 59% of the California population (approximately 24 million people).

Using a legal epidemiological approach,[14,15] we systematically coded characteristics of cannabis policies in all 241 jurisdictions and then linked these policies to data on demographic and socioeconomic factors to characterize the affected populations. For each jurisdiction, we identified the corresponding local government's online searchable database of currently applicable laws. All code and ordinances are publicly available under the California Public Records Act.[16] We downloaded all legal text pertaining to cannabis by using the search term "cannabis OR marijuana OR marihuana." Across jurisdictions, relevant legal text ranged in length from 1 paragraph to thousands of pages. Five authors (E. C. M., L. M. M., C. F., S. Z., and D. E. A.) reviewed the text using a structured data collection instrument to capture the presence or absence and content of prespecified provisions in each jurisdiction's cannabis law.

Policy data were collected and managed using REDCap electronic data capture tools hosted at the University of California San Francisco.[17,18] The data collection instrument was iteratively piloted and refined as new policy approaches were uncovered. To ensure accuracy, all jurisdictions were double-coded by 2 analysts until achieving greater than 95% agreement.[19] Policy data collection and coding were conducted from November 2020 to January 2021. The complete protocol and data collection instrument are provided in Appendices B and C (available as supplements to the online version of this article at https://ajph.org).

Policy Measures

California state law specifies a minimum set of policies that apply to medical and recreational cannabis statewide. However, localities retain considerable discretion. We collected cannabis policy measures, guided by an established taxonomy of all possible cannabis policies developed by affiliates of the Alcohol Policy Information System.[20] From this comprehensive taxonomy, we measured all policies that (1) could be applied at the local level in California given state law, (2) varied across jurisdictions within California, (3) were more restrictive than state law, and (4) were plausibly related to public health according to previous evidence, recommended public health best practices, and expert opinion.[6,7,20] We captured the greatest detail on restrictions related to cannabis availability and retail sales, because these

are major levers for modifying population-level consumption,[1,3–6,21,22] and existing evidence suggests that policies regulating retail sales are the key component of state laws linking legalization to consumption and problems.[23,24] Appendix A, Table A (available as a supplement to the online version of this article at https://ajph.org) describes these local policies, relative to state law.

Coded policy variables were summarized in 3 ways:

1. Bans on cannabis businesses: This dichotomous variable reflects whether the local government allowed any medical or recreational cannabis businesses offering retail, cultivation, distribution, manufacture, or testing to operate within their jurisdiction.
2. Restrictiveness of cannabis availability: For those jurisdictions allowing retail businesses for medical or recreational cannabis, we summed the 19 dichotomous policy variables related to cannabis availability and retail sales (Appendix A, Table A) and dichotomized the resulting score at the median (8 or more policies adopted vs 7 or fewer). In sensitivity analyses, we broke the policy score into quarters instead of halves.
3. Individual cannabis control policies: For jurisdictions allowing retail sales, we examined each of 19 dichotomous policy variables related to cannabis availability and retail sales in turn.

Sociodemographic Characteristics

To characterize the populations exposed to different policy approaches, we included a range of demographic and socioeconomic characteristics from sources including the US Census Bureau and Geolytics. We considered sociodemographic characteristics related to health disparities, including age, race/ethnicity, gender, educational attainment, poverty, unemployment, median income, household composition, urbanicity (population density), home ownership, and population change. We also assessed the density of social organizations (e.g., religious organizations, charities, interest groups) as a measure of social capital[25] and density of general retail businesses as a measure of economic development.[26] Appendix A, Table B (available as a supplement to the online version of this article at https://ajph.org) provides additional detail on each covariate.

In addition to considering each sociodemographic characteristic individually, to help synthesize the overall pattern of results, we created a binary measure of social advantage by entering all of the jurisdiction-level sociodemographic measures into a principal components analysis and dichotomizing the resulting first component at the median. In sensitivity analyses, we considered measures of social advantage dichotomized at the 75th and 90th percentiles.

Database Development

We merged the policy and predictor data by jurisdiction. Because county characteristics are typically reported for the county overall, not for the unincorporated areas alone, we used population characteristics data at the census block group level and aggregated up to the jurisdiction level (see Appendix A, "Database development," for detail). Three small jurisdictions had no residential populations and were excluded from analyses describing population characteristics.

Statistical Analysis

We conducted statistical analysis in R version 4.0.4 (R Foundation for Statistical Computing, Vienna, Austria). We characterized the populations residing in jurisdictions with differing policy approaches for each of the 3 levels of policy measures (bans on cannabis businesses, restrictiveness of cannabis availability, individual cannabis control policies). For the jurisdictions in each category of each policy measure, we calculated an overall population-weighted summary statistic for each sociodemographic characteristic (e.g., the median age across all people residing in study jurisdictions banning cannabis businesses). We also measured the average difference in each population characteristic across jurisdictions, comparing jurisdictions with differing policy approaches (e.g., jurisdictions with vs without bans on cannabis businesses), using linear regressions of the policy measure on each population characteristic separately. For analyses of the individual cannabis control policies, we calculated the proportion of jurisdictions adopting the given policy, comparing jurisdictions with greater than versus less than median social advantage.

RESULTS

We found substantial local variation in cannabis control policies. Of 241 jurisdictions, 83 permitted at least 1 form of commercial medical or recreational cannabis business (retail, cultivation, distribution, manufacture, or testing; Figure 1, Appendix A, Figure A). The

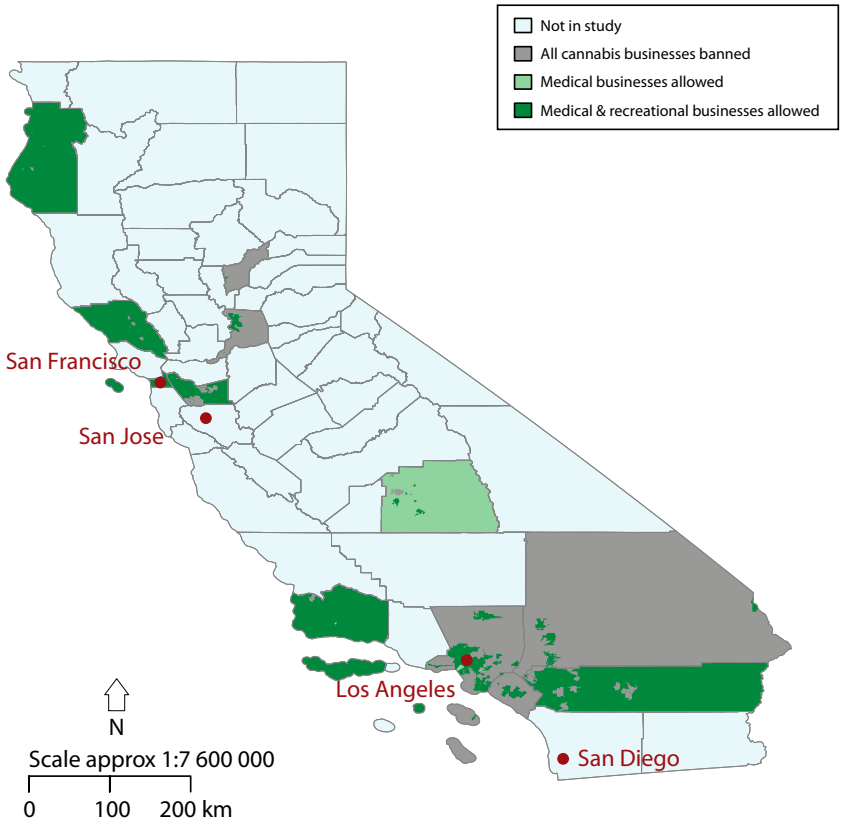

FIGURE 1— Study Cities and Counties by Policy on Cannabis Businesses: California, 2020–2021

Note. The total number of jurisdictions was 241. The gray lines indicate the boundaries of counties. The counties included in this study were Alameda, Humboldt, Los Angeles, Orange, Riverside, Sacramento, San Bernardino, San Francisco, Santa Barbara, Sonoma, Tulare, and Yuba.

largest distinction in regulatory approaches across jurisdictions was between those that banned all forms of medical and recreational cannabis businesses (n = 158; 66%) and those that permitted them all (n = 59; 22%). Between these extremes, 5 jurisdictions permitted all types of medical businesses but not recreational businesses; 14 permitted cultivation, distribution, manufacture, and testing but not retail; and 5 permitted retail only.

Jurisdictions with nonzero residential populations permitting at least one form of medical or recreational retail cannabis (n = 68) enacted a range of cannabis control policies (Figure 2). Most jurisdictions required local permits for retail sales (99%), limited hours of sale (77%), taxed retail purchases (62%), restricted the density of outlets permitted per land area or population (58%), and adopted operating standards for upkeep (58%) and safety (94%). Bans on on-site consumption, which protect workers and visitors from health hazards such as secondhand smoke exposure, were present in 74% of jurisdictions. Less common were public health tools such as restrictions on marketing or advertising (43%), server training requirements (6%), limits on product types or potency (e.g., bans on edibles or flavors, maximum tetrahydrocannabinol [THC] concentrations; 6%), or social host liability (holding adults responsible for hosting underage consumption on their property; 7%).

Populations With and Without Bans

For the 238 jurisdictions with nonzero residential populations, Table 1 compares the population characteristics of jurisdictions banning all cannabis businesses versus those that permitted 1 or more. All-out bans on all cannabis businesses were more common in areas with higher socioeconomic status. Populations in jurisdictions permitting commercial cannabis, by contrast, were on average less educated, with lower median income, more poverty, higher unemployment, and more crowded housing. Cities and unincorporated areas allowing cannabis businesses were also slightly older and had greater proportions of Black and Latinx residents, and fewer Asian and White residents. Population density, population growth, renters, nonfamily households, and densities of general retail and social organizations were also greater in jurisdictions permitting cannabis businesses.

Populations by Cannabis Availability

For the 68 jurisdictions with nonzero residential populations that permitted at least 1 form of cannabis retail, Table 2 shows the characteristics of populations residing in jurisdictions with varying numbers of public health restrictions on retail sales and cannabis availability. Estimated associations were imprecise because of the small number of units (jurisdictions permitting retail) that were included in the analysis,

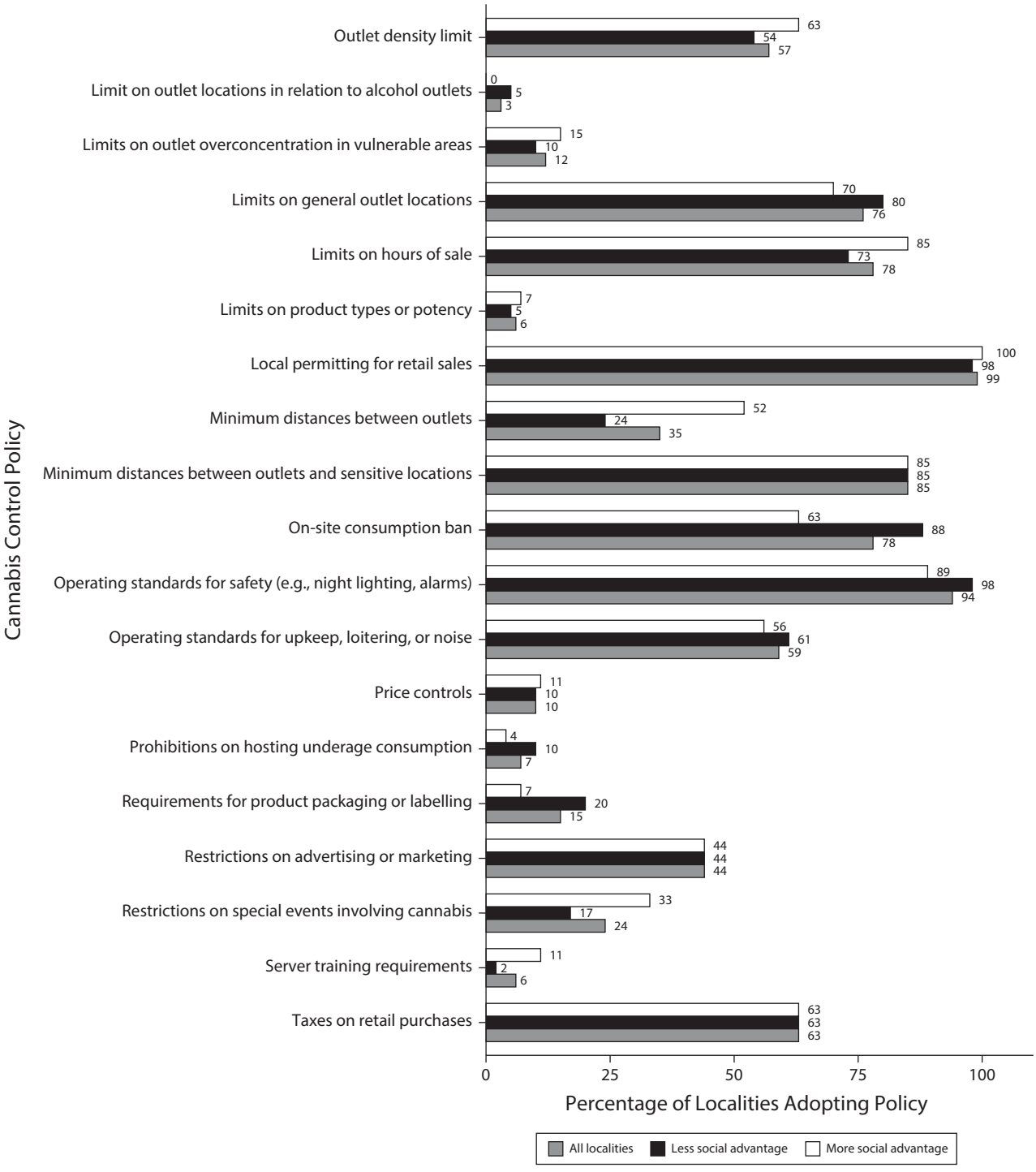

FIGURE 2— Percentage of Localities Adopting Cannabis Control Policies, by Level of Social Advantage, Among 68 Localities Permitting Retail Sales: California, 2020–2021

Note. Degree of social advantage was measured by entering all the demographic and socioeconomic population characteristics into a principal components analysis and dichotomizing the resulting first component at the median.

TABLE 1— Characteristics of Populations Residing in Localities Permitting Versus Banning Cannabis Businesses: California, 2020–2021

Characteristic	Population Residing in Localities That Ban All Cannabis Businesses	Population Residing in Localities Allowing Cannabis Businesses	Average Difference Across Localities (95% CI)
Total population size, no.			
Localities	156	82	. . .
People	11 595 680	12 754 287	81 209 (4 677, 157 740)
Households	3 699 248	4 307 589	28 818 (2 784, 54 853)
Demographic characteristics			
Median age, y	36.6	37.7	−2.1 (−4.1, −0.2)
% women	50.4	50.3	−0.3 (−0.9, 0.2)
Race/ethnicity, %[a]			
Asian	14.6	12.2	−6.5 (−10.5, −2.5)
Black	4.4	6.9	1.5 (0.1, 2.9)
Latinx	45.6	50.3	11.0 (3.9, 18.1)
White	55.7	50.6	−2.5 (−7.6, 2.5)
Population density (per 10 sq mi)	9 933	16 619	1 528 (−132, 3 187)
Population mobility and household composition, %			
Population change since 2000	9.2	11.4	5.2 (2.4, 7.9)
Renters	34.6	47.3	10.4 (6.6, 14.2)
Family households	77.1	68.6	−5.3 (−8.3, −2.2)
Average household size	3.2	3.1	0.0 (−0.1, 0.2)
Socioeconomic characteristics			
Education, %			
With a high school degree	20.1	18.8	2.2 (0.6, 3.8)
With some college or associate degree	30.4	26.2	−1.8 (−3.7, 0.2)
With bachelor's degree	25.4	24.3	−7.6 (−12.0, −3.3)
Poverty and income			
% with income below 150% of poverty level	24.3	34.2	9.8 (6.3, 13.3)
Median income, $	75 044	61 536	−21 879 (−29 747, −14 011)
Unemployment rate, %	4.8	5.3	1.0 (0.5, 1.4)
% crowded households	26.5	40.7	7.2 (1.3, 13.2)
Density of general retail outlets (per 10 sq mi)	1 377	1 698	4 658 (−1 326, 10 641)
Density of social organizations (per 10 sq mi)	196.6	308.3	748.3 (7.2, 1 489.5)

Note. CI = confidence interval. Results reported in this table are for the 238 jurisdictions with nonzero residential populations. The "Average difference across localities" column reports the difference between the average value of the population characteristic for jurisdictions allowing cannabis businesses and the average value of the population characteristic for jurisdictions banning cannabis businesses. Average differences were computed with linear regressions of the dichotomous bans variable on each population characteristic separately.

[a]Racial/ethnic categories are not mutually exclusive. Asian, Black, and White racial groups include all people identifying as the corresponding race irrespective of Latinx identity. The Latinx group includes people identifying as Latinx irrespective of racial identity.

but are meaningful for the study jurisdictions.

Cities and unincorporated county areas that had 8 (the median) or more cannabis control policies generally had greater population density, more renters, fewer family households, more crowded households, and higher densities of social organizations compared with jurisdictions with fewer policies. More restrictive jurisdictions were also older, with more Asian and Black residents, and fewer Latinx and White residents. Again, cannabis control policies followed socioeconomic status: populations in areas that permitted retail cannabis business but were covered by more cannabis control policies

TABLE 2— Characteristics of Populations Residing in Localities Adopting Cannabis Control Policies, Among the 68 Localities Permitting Retail Sales: California, 2020–2021

	Population Residing in Localities Adopting < the Median No. of Cannabis Control Policies	Population Residing in Localities Adopting ≥ the Median No. of Cannabis Control Policies	Average Difference Across Localities (95% CI)
Total population size, no.			
Localities	30	38	. . .
People	1 486 000	9 657 000	204 586 (−35 298, 444 471)
Households	475 700	3 335 196	71 912 (−10 624, 154 447)
Demographic characteristics			
Median age, y	34.4	38.6	3.3 (0.0, 6.6)[a]
% women	50.2	50.4	0.5 (−0.3, 1.3)
Race/ethnicity, %[b]			
Asian	6.3	12.6	2.6 (−2.3, 7.6)
Black	2.5	7.9	3.5 (1.1, 5.9)
Latinx	55.9	49.6	−9.7 (−22.6, 3.2)
White	59.5	49.1	−0.6 (−9.1, 7.9)
Population density (per 10 sq mi)	9 224	18 806	1 890 (−1 889, 5 669)
Population mobility and household composition, %			
Population change since 2000	11.0	11.3	−1.3 (−5.8, 3.2)
Renters	40.4	49.7	−1.5 (−7.5, 4.5)
Family households	73.4	66.6	−2.6 (−9.8, 4.6)
Average household size	3.3	3.1	−0.2 (−0.6, 0.1)
Socioeconomic characteristics			
Education, %			
With a high school degree	21.0	18.3	0.0 (−2.9, 2.9)
With some college or associate degree	27.3	25.5	2.0 (−1.4, 5.3)
With bachelor's degree	19.8	24.8	2.7 (−4.0, 9.5)
Poverty and income			
% with income below 150% of poverty level	34.9	35.3	−7.5 (−14.1, −0.9)
Median income, $	57 314	60 745	8 217 (−257, 16 691)
Unemployment rate, %	5.9	5.2	−0.7 (−1.6, 0.2)
% crowded households	29.0	44.4	−1.6 (−12.5, 9.4)
Density of general retail outlets (per 10 sq mi)	330.4	3 095.3	−5177.4 (−19 666.5, 9 311.7)
Density of social organizations (per 10 sq mi)	49.3	606.8	840.7 (−1 042.6, 2 724.1)

Note. CI = confidence interval. Results reported in this table are for the 68 jurisdictions with nonzero residential populations and that permit at least 1 form of retail cannabis business. The "Average difference across localities" column reports the difference between the average value of the population characteristic for jurisdictions adopting greater than the median number of cannabis control policies and the average value of the population characteristic for jurisdictions adopting fewer than the median number of cannabis control policies. Average differences were computed using linear regressions of the dichotomous fewer versus more cannabis control policies variable on each population characteristic separately.

[a]CI includes 0.
[b]Racial/ethnic categories are not mutually exclusive. Asian, Black, and White racial groups include all people identifying as the corresponding race irrespective of Latinx identity. The Latinx group includes people identifying as Latinx irrespective of racial identity.

were more educated with less poverty and higher median income. Results of sensitivity analyses breaking the policy score into quarters instead of halves showed patterns consistent with the main results, with the most pronounced differences for jurisdictions with the fewest cannabis control policies (Appendix A, Table C, available as a supplement to the online version of this article at https://ajph.org).

Policies by Level of Social Advantage

Figure 2 and Appendix A, Table D (available as a supplement to the online version of this article at https://ajph.org) present the proportion of jurisdictions adopting each cannabis control policy, by level of social advantage, among jurisdictions with nonzero residential populations that permitted at least 1 type of cannabis retail (n = 68). Cannabis control policies were not universally more common in jurisdictions with greater social advantage but rather depended on the policy. At one extreme, requirements on minimum distances between outlets were far more common in jurisdictions with social advantage greater than or equal to the median (52%) compared with jurisdictions with less than median social advantage (24%; average difference in policy prevalence across jurisdictions with more vs less social advantage: 27.5%; 95% confidence interval [CI] = 4.8, 50.1).

At the other extreme, bans on on-site consumption were more common in jurisdictions with less social advantage (88%) compared with those with more social advantage (63%; average difference in policy prevalence across jurisdictions: 24.8%; 95% CI = 5.3, 44.4). For other policies, associations were less precise and CIs included the null. More socially advantaged jurisdictions generally had more event restrictions, limits on hours of sale, outlet density limits, server training requirements, and limits on outlet overconcentration in vulnerable areas. Less socially advantaged jurisdictions generally had more outlet location limits, operating standards for safety and upkeep, and social host laws. Results of sensitivity analyses dichotomizing the social disadvantage score at the 75th and 90th percentiles showed similar patterns to the main results (Appendix A, Tables E and F, available as supplements to the online version of this article at https://ajph.org).

DISCUSSION

We examined local variation in the adoption of cannabis control policies in relation to social advantage for 241 of California's 539 cities and unincorporated county areas. Following statewide recreational cannabis legalization, a majority (65%) of these jurisdictions banned all cannabis businesses. The 25% of jurisdictions that allowed retail cannabis businesses varied widely in their adoption of 19 policies (e.g., taxes, limits on operating hours, marketing controls). This study is among the first to investigate patterns in local cannabis control policies relative to socioeconomic and demographic characteristics. We found that all-out bans on cannabis businesses were more common in localities with higher income and education levels, and communities with disproportionately more Asian residents and fewer Black and Latinx residents. Among jurisdictions permitting retail cannabis businesses, recommended cannabis control policies were more frequently adopted in jurisdictions with less poverty and more Black residents, although there was variation by policy. This uneven application of cannabis control policies has the potential to exacerbate cannabis-related health disparities in communities already at higher risk of poor health outcomes.

Recreational cannabis legalization has been framed as a way to repair racial injustices stemming from discriminatory drug policies,[27–29] but just implementation of cannabis legalization is also a concern. Commercial cannabis may offer business opportunities, which has motivated some jurisdictions to offer priority licensing for people negatively impacted by historical cannabis criminalization.[28] Communities with more Black and Hispanic residents have more illegal cannabis outlets that may not comply with requirements such as product safety standards[12,30]; legalizing cannabis outlets allows localities to regulate them and thereby potentially promote public health.[12]

Yet our findings also suggest potential for legalization to exacerbate longstanding racial/ethnic and socioeconomic inequities. Cannabis is not harmless. Cannabis use disorder occurs in 20% of lifetime cannabis users, with 11% of these cases severe enough to prevent individuals from participating in major life activities (e.g., employment, caregiving).[31,32] While valid medicinal uses exist, cannabis use has been linked to potential harms including motor vehicle crashes, psychotic disorders, respiratory disease, and low birth weight.[33,34] Thus, communities that increase access to cannabis by permitting cannabis businesses—particularly commercial retail—may experience increases in cannabis use and associated negative health consequences.[1] Communities with less social advantage may have

less power to resist policies that enable legal or illicit cannabis sales, consistent with research showing that cannabis outlets are disproportionately located in neighborhoods with more low-income and racial/ethnic minority residents.[10–12]

Economically disadvantaged communities were more likely to allow commercial cannabis businesses, and on average less likely to deploy recommended policies that curb the availability of commercial cannabis and exposure to some of its harms. This finding is consistent with previous research showing that higher-socioeconomic-status communities were more likely to have comprehensive tobacco smoke-free air laws.[9] Jurisdictions with greater proportions of Black residents adopted significantly more cannabis control policies regulating retail cannabis businesses, if allowed. This finding may have positive implications for health disparities and may reflect that some cities with previous experience of social activism to promote local alcohol control (e.g., Oakland) are translating these lessons to cannabis.

Cannabis control policies were also more common in places with higher population density. Urban areas in California are more politically liberal and, thus, more likely to adopt a variety of public health policies, including those pertaining to cannabis. Larger cities may also have more capacity to consider public health concerns and develop more extensive regulatory approaches.[35] The optimal policy strategy for local cannabis is unknown, as most local cannabis policies have not yet been evaluated. However, if lessons learned from alcohol and tobacco apply to cannabis,[3–6,21,22] then cities covered by more cannabis control policies may benefit while rural areas may face more exposure to health harms.

We found notable patterns in the types of cannabis control policies adopted by more and less socially advantaged jurisdictions. More advantaged jurisdictions generally adopted more restrictions on physical cannabis access (event restrictions, limits on hours of sale, outlet density limits, server training requirements, and limits on outlet overconcentration in vulnerable areas). Less advantaged jurisdictions generally had more restrictions related to retail cannabis's presence in the neighborhood environment (operating standards for safety and upkeep, prohibitions on hosting underage consumption, and outlet location limits). These distinct policy combinations may be motivated by different underlying interests (e.g., focusing on protecting public health vs preventing crime).

Local policy patterning may also reflect the "not-in-my-backyard" (NIMBY) phenomenon. Wealthy, White, and socially advantaged groups within local jurisdictions often have a disproportionate voice in local politics, allowing them to influence decision-making in the interests of keeping commercial cannabis out of their own neighborhoods. If NIMBYism is at play, it would be consistent with other areas of health—NIMBYism has been shown to thwart public health equity in local policymaking on issues ranging from homelessness to AIDS, alcohol control, and air pollution,[36–39] and is a manifestation of structural racism.[40] Public health researchers and health equity advocates should therefore monitor this concern in local cannabis policymaking going forward. As with other areas, ensuring equitable local policies may involve combatting NIMBYism through public policy or engagement strategies.[39,41]

Limitations

This study has limitations. First, local cannabis policies have evolved since legalization, but our assessment was cross-sectional. Evaluating temporal trends in local cannabis policies is an area for future investigation. Second, our analysis covered 241 of California's 539 localities; the findings may not generalize to other parts of California or other states. Third, our summary measure of social advantage has not been validated; alternative measures may produce different findings. Fourth, populations may be affected by the policies in neighboring jurisdictions. While such spillover effects have been unsubstantiated for tobacco,[42] whether this phenomenon occurs for cannabis remains to be determined. Finally, our statistical analysis involved tests of multiple population characteristics. However, our analysis was descriptive, and whether adjustments for multiple comparisons are necessary remains debated.[43]

Conclusions

Local authority over cannabis can benefit public health because local policymakers may be more directly responsive to their constituents' desires than state or federal policymakers.[44,45] Local cannabis policymaking also presents an opportunity to reduce inequities by extending land use planning strategies for unhealthy commodities—including alcohol, tobacco, firearms, and fast food[46]—to commercial cannabis. However, California had uneven application of cannabis control policies that could exacerbate cannabis-related health inequities. More advantaged communities were less likely to permit cannabis businesses, and if they did, they were generally more likely to regulate those businesses. Local policies

may help explain why outlets are disproportionately located in low-income communities and communities of color. To prevent local decision-making from exacerbating health inequities, there should be more uniform adoption of cannabis control policies across localities. This could be achieved by advocating local adoption of model ordinances or by raising statewide requirements. Common standards are increasingly important as more US states consider legalization and federal lawmakers discuss national decriminalization.

Our results suggest that local policy differences may help explain why cannabis businesses are disproportionately located in low-income communities of color. Further research is needed to determine whether similar local policy patterns occur across other regions and to examine the relationships between local laws, outlet density, and cannabis-related health inequities. If local laws prove to be an important factor in health inequities, the laws can be changed in ways that help close the gap. AJPH

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E. C. Matthay, L. A. Schmidt, and D. E. Apollonio conceptualized the study. E. C. Matthay, L. M. Mousli, C. Fu, S. Zhang, and D. E. Apollonio collected and coded the cannabis policy data. E. C. Matthay completed the analyses and led the writing. W. R. Ponicki and P. Gruenewald assisted with the study conceptualization and design. All authors contributed to the interpretation of the study results and provided critical feedback on the article.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to report.

HUMAN PARTICIPANT PROTECTION

Population data in this study were based entirely on publicly available secondary data, and this study was therefore exempt from institutional review board review.

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Workplace Violence Against Adolescents, Uganda, 2014–2019

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See also Amo-Adjei and Fry, p. 1535.

Objectives. To describe the prevalence of and risk factors for workplace violence among Ugandan adolescents.

Methods. The analysis focused on adolescents recruited at primary schools who participated in the endline survey of a trial in 2014 (at ages 11–14 years) and were followed up in 2018–2019 (at ages 17–19 years). The analysis was restricted to those engaged in past-year paid work (n = 1406). We estimated the prevalence of past-year workplace violence and used mixed-effects multivariable logistic regression to explore associations with characteristics measured in early adolescence, current life circumstances, and work-related factors.

Methods. The analysis focused on adolescents recruited at primary schools who participated in a 2014 survey and were followed up in 2018–2019. The analysis was restricted to those engaged in past-year paid work (n = 1406). We estimated the prevalence of past-year workplace violence and used mixed-effects multivariable logistic regression to explore associations with characteristics measured in early adolescence, current life circumstances, and work-related factors.

Results. Overall, 40% (95% confidence interval [CI] = 37%, 43%) of adolescents in paid work experienced past-year workplace violence; odds were doubled among female domestic workers (vs retail/trade workers; adjusted odds ratio [AOR] = 2.07; 95% CI = 1.28, 3.35). Experiences measured in early adolescence, including eating less than 3 meals the previous day, experiencing severe physical violence (male adolescents: AOR = 1.48; 95% CI = 1.11, 1.98; female adolescents: AOR = 1.69; 95% CI = 1.13, 2.53) and bullying, and having poor mental health (male adolescents: AOR = 2.32 95% CI = 1.37, 3.92; female adolescents: AOR = 2.27; 95% CI = 1.05, 4.89), were associated with increased odds of workplace violence. Current life circumstances (fewer household assets, more moves, functional difficulties, poorer mental health) were also associated with workplace violence.

Conclusions. Interventions are needed to address the high prevalence of workplace violence across all sectors, with female domestic workers particularly vulnerable. Early prevention of violence and poor mental health may be promising. (*Am J Public Health*. 2022;112(11):1651–1661. https://doi.org/10.2105/AJPH.2022.306983)

Violence, including workplace violence, is an expression of power and dominance, and those who are in subordinate social positions because of age, gender, and poverty may be particularly vulnerable.[1,2] Survey data, mainly from high-income countries, suggest that 30% to 60% of women experience sexual harassment at work and that younger women are especially at risk.[3] Limited data from studies conducted in low- and middle-income countries suggest that the prevalence of sexual harassment is as high or higher.[4] These studies have reported the prevalence of workplace violence within individual sectors such as domestic work, agriculture, and mining.[4–6] National surveys in several countries have shown that 14% to 40% of children involved in work experience violence.[7–9]

The consequences of workplace violence include negative effects on mental and physical health and social

outcomes.[10,11] Building on the momentum of the #MeToo and #TimesUp movements, International Labour Organization (ILO) member states have adopted the Violence and Harassment Convention 2019,[12] providing an impetus to reduce workplace violence and harassment.

More than 47.5 million adolescents 15 to 17 years of age face working conditions that expose them to environmental hazards, excessive hours, or violence, especially in low- and middle-income countries.[13] Young workers are at higher risk of workplace violence than adults[3] and are more likely to engage in low-status, insecure, and unstable work, further increasing their vulnerability to workplace violence.[4] Most countries have legislation on workers' safety, including implicit and explicit provisions covering workplace violence.[4] Although these legal guarantees are important, their effectiveness may be reduced in countries such as Uganda, where the vast majority of workers (91.9%) remain in informal employment and out of the reach of labor inspections.[14]

Despite increased awareness of the pervasive nature of workplace violence, there are virtually no large-scale quantitative data documenting the prevalence of different forms of violence across all young workers and sectors in low-income settings. Existing data are difficult to compare because of differences in definitions,[4] and violence is likely underreported. To our knowledge, no longitudinal studies have investigated risk factors for workplace violence in low-income settings.

In Uganda, almost 1 in 5 adolescents 15 to 17 years of age are out of school and working[14] and 14% have experienced violence at work,[7] despite the existence of laws guaranteeing fundamental freedoms and rights.[15–17] Yet, very little is known about forms of violence and types of perpetrators in different work settings. Using data from a cohort study of male and female adolescents originally residing in Uganda's Luwero District, we sought to (1) describe the prevalence of physical, sexual, and emotional workplace violence across work sectors; (2) determine what work-related factors are associated with workplace violence; (3) explore what characteristics measured in early adolescence, including childhood exposure to violence, are associated with workplace violence in later adolescence; and (4) explore how workplace violence is associated with current life circumstances.

METHODS

We used data from the Contexts of Violence in Adolescence Cohort Study,[18] an ongoing closed cohort investigation of adolescents originally recruited as part of a trial of the Good School Toolkit, a whole-school intervention designed to reduce violence in schools.[19] Trial recruitment involved a 2-stage process. A list of all primary schools in the Luwero District was obtained in 2012, and schools with more than 40 grade 5 students were eligible. The 151 eligible schools contained more than 80% of all students in the district; 42 schools were randomly selected, and all agreed to participate. Twenty-one received an intervention from 2012 to 2014, and 21 served as a wait-list control group that received an intervention from 2015 to 2018.

A simple random sample of up to 130 students per school in grades 5 through 7 (11–14 years of age) was selected, and students were approached to participate in a survey in 2014; if fewer than 130 students were present, the complete sample was invited to participate. In total, 93% of students agreed to participate and 90% of participants agreed to ongoing follow-up, forming the wave 1 sample (n = 3431). At wave 2 (2018–2019), we successfully traced 81% of the participants (n = 2773; Table C, available as a supplement to the online version of this article at http://www.ajph.org). Adolescents who had moved to districts beyond those neighboring Luwero (4% of participants) were not traced owing to study operational considerations. There was some evidence of differential attrition: adolescents not completing a wave 2 survey had eaten fewer meals the previous day at wave 1, were older, and were likely to be experiencing higher levels of adversity.

Procedures

Wave 1 and wave 2 data were captured by trained Ugandan interviewers, who administered face-to-face survey interviews using hand-held devices. At wave 2, interviews took place at school, home, work, or community settings. Adolescents 18 years or older and emancipated minors provided informed written consent before participation. In the case of adolescents younger than 18 years who were not emancipated minors, caregivers were first provided with information and could opt out from their child participating. Adolescents who were not opted out by their caregiver were approached to provide informed written assent before participation. Interviewers assessed participants' ability to understand consent procedures in English or Luganda before proceeding with the informed consent process.

At the end of the interview, all adolescents were offered counseling, regardless of what they disclosed. Those who

disclosed violence or a well-being concern in accordance with our predefined criteria were, on their agreement, referred to a child protection officer or counselor for appropriate action depending on severity and timing. Open Data Kit was used to capture, transmit, and store all data on a secure server.

Study Population

In our analysis, we used data from participants who reported at wave 2 that they had been involved in paid work in the preceding 12 months (934 male participants [70%] and 472 female participants [33%]).

Study Measures

Workplace violence was defined as self-reports of violent acts perpetrated by an employer or adult in a work-related position of authority or by peers at the workplace. Table A (available as a supplement to the online version of this article at http://www.ajph.org) lists workplace violence items captured at wave 2 and the composite measures modeled as binary variables in our analysis. Our main outcome was any workplace violence in the past year. This included physical, emotional, or sexual violence from an employer or peer at work. Other measures included any sexual workplace violence in the past year (from an employer or peer at work) and specific types of violence (emotional, physical, and sexual) from employers and peers at work in the past year.

Students were asked about lifetime, past-year, and past-week experiences of violence from different perpetrators. A full list of the violence questions asked and the violence exposure measure are provided in Table A. We constructed binary measures to describe lifetime experiences of caregiver violence, sexual violence, and severe physical violence. Two past-year school violence binary measures (multiple acts of physical or emotional violence from a teacher or school staff member and bullying) and 1 categorical variable (polyvictimization) were also constructed.

Other measures have been widely used and were adapted and piloted with this population before use. As in past analyses, we used number of meals eaten yesterday as a proxy for socioeconomic status at wave 1. A list of measures is provided in Table A.

We constructed work sector groupings (shown in Table B, available as a supplement to the online version of this article at http://www.ajph.org) using ILO definitions,[13] Ugandan national surveys,[14] and data response frequencies for male and female adolescents (groups including less than 5% of the sample were combined for analysis).

Data Analysis

Stata version 16 (StataCorp LLC, College Station, TX) was used in conducting all of our analyses. Few data were missing (less than 1% for any variable used in the analysis; less than 1% of participants were dropped in any multivariable model because of missing data). Descriptive statistics for continuous variables included numbers of observations, means and standard deviations or standard errors, and medians and interquartile ranges (IQRs) for skewed data. Categorical variables are presented as frequencies and percentages. When producing prevalence estimates with associated 95% confidence intervals, we accounted for clustering at the school level using the Stata *svy* command.

We initially determined the prevalence of different types of workplace violence by sex and work sector. We then used mixed-effects logistic regression, with school modeled as a random effect to account for clustering at the school level, to explore how work-related factors and individual characteristics (exposures) were associated with any workplace violence in the past year (the primary outcome). All analyses were conducted separately for male and female adolescents. Unadjusted and adjusted odds ratios (ORs) are presented. Adjusted models included original study arm as a covariate to adjust for any study arm effects. Age, number of meals eaten yesterday, and any functional difficulty were identified a priori as potential confounders of specific exposure–outcome relationships. The covariates included in each model are indicated in the relevant tables.

RESULTS

Table B shows that the nature of work in which young people engage differs by sex. Female adolescents most commonly reported engaging in domestic work (32%) and retail or trade (32%), whereas male adolescents worked in farming (33%) and manual labor (28%). A similar percentage of male and female adolescents reported working in street or recreational work sectors (12% male and 17% female). The median age of adolescents who had engaged in paid work within the past year was 18 years (IQR = 17–19; Table 1). A higher proportion of male than female adolescents were in school or in training (41% vs 26%) and lived with an adult family member (61% vs 49%). Just over half of the participants had eaten 3 or more

TABLE 1— Wave 2 Sociodemographics and Workplace Violence Among Adolescents Engaged in Paid Work in the Past Year, by Sex: Uganda, 2018–2019

	Total (n = 1406), Median (IQR) or No./Total No. (%; 95% CI)	Male (n = 934), Median (IQR) or No./Total No. (%; 95% CI)	Female (n = 472), Median (IQR) or No./Total No. (%; 95% CI)
Sociodemographic factors			
Age, y	18 (17–19)	18 (17–19)	18 (17–19)
In school/training	511/1406 (36; 31, 42)	387/934 (41; 35, 48)	124/472 (26; 20, 33)
Lives with adult family member(s)[a]	803/1406 (57; 54, 60)	571/934 (61; 57, 65)	232/472 (49; 44, 54)
Three or more meals eaten yesterday	765/1406 (54; 51, 58)	515/934 (55; 52, 59)	250/472 (53; 47, 59)
No household assets[b]	178/1406 (13; 11, 15)	109/934 (12; 10, 14)	69/472 (15; 11, 18)
Workplace violence, past year			
Any workplace violence[c]	565/1406 (40; 37, 43)	371/934 (40; 37, 43)	194/472 (41; 36, 46)
Any sexual workplace violence[d]	103/1406 (7; 6, 7)	40/934 (4; 3, 6)	63/472 (13; 11, 17)
Any employer and peer violence	159/1406 (11; 9, 14)	104/934 (11; 9, 14)	55/472 (12; 9, 15)
Any employer violence only	332/1406 (24; 22, 26)	213/934 (23; 21, 25)	119/472 (25; 21, 29)
Any peer violence in workplace only	74/1406 (5; 4, 8)	54/934 (6; 4, 8)	20/472 (4; 3, 7)
Employer violence, past year			
Any violence	491/1406 (35; 32, 38)	317/934 (34; 31, 37)	174/472 (37; 32, 42)
Emotional violence	463/1406 (33; 30, 36)	300/934 (32; 29, 36)	163/472 (35; 30, 40)
Physical violence	109/1406 (8; 7, 9)	74/934 (8; 6, 10)	35/472 (7; 5, 10)
Sexual violence	78/1406 (6; 5, 7)	31/934 (3; 2, 5)	47/472 (10; 8, 13)
Physical and emotional violence	94/1406 (7; 6, 8)	63/934 (7; 5, 9)	31/472 (7; 5, 9)
Any violent act many times	156/1406 (11; 9, 13)	88/934 (9; 7, 12)	68/472 (14; 11, 18)
Peer workplace violence, past year			
Any violence	233/1406 (17; 14, 19)	158/934 (17; 14, 20)	75/472 (16; 13, 20)
Emotional violence	215/1406 (15; 13, 18)	150/934 (16; 13, 19)	65/472 (14; 11, 17)
Physical violence	39/1406 (3; 2, 4)	34/934 (4; 3, 5)	5/472 (1; 0, 3)
Sexual violence	37/1406 (3; 2, 4)	12/934 (1; 1, 2)	25/472 (5; 4, 8)
Physical and emotional violence	34/1406 (2; 2, 4)	29/934 (3; 2, 5)	5/472 (1; 0, 3)

Note. CI = confidence interval; IQR = interquartile range.

[a]One or more of the following: biological father, biological mother, stepfather, stepmother, grandfather, or grandmother.
[b]No electricity, radio, television, or refrigerator.
[c]Any violence from employers or peers in the workplace in the past year.
[d]Any sexual violence from employers or peers in the workplace in the past year.

meals on the day before the interview, and 13% had no household assets (no electricity, radio, television, or refrigerator).

Prevalence of Workplace Violence

Overall, 40% of male and 41% of female adolescents reported experiencing any type of workplace violence from an employer or peer at work in the past year (Table 1), and 4% of male and 13% of female adolescents reported experiencing sexual violence at their workplace within the past year. Employers were the most common perpetrators of violence, with 34% of male and 37% of female adolescents reporting any type of violence from an employer. Emotional violence was the most common form of violence perpetrated by employers, but 8% of participants reported past-year physical violence from an employer. Peers were also common perpetrators of workplace violence; 17% of adolescents reported peer workplace violence, with emotional violence the most commonly perpetrated form.

Table 2 and Figure A (available as a supplement to the online version of this article at http://www.ajph.org) show how workplace violence differed across sectors. The prevalence of workplace violence among male adolescents ranged from 35% to 48% across sectors, with employer and peer violence lowest in the farming category. In the case of female adolescents, the prevalence of workplace violence ranged from 34% to 54% across sectors. Half of female domestic workers (accounting for a third of our sample) reported violence from their employer, and 18% reported violence from peers (i.e., young people associated with their employer's household).

Table 2 and Figure A show that past-year workplace sexual violence was reported by fewer male (range = 1%–6%) than female (range = 11%–18%) adolescents across all sectors. Confidence intervals overlapped across all sectors; however, among female adolescents, sexual violence was most commonly reported by those working in street or recreational and domestic work, and sexual violence from peers was more prevalent among both male and female adolescents in street or recreational work.

Work-Related Factors and Workplace Violence

Female domestic workers had more than double the odds of violence victimization than female adolescents who worked in retail or trade (Table 3). Among both male and female adolescents, time spent at work was the strongest predictor of violence, with those spending 9 to 12 hours at work (vs 4 hours or less) on an average day having the highest odds of violence. Those working in more than 1 job also had higher odds of experiencing workplace violence.

Characteristics Measured in Early Adolescence and Workplace Violence

Adolescents who had eaten 3 or more meals and those who had better mental health in early adolescence (wave 1; ages 11–14 years) were less likely to report past-year workplace violence at ages 17 to 19 years (wave 2; Table 4). Male adolescents who had been involved in paid work in early adolescence had higher odds of later workplace violence, whereas those who felt more connected to their family when they were younger were less likely to report workplace violence. Experiences of most types of childhood violence (wave 1; ages 11–14 years) were associated with increased odds of later workplace violence among male adolescents, including caregiver violence, multiple acts of physical or emotional violence from a teacher or school staff member, bullying, severe physical violence, and polyvictimization. In the case of female adolescents, being bullied in early adolescence and experiencing severe physical violence from any perpetrator were associated with later workplace violence.

Current Life Circumstances and Workplace Violence

Life circumstances measured in later adolescence (at wave 2, when data on workplace violence were measured) were also associated with workplace violence (Table 4). Adolescents who were working while in school or training had half the odds of workplace violence. Economic vulnerability, a higher frequency of residential moves, and having functional difficulties were associated with increased odds of workplace violence. Currently living with adult family members and having more peer support were associated with less workplace violence among young men. Male and female adolescents who were victims of workplace violence had highly elevated odds of concurrent poor mental health.

DISCUSSION

Our study confirms the widespread nature of workplace violence across work sectors. Overall, 2 in 5 working Ugandan adolescents reported past-year physical, sexual, or emotional workplace violence; 13% of female adolescents reported past-year sexual violence in the workplace, as compared with 4% of male adolescents. Employers were the most common perpetrators. Violence was common across all sectors, with female domestic workers at particularly high risk. Early adolescent economic hardship, violence, and poor mental health were associated with an increased risk of workplace violence in later adolescence. Work intensity and a higher frequency of moves were strongly associated with past-year workplace violence, and those with poorer mental health had much higher odds of reporting past-year violence.

Our findings extend those of other workplace violence studies conducted mainly in population subgroups and high-income countries.[20,21] Differences in definitions and measurements limit direct comparisons across studies.[3] However, other research has identified domestic workers as being at high risk of violence,[6] and qualitative research with adolescent domestic workers in Uganda has also revealed widespread workplace sexual harassment and

TABLE 2— Past-Year Workplace Violence Victimization Across Work Sectors, by Perpetrator and Sex: Uganda, 2018–2019

	Retail/Trade, No./Total No. (%; 95% CI)	Street/Recreational, No./Total No. (%; 95% CI)	Farming or Farming+, No./Total No. (%; 95% CI)	Workshop, No./Total No. (%; 95% CI)	Manual Work, No./Total No. (%; 95% CI)	Domestic Work, No./Total No. (%; 95% CI)
Male						
Violence in the workplace						
Any workplace violence, past year	42/98 (43; 33, 53)	52/111 (47; 36, 58)	108/311 (35; 29, 39)	43/89 (48; 39, 58)	109/261 (42; 35, 47)	
Sexual workplace violence, past year	1/98 (1; 0, 7)	6/111 (5; 2, 11)	9/311 (3; 2, 5)	5/89 (6; 2, 15)	15/261 (6; 3, 10)	
Violence from employers						
Any violence, past year	32/98 (33; 25, 42)	40/111 (36; 27, 47)	96/311 (31; 26, 36)	33/89 (37; 28, 48)	96/261 (37; 31, 43)	
Sexual violence, past year	1/98 (1; 0, 7)	4/111 (4; 1, 9)	6/311 (2; 1, 4)	3/89 (3; 1, 14)	14/261 (5; 3, 9)	
Violence from peers at the workplace						
Any violence, past year	21/98 (21; 15, 30)	30/111 (27; 19, 37)	38/311 (12; 8, 16)	27/89 (30; 23, 39)	42/261 (16; 11, 21)	
Sexual violence, past year	0/98 (0)	5/111 (5; 2, 10)	3/311 (1; 0, 4)	2/89 (2; 1, 9)	1/261 (0; 0, 3)	
Female						
Violence in the workplace						
Any workplace violence, past year	51/149 (34; 27, 43)	36/78 (46; 33, 58)	22/64 (34; 22, 45)			82/153 (54; 44, 60)
Sexual workplace violence, past year	16/149 (11; 6, 15)	14/78 (18; 10, 26)	8/64 (13; 6, 19)			25/153 (16; 11, 21)
Violence from employers						
Any violence, past year	42/149 (28; 21, 37)	30/78 (38; 26, 52)	20/64 (31; 21, 44)			76/153 (50; 42, 57)
Sexual violence, past year	10/149 (7; 3, 10)	7/78 (9; 3, 15)	8/64 (13; 6, 19)			21/153 (14; 9, 18)
Violence from peers at the workplace						
Any violence, past year	29/149 (19; 14, 26)	13/78 (17; 9, 24)	6/64 (9; 4, 16)			27/153 (18; 11, 24)
Sexual violence, past year	10/149 (7; 3, 11)	8/78 (10; 3, 17)	3/64 (5; 0, 9)			5/153 (3; 0, 5)

Note. CI = confidence interval. For female adolescents, farming, workshop, and manual work were combined and named "Farming+."

TABLE 3— Work-Related Factors Associated With Any Past-Year Workplace Violence Among Those in Paid Work Within the Past Year (Wave 2), by Sex: Uganda, 2018–2019

	Workplace Violence, Past-Year Male Victimization (n = 934)			Workplace Violence, Past-Year Female Victimization (n = 474)		
	No. (%)	Crude OR (95% CI)	AOR (95% CI)	No. (%)	Crude OR (95% CI)	AOR (95% CI)
Workplace violence	371 (40)			194 (41)		
Main workplace						
Retail/trade	98 (10)	1 (Ref)	1 (Ref)	149 (32)	1 (Ref)	1 (Ref)
Street/recreational	111 (12)	1.18 (0.68, 2.03)	1.11 (0.63, 1.93)	78 (17)	1.56 (0.89, 2.75)	1.59 (0.90, 2.83)
Farming	311 (33)	0.68 (0.43, 1.08)	0.72 (0.45, 1.16)	. . .	. . .	. . .
Workshop	89 (10)	1.25 (0.70, 22.22	1.29 (0.72, 2.31)	. . .	. . .	. . .
Manual work	261 (28)	0.93 (0.58, 1.48)	1.02 (0.63, 1.64)	. . .	. . .	. . .
Farming+	. . .	. . .	. . .	64 (14)	0.94 (0.50, 1.76)	1.03 (0.53, 1.97)
Domestic work	. . .	. . .	. . .	153 (32)	2.10 (1.32, 3.35)	2.07 (1.28, 3.35)
Other	64 (7)	0.70 (0.36, 1.34)	0.72 (0.37, 1.39)	28 (6)	0.65 (0.26, 1.63)	0.66 (0.26, 1.68)
Main employment						
Seasonal	139 (15)	1 (Ref)	1 (Ref)	34 (7)	1 (Ref)	1 (Ref)
Occasional/casual	249 (27)	1.25 (0.82, 1.93)	1.23 (0.80, 1.91)	56 (12)	0.76 (0.30, 1.94)	0.81 (0.31, 2.08)
Full time	340 (36)	1.54 (1.02, 2.31)	1.34 (0.88, 2.03)	328 (69)	1.77 (0.83, 3.78)	1.69 (0.78, 3.68)
Part time	102 (11)	1.14 (0.67, 1.93)	1.06 (0.62, 1.81)	34 (7)	1.28 (0.47, 3.52)	1.29 (0.46, 3.60)
Weekends	103 (11)	0.65 (0.37, 1.14)	0.71 (0.40,1.26)	19 (4)	0.56 (0.15, 2.12)	0.68 (0.18, 2.65)
Time spent on an average day at main work						
≤4 hours	163 (17)	1 (Ref)	1 (Ref)	73 (15)	1 (Ref)	1 (Ref)
5–8 hours	275 (29)	1.57 (1.01, 2.45)	1.51 (0.97, 2.36)	107 (23)	2.00 (1.00, 3.98)	1.84 (0.91, 3.73)
9–12 hours	372 (40)	3.62 (2.39, 5.49)	3.25 (2.12, 4.98)	215 (46)	3.60 (1.92, 6.72)	3.35 (1.76, 6.40)
>12 hours	123 (13)	2.18 (1.31, 3.63)	2.09 (1.24, 3.51)	76 (16)	2.50 (1.20, 5.20)	2.21 (1.04, 4.69)
Working more than 1 job	361 (39)	1.44 (1.10, 1.89)	1.45 (1.11, 1.91)	90 (19)	1.66 (1.04, 2.65)	1.63 (1.01, 2.63)

Note. AOR = adjusted odds ratio; CI = confidence interval; OR = odds ratio. All models were adjusted by age and meals and included original study arm as a covariate. Groups containing less than 5% were combined as follows: for female adolescents, farming, workshop, and manual work were combined and named "Farming+," and for male adolescents domestic work was combined with other. See Table B for a detailed breakdown.

violence.[22,23] Workplace violence is an expression of power asymmetries between employers and workers, exacerbated by deeply rooted social norms that devalue and stigmatize paid domestic work.[22,23] The often invisible, unprotected, and unregulated nature of this type of work perpetuates risks of violence.[24] In Uganda, placing adolescents with wealthier friends or relatives may increase the likelihood of forced labor,[22] which is associated with exploitation, abuse, and violence. This practice is common in Uganda because employers prefer to hire domestic workers whose families they know.[22]

Our study demonstrates the association between experiences in early adolescence and later experiences of workplace violence, highlighting the potential for compounding of disadvantage. Severe physical violence and bullying, in particular, increased adolescents' risk for later workplace violence.

Our results accentuate that primary prevention of all childhood violence is paramount to protect and achieve a healthy society.[25] Childhood violence is associated with a myriad of detrimental effects in terms of educational outcomes, confidence, self-worth, mental health, social bonding, and future experiences of violence.[25–27] These effects may be compounded if adolescents leave school because of school violence, which leads to early entry into informal work and increased vulnerability to workplace violence.[28] We found that those with poorer mental health in early adolescence were particularly likely to experience workplace violence in later adolescence. Also, as in other

TABLE 4— Associations of Characteristics Measured in Early Adolescence, Childhood Violence Exposures (Wave 1), and Current Life Circumstances (Wave 2) With Any Workplace Violence in the Past Year (Wave 2), by Sex: Uganda, 2014–2019

	Workplace Violence, Past-Year Male Victimization (n = 934)			Workplace Violence, Past-Year Female Victimization (n = 472)		
	No. (%) or Mean (SE)	Crude OR (95% CI)	AOR (95% CI)	No. (%) or Mean (SE)	Crude OR (95% CI)	AOR (95% CI)
Workplace violence	371 (40)			194 (41)		
Characteristics in early adolescence, wave 1						
Urban school[a]	377 (40)	1.12 (0.86, 1.47)	1.21 (0.92, 1.58)	154 (33)	0.80 (0.52, 1.24)	0.83 (0.53, 1.31)
Three or more meals[a]	444 (48)	0.67 (0.52, 0.87)	0.68 (0.52, 0.89)	164 (35)	0.53 (0.35, 0.80)	0.55 (0.36, 0.83)
Lived with biological parent	579 (62)	0.81 (0.62, 1.06)	0.87 (0.66, 1.14)	293 (62)	1.17 (0.79, 1.73)	1.27 (0.85, 1.89)
Paid work, ever	564 (60)	1.61 (1.22, 2.11)	1.44 (1.09, 1.91)	101 (21)	1.31 (0.84, 2.06)	1.32 (0.83, 2.08)
Any functional difficulty	191 (20)	1.25 (0.90, 1.72)	1.12 (0.81, 1.56)	118 (25)	1.40 (0.91, 2.15)	1.41 (0.91, 2.18)
Mental health score	0.44 (0.01)	2.31 (1.37, 3.88)	2.32 (1.37, 3.92)	0.46 (0.01)	2.29 (1.07, 4.90)	2.27 (1.05, 4.89)
Peer support score	3.44 (0.06)	0.97 (0.90, 1.05)	0.96 (0.89, 1.04)	3.40 (0.09)	1.10 (1.00, 1.22)	1.09 (0.98, 1.20)
School connectedness	9.72 (0.07)	0.98 (0.93, 1.03)	0.98 (0.93, 1.03)	9.95 (0.10)	1.01 (0.94, 1.09)	1.01 (0.94, 1.09)
Family connectedness	9.92 (0.07)	0.94 (0.88, 0.99)	0.93 (0.87, 0.99)	10.01 (0.10)	1.02 (0.93, 1.11)	1.03 (0.95, 1.13)
Childhood violence exposures, wave 1[b]						
Caregiver, lifetime	152 (16)	1.41 (0.99, 2.00)	1.38 (0.97, 1.98)	97 (21)	0.91 (0.57, 1.46)	0.86 (0.53, 1.40)
Sexual, lifetime	28 (3)	1.14 (0.53, 2.44)	1.02 (0.47, 2.21)	62 (13)	1.64 (0.95, 2.84)	1.39 (0.80, 2.44)
Multiple acts of physical/emotional violence from teacher/school staff member	193 (21)	1.47 (1.07, 2.03)	1.50 (1.08, 2.09)	72 (15)	1.12 (0.67, 1.90)	1.17 (0.68, 1.99)
Bullying	97 (10)	1.49 (0.98, 2.27)	1.60 (1.04, 2.46)	42 (9)	2.80 (1.43, 5.47)	2.64 (1.33, 5.22)
Severe physical, lifetime	302 (32)	1.47 (1.11, 1.94)	1.48 (1.11, 1.98)	159 (34)	1.63 (1.10, 2.41)	1.69 (1.13, 2.53)
Polyvictimization						
None (of the 3)	415 (44)	1 (Ref)	1 (Ref)	176 (37)	1 (Ref)	1 (Ref)
One	333 (36)	1.54 (1.14, 2.08)	1.68 (1.23, 2.28)	184 (39)	1.17 (0.76, 1.80)	1.11 (0.71, 1.74)
Two or 3	186 (20)	1.57 (1.10, 2.24)	1.68 (1.16, 2.43)	112 (24)	1.54 (0.94, 2.53)	1.48 (0.89, 2.47)
Current life circumstances, wave 2						
Lives with family members	571 (61)	0.58 (0.45, 0.76)	0.66 (0.50, 0.88)	232 (49)	0.84 (0.58, 1.23)	0.90 (0.61, 1.34)
In school or training	387 (41)	0.41 (0.31, 0.54)	0.46 (0.34, 0.63)	124 (26)	0.47 (0.30, 0.73)	0.54 (0.33, 0.89)
No household assets	109 (12)	1.78 (1.19, 2.66)	1.76 (1.17, 2.65)	69 (15)	1.79 (1.06, 3.02)	1.70 (1.00, 2.90)
Moves since 2014						
0	396 (42)	1 (Ref)	1 (Ref)	74 (16)	1 (Ref)	1 (Ref)
1	283 (30)	1.63 (1.19, 2.23)	1.46 (1.06, 2.02)	170 (36)	1.36 (0.76, 2.45)	1.23 (0.68, 2.25)
2	187 (20)	1.73 (1.21, 2.47)	1.50 (1.04, 2.16)	132 (28)	1.53 (0.83, 2.81)	1.38 (0.74, 2.57)
≥3	68 (7)	2.53 (1.50, 4.26)	2.53 (1.49, 4.31)	96 (20)	2.59 (1.36, 4.92)	2.30 (1.19, 4.45)
Any functional difficulty	223 (24)	1.65 (1.21, 2.25)	1.65 (1.21, 2.26)	164 (35)	2.04 (1.38, 3.01)	1.94 (1.31, 2.89)
Peer support score	3.85 (0.05)	0.84 (0.77, 0.91)	0.84 (0.77, 0.91)	3.54 (0.08)	0.90 (0.81, 1.01)	0.92 (0.82, 1.03)
Mental health score	0.42 (0.01)	21.96 (11.89, 40.56)	21.24 (11.36, 39.70)	0.53 (0.01)	13.35 (6.19, 28.80)	12.6 (5.75, 27.60)

Note. AOR = adjusted odds ratio; CI = confidence interval; OR = odds ratio. Models were adjusted by age and meals and included original study arm as a covariate.

[a]Adjusted by age only.
[b]Also adjusted by wave 1 functional difficulty.

studies,[29,30] we found that current poor mental health was strongly associated with recent workplace violence even when we adjusted for mental health in early adolescence.

According to the ILO, 3 in 5 young adolescents globally are able to find only informal jobs in which there are low wages, little stability, and no social protection[3,14] and reporting mechanisms and enforcement of rights are unlikely. Young people from disadvantaged backgrounds may have substantial economic pressure to stay in any job, regardless of its quality, safety, and likelihood of violence.[31] Engaging in work at a younger age, working long hours,[14] and being forced to move to find work can cause disruptions in social networks and stress,[31] and we found that these factors were associated with workplace violence.

Our study revealed some differences by sex, with experiences of violence in early adolescence more strongly and uniformly associated with workplace violence among male adolescents and family support protective for workplace violence among male but not female adolescents. Both violence and work are highly gendered, and further research is needed to explore these differences.

Implications

There is a clear need for interventions to address workplace violence against adolescents and to stop violence from figures of authority in public institutions and organizations. The ILO advocates for intensive occupational safety and health initiatives to reduce workplace violence with an emphasis on laws and regulations,[4] and in Uganda employers with more than 25 workers are required to adopt a written policy designed to combat sexual harassment.[4] However, the existence of this law and others intended to prevent violence in Uganda points to the gap between the availability of laws and their implementation.[15,16,32] Furthermore, organizational-level policies are unlikely to benefit young people employed in the informal sector.

The diverse range of workplaces, both formal and informal, are likely to need a variety of tailored approaches to violence prevention informed by an understanding of local practices and societal and gender norms pertaining to entry into work. Informal jobs are least likely to be covered by labor inspections, collective bargaining agreements, or legislation.[3] Rapid and sustainable change may hinge on engaging employers, adolescent workers, families, communities, and policy implementers in coproduction of interventions that can protect against violence in informal sectors. Initiatives in Uganda include collective bargaining agreements that challenge sexual harassment in the horticulture industry, support for women transport workers engaged in informal jobs on issues around violence and equality, and an initiative in which women working in Kampala markets are uniting against harassment.[3,33]

In the formal sector, in addition to strengthening policies, regulations, and reporting mechanisms, there is a need for institutional change interventions to improve work environments. These interventions might draw on successful cultural change initiatives in other types of institutions such as the Good School Toolkit, which is designed to change the operational culture of schools. Developed by a Ugandan nongovernmental organization, the toolkit has been shown to reduce physical violence committed by teachers against students by 42%.[19]

Schools and vocational skill training schools are important for reaching young people before and as they navigate into work spaces. The ILO has produced a toolkit to support institutions and organizations in raising young people's awareness of their rights at work.[34] However, adolescents' awareness alone is unlikely to prevent violence by employers or colleagues in work contexts characterized by deep power imbalances and lack of regulation and oversight.

Strengths and Limitations

To our knowledge, this is the first longitudinal study presenting data on the prevalence of workplace violence from different perpetrators across a wide range of work sectors and exploring relationships with earlier life circumstances. Our cohort was broadly representative of adolescents in the Luwero District and was not selected on the basis of any characteristics related to violence or work. However, there was some evidence of differential attrition by wave 2 (Table D, available as a supplement to the online version of this article at http://www.ajph.org). Our cohort members were exposed to a successful violence prevention intervention during their primary school years, which may have reduced their likelihood of experiencing subsequent workplace violence. The prevalence of workplace violence in our sample may therefore have been underestimated.

We used questions regarding specific acts of violence to document experiences of violence, in line with gold-standard methods,[35] and made every effort to support safe disclosures. However, as in all violence studies, it is likely that acts of violence were underreported as a result of the stigma and

fear attached to reporting some forms of violence. We captured sexual, physical, and emotional violence in childhood and later at work but did not capture other forms of indirect, structural, or political violence. It would be interesting in future research to explore not only single types of exposures to violence but overall patterns of violence exposure early in adolescence (and their associations with workplace violence) as well as in the workplace. We did not capture past-year workplace violence perpetrated by customers or suppliers who were not peers.[21] Number of meals eaten (captured at wave 1) might not be a perfect proxy for socioeconomic status, but this is challenging to measure in children who are not aware of household markers such as assets.

We treated male and female adolescents separately because of the gendered nature of both work and violence; however, our sample of female adolescents was limited in size (n = 475), and thus our study may have been underpowered with respect to detecting associations with workplace violence. We collected data on current life factors at the same time as data on workplace violence; therefore, associations may have been bidirectional, and life factors can potentially be interpreted as both a cause and a consequence of workplace violence. Finally, it may not be possible to extrapolate our findings to other populations and settings.

Conclusions

Workplace violence against adolescents is common across a range of sectors, and early adolescent economic disadvantage, violence, and poor mental health are associated with increased risk. Interventions to prevent and address such violence are urgently required. AJPH

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This study was approved by the ethics committees of the London School of Hygiene and Tropical Medicine, the University of London, the Uganda Virus Research Institute, and the Uganda National Council of Science and Technology. All participants provided informed consent/assent to take part.

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Abortion Criminalization: A Public Health Crisis Rooted in White Supremacy

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See also Hing et al., p. 1529.

The Supreme Court decision to overturn *Roe v. Wade* and the growing onslaught of state laws that criminalize abortion are part of a long history of maintaining White supremacy through reproductive control of Black and socially marginalized lives.

As public health continues to recognize structural racism as a public health crisis and advances its measurement, it is imperative to explicate the connection between abortion criminalization and White supremacy.

In this essay, we highlight how antiabortion policies uphold White supremacy and offer concrete strategies for addressing abortion criminalization in structural racism measures and public health research and practice. (*Am J Public Health*. 2022;112(11):1662–1667. https://doi.org/10.2105/AJPH.2022.307014)

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> "One of the key problems addressed by Reproductive Justice is the isolation of abortion from other social justice issues that concern communities of color: issues of economic justice, the environment, immigrants' rights, disability rights, discrimination based on race and sexual orientation, and a host of other community-centered concerns."
>
> —*Loretta Ross, "What is Reproductive Justice"*[1]

Across the country, public health agencies and academic institutions are following the lead of health equity scholars and the charge from the Centers for Disease Control and Prevention to recognize and confront racism as a core driver of health inequities. As the public health field continues to work toward addressing structural racism as a public health crisis and as we enter a post-*Roe* era, conceptualizing and connecting antiabortion policies as structurally racist and rooted in White supremacy is fundamental to advancing health equity.

Abortion criminalization aligns with the undercurrents of structural racism through both whom it disproportionately impacts and how power is wielded to erase, suppress, and threaten the livelihoods of racially minoritized communities. There were a record-breaking 108 state laws enacted in 2021 that criminalized abortion, including gestational age bans, restrictions on medication abortion, trigger bans that automatically banned abortion when *Roe* was overturned, and "Texas-style" bans that rely on bounty-hunter enforcement mechanisms.[2] This follows decades of laws such as the Hyde Amendment that prohibit federal funds from covering abortion services and undermine abortion rights and access for pregnant people in federally funded programs, including 7.8 million people on Medicaid, half of whom are people of color.[3]

This has made the legal precedent of *Roe* a minimal baseline that has failed to protect abortion access for all. For all public health professionals and all people concerned with the ties between social injustices and health, it is crucial to consider how these policies of reproductive control uphold White supremacy both historically and contemporarily.

Abortion criminalization is an overlooked dimension of state control in existing measures of structural racism. Structural racism refers to the "state-sanctioned and/or extralegal production and exploitation of group-differentiated vulnerability to premature death"[4(p28)] that works through "mutually reinforcing inequitable systems."[5(p1454)] Structural racism is sustained through White supremacy, which is the system of

conditions and ideologies that underscore the hegemony of whiteness and White political, social, cultural, and economic power.[6]

In this essay, we provide a historical overview of how the origins of antiabortion policies are rooted in White supremacy and outline the current disastrous public health effects of abortion criminalization. A guiding framework for understanding abortion criminalization as rooted in White supremacy is reproductive justice, which was coined by Black women in 1994 as the right to maintain personal bodily autonomy, have children, not have children, and parent children in safe and sustainable communities.[7] Following the lead of Black feminists and reproductive justice scholars,[7,8] we propose an intersectional[9–11] approach to measures of structural racism in the public health literature that makes the critical connections between abortion criminalization and the other interrelated dimensions of structural racism that maintain White supremacy.

HISTORY OF WHITE SUPREMACY AND REPRODUCTIVE CONTROL

The policing of bodies of pregnant-capable people racialized as Black is central to the historical perpetuation of White supremacy, starting with the forced reproduction of women who were enslaved. After 1808, when slaveholders could no longer rely on the international slave trade, the expansion and sustaining of slavery depended on the reproduction of those already enslaved.[12] This gave enslavers an economic incentive to control and govern Black women's reproduction because the law made the enslaved women's children the property of the enslaver.[13] As Dorothy Roberts explains, "it marked Black women from the beginning as objects whose decisions about reproduction should be subject to social regulation rather than to their own will."[13(p23)]

Indeed, some of the first laws in the United States involved control over enslaved women's reproduction, and the country's legal system was built off this racial and gender subjugation.[13] Critically, women who were enslaved were not passive victims of this reproductive control and practiced resistance using methods of birth control and abortion to resist the oppressive conditions of slavery that, if discovered, were punished by slaveholders.[14]

Whereas this controlled reproduction laid the foundation of the US legal system, medical experimentation on and violence against women who were enslaved were the foundation of the medical field, particularly obstetrics and gynecology. The career of J. Marion Sims, recognized as the "father of American gynecology," was entirely built on the grotesque obstetric and gynecological experimentation on enslaved women, specifically Anarcha, Betsey, and Lucy.[15] Years later, the medical and public health fields contributed to the state-sanctioned strategy of eugenics and forced sterilization to maintain White supremacy through reproductive control.

The 20th-century eugenics movement supported forced birth for "socially desirable" women through racist, classist, and ableist standards while simultaneously implementing a widespread campaign of involuntary sterilization among Black, poor, immigrant, and incarcerated women.[13] This abuse continued with the involuntary sterilization of between 25% and 50% of Indigenous women in the 1970s by the federal government via the Indian Health Service.[16] The impact of the scale of this government-sponsored reproductive coercion cannot be understated. It is estimated that in 1972 alone the federal government funded 100 000 to 200 000 sterilizations, which is an annual number equivalent to the estimated total number of all sterilizations carried out during Hitler's reign in Nazi Germany under the Nazi Hereditary Health Law.[17]

To this day, as evident with recent laws and policies, White supremacy continues to operate through reproductive control of certain lives. One example is family cap policies that deny additional assistance to families who have another child while receiving Temporary Assistance for Needy Families benefits. These policies are rooted in racist narratives that mothers have more children to qualify for more public assistance.[13] Since their introduction in the 1970s, these family cap policies that discourage childbearing have received bipartisan support, disproportionately affect Black families, and wield societal "ideals" of family size unto Black communities.[13]

A second example is the increasing number of state laws that aim to prosecute people for drug use during pregnancy, which serves as another mechanism of reproductive control.[18] Black women are more likely to be screened for drug use during pregnancy, reported to child welfare authorities, lose custody of children, and face criminal prosecutions than women in other racialized groups.[18]

A final example of how White supremacy is wielded through policies of reproductive control is seen in our immigration system, with the high rates of hysterectomies performed on individuals detained by Immigrations and Customs Enforcement, abortion bans for unaccompanied minors in

detention, mistreatment of pregnant immigrants in detention, and forced separation of families at the border.[19,20] These anti-immigrant policies utilize reproductive coercion to control the reproductive agency of immigrants and punish migrants with the goals to deter future immigration and maintain White demographic and political power.[19,20]

ANTIABORTION LEGISLATION

The original laws that criminalized abortion intended to ensure that the United States remained a White nation.[12] The first antiabortion laws enacted in the 19th century made abortion illegal and criminalized midwives, who were primarily Black and Indigenous and provided the majority of reproductive health care including abortion.[21] The campaign was led by physicians to consolidate power and medical legitimacy among White, male doctors and to ensure demographic stability and dominance of White Anglo-Saxons.[21–23]

Whereas these laws are historically grounded in maintaining White political power through childbearing of White offspring,[23] the current onslaught of antiabortion legislation is also part of a long history of criminalizing bodily autonomy, especially for Black, Indigenous, migrant, disabled, working-class, and trans people who experience the harshest effects of antiabortion laws.[24] Recent laws such as SB8 in Texas, which deputizes civilians to police each other's reproductive decisions, harken back to the Fugitive Slave Act, which deputized citizens to aid in the capture of enslaved people who were seeking freedom.[25] Laws such as SB8 increase the surveillance and carceral power of the state, adding to the existing harms of surveillance and policing that already disproportionately criminalize, punish, and disrupt access to multiple social determinants that affect the health of undocumented, Black, Indigenous, and low-income communities.[24,26,27]

PUBLIC HEALTH EFFECTS

There have already been upwards of 1200 people arrested, disproportionately Black, Latinx, Indigenous, and working-class individuals, because of their pregnancy outcomes (e.g., stillbirth, miscarriage, abortion) since 1973, the year *Roe* was decided.[28,29] A recent harrowing example of this increasing criminalization was the arrest of a Latina woman in Texas who was charged with murder after seeking care at a hospital whose staff reported her to the police for allegedly self-managing an abortion.[30]

This expansion of the carceral state further into our health care systems is detrimental to public health. The adverse population health effects of policing and incarceration, both within and outside the health care system, are well documented.[31,32] Beyond the impact on individuals and families who are criminalized for seeking pregnancy care, these laws have collateral effects that can contribute to larger patterns of racism-related daily stressors among Black and other minoritized women that have serious health consequences.[33,34] Medical and public health professionals cannot be complicit in this expansion of the carceral state but, rather, should mobilize around abortion criminalization as a public health crisis that is grounded in White supremacy and has deleterious effects on population health inequities.

As argued by birth equity scholars in an amicus brief for the *Dobbs v. Jackson Women's Health Organization* case that overturned *Roe*, abortion criminalization directly contributes to the profound disparities in maternal health in the United States.[35] Evidence suggests that abortion restrictions contribute to rising US maternal mortality.[36–38] Overturning *Roe* is estimated to lead to a 21% increase in the number of pregnancy-related deaths overall and a 33% increase among Black pregnant people because there are higher risks in pregnancy relative to abortion.[39]

Abortion bans not only restrict access to essential health care but can also have destructive implications across the life course and wide-reaching effects on families and communities as a result of the negative economic and health consequences of being denied an abortion.[40,41] People denied a wanted abortion have experienced increases in household poverty, debt, and evictions and elevated levels of anxiety and stress, and their existing children have shown worse child development than children of people receiving a wanted abortion.[41–43]

Alongside increasing economic inequality and the rising costs of housing, food, and health care, abortion restrictions continue to suppress the socioeconomic power of families and communities to make decisions that are aligned with their wishes and abilities to reproduce in safe, supportive environments. It is critical to consider laws restricting or criminalizing abortion as part of the larger web of structural racism that leads to population health inequities, particularly when considering reproductive, maternal, infant, and child health outcomes.

ABORTION CRIMINALIZATION AND STRUCTURAL RACISM

Recent studies have advanced our epidemiological approaches toward examining multiple interconnecting political, economic, and social forces that maintain White supremacy and perpetuate population health inequities.[44–52] These distinct analytic approaches (e.g., indices, latent constructs) generally include similar dimensions indicative of social determinants of health (e.g., racialized inequities in education, employment, homeownership, and political participation) that reflect the structural limitations of bodily autonomy dictating where minoritized people can live, work, vote, learn, and raise families in safe and healthy environments.

Most of the common structural racism measures capture area-based inequities, but it is also important to consider the laws and policies that either explicitly or implicitly contribute to population health inequities.[49,52,53] Although separate measures of racial and gender oppression have been introduced,[49] it is critical to include antiabortion laws as a dimension of the underlying forces of structural racism given the disproportionate individual and population-level health effects of abortion restrictions as well as the racist justifications and implications of these restrictions. Recognizing abortion criminalization as a key component of the system that perpetuates structural racism allows for a more complete interrogation of the institutional connections that maintain White supremacy.[44]

States have been conceptualized as racializing institutional actors that play critical roles as legal and administrative entities to shape population health.[49,50,54] According to the Guttmacher Institute, 26 states either had laws in place to ban abortion or were likely to ban abortion once *Roe v. Wade* was overturned on June 24, 2022.[55] Using the most recently available data from all sources (Table A, available as a supplement to the online version of this article at http://www.ajph.org), we mapped common measures of structural racism (e.g., index of concentration at the extremes, education and employment inequity) and racist policies to show the glaring overlap between structural racism measures and abortion hostility at the state level. States that are hostile to abortion also pass policies that gut welfare and the social safety net, restrict voting access, and involve high levels of racialized inequities (Figure A, available as a supplement to the online version of this article at http://www.ajph.org).

Most measures of structural racism focus on political and socioeconomic patterns of exclusion and suppression embedded in American institutions; however, missing from these measures are the reinforcing ways in which bodily and reproductive autonomy is structurally limited. Abortion criminalization is central to the intersecting oppressive systems that undergird the US racial hierarchy.

PUBLIC HEALTH MOBILIZATION

Abortion criminalization has and will continue to have devastating public health implications. The public health field must heed the calls of reproductive justice advocates and scholars to examine and address structural determinants of reproductive health in our research, advocacy, and clinical care.[56] The public health critical race praxis offers multiple approaches for doing so.[57] Namely, we must first acknowledge our field's historic and contemporary complicity and perpetuation of racist policies of reproductive control, coercion, and harm. Beyond this acknowledgment and repair, there are several actions public health professionals can take to, at a baseline level, interrogate and disrupt the White supremacy embedded in abortion criminalization and, most necessarily, mobilize with communities to advance reproductive health equity and justice.

Measurement

Conceptualizing abortion criminalization laws as a measure of structural racism meets recent calls to capture the intersectionality, historical, and geographic contexts to improve the measurement of structural racism.[50] In addition to a stand-alone measure, abortion criminalization laws could be included in multidimensional measures of structural racism to more fully capture the multifaceted, intersecting webs of structural racism and its impact on population health. Particularly when studying reproductive health inequities, it is important to understand the potential compounding effects of racial, gender, and class oppression to develop multifaceted interventions for structural change.[58] In accord with the public health critical race praxis, the individuals and communities directly affected by this structural violence must be centered and lead the knowledge production of how White supremacy is enacted through abortion criminalization.[57]

Data

The lack of funding (e.g., from the National Institutes of Health and the Centers for Disease Control and Prevention) for abortion-related research

and large gaps in abortion surveillance data in the United States further uphold the process of science that reinforces White supremacy and limits advances in structural approaches to achieving equitable access to abortion. Following previous calls, we need timely public health indicators for abortion access and a public health abortion surveillance system that respects the confidentiality of abortion clients and providers.[59] Together, data and measurement will allow the public health field to develop antiracist methodologies and strategies to disrupt these structural limitations to bodily autonomy. In addition, and central to the public health critical race praxis, it is critical that we share these data and findings with community advocates.

Action

Most important, public health professionals should leverage their political capital and public health training to support local and state efforts to protect and fund abortion access while uplifting reproductive justice activists and abortion funds who have been fighting these gendered racist policies and supporting people to live self-determined lives for decades. Resistance to these structural barriers has always been cultivated in Black, Indigenous, trans, immigrant, and other marginalized communities. We must work in solidarity with communities in building power to disrupt these oppressive systems and attacks on reproductive freedom to advance our field's equity-oriented goals. AJPH

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Nonfatal Violence Involving Days Away From Work Following California's 2017 Workplace Violence Prevention in Health Care Safety Standard

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Objectives. To examine the impact of the California Occupational Safety and Health Administration's (Cal/OSHA's) 2017 workplace violence (WPV) prevention in health care safety standard on nonfatal violent injuries among health care workers (HCWs).

Methods. We accessed estimated counts of WPV from the survey of occupational injuries and illness from 2011 to 2019 specific to HCWs. We used the Current Population Survey estimates of HCWs to create rates per 10 000. We conducted a longitudinal panel analysis and a comparative interrupted time-series analysis to examine the change in incidence and in rates associated with California's new standard.

Results. Adoption of the 2017 safety standard led to an additional 3.48 reported WPV injuries per 10 000 HCWs in California, or an additional 473 injuries. Sensitivity analyses suggest other injuries did not change in the same period.

Conclusions. It appears that the Cal/OSHA standard increased reporting of WPV injuries among HCWs in the first year of its adoption compared with the United States. Mandating reporting of all WPV incidents in the health care setting may be a means to ensure a more complete understanding of this public health problem. (*Am J Public Health*. 2022;112(11):1668–1675. https://doi.org/10.2105/AJPH.2022.307029)

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Workplace violence (WPV) among health care workers (HCWs) is a pervasive public health problem. Since 2011, the incidence rate per 100 000 population of nonfatal WPV against HCWs has increased 62.5%.[1] HCWs are 5 times more likely to be a victim of WPV than are workers overall[1,2] and accounted for 73% of all nonfatal injuries and illness owing to violence in 2018.[1] Notably, only around 20% of WPV involves a physical assault.[3]

Unfortunately, these estimates represent a largely underreported problem. Previous research suggests that WPV is formally reported between 7% and 42% of the time.[2–8] How HCWs perceive the violence they suffer (intentional vs unintentional or related to an illness) is a major factor in whether physical WPV is reported.[4,9–11] Organizational factors, including the hierarchical nature of the perpetrator–victim relationship, are a major factor in whether verbal WPV incidents are reported.[4,12,13]

Preventing WPV in health care has been the subject of much study.[14,15] Interventions to prevent WPV exist at the individual, organizational, and regulatory levels. Individual interventions focus primarily on behavioral modification through knowledge attainment, attitudes, and propensity to report a WPV incident, typically using Web-based or classroom-based programs.[14] Although individual interventions have been shown to increase knowledge, there is mixed evidence to support their long-term effectiveness. Organizational interventions focus on the workplace safety culture of management or

the physical design of the workplace.[15–19] Similar to individual-level interventions, organizational-level interventions have limited results, with potential reductions related to improving workplace safety culture.

Currently, 9 states (CA, CT, IL, ME, MD, NJ, NY, OR, and WA) have laws requiring health care organizations to have WPV prevention programs.[20,21] California was the first state to pass legislation to this effect, when in 1993 it passed the California Hospital Safety and Security Act.[22] New Jersey is the latest state to pass legislation: the 2011 New Jersey Violence Prevention in Health Care Facilities Act.[20] These laws largely contain similar components and require health care facilities to create and implement WPV prevention programs, which include training plans, reporting systems, and, in some cases, WPV risk assessment plans. Investigations into the impact of these state policies are limited and largely consider implementation or opinion rather than impact.[20,22,23] One evaluation found that the California law did reduce assaults in for-profit and smaller hospitals, but there were no observed reductions in assaults at nonprofit hospitals.[24]

In 2017, California's Occupational Safety and Health Administration (Cal/OSHA) adopted the first workplace safety standard related to WPV in the United States (Workplace Violence Prevention in Health Care, California Code of Regulations, Title 8, Section 3342). The standard was a result of 2 HCW unions filing petitions with California's Occupational Safety and Health Standard Board to request a new standard to provide HCWs with specific protections against WPV.[25] This was the first such standard enforceable by a state or federal OSHA.

The standard mandated that hospitals develop a comprehensive violence prevention plan with training for workers. Baseline training requirements mandated by the standard included a 1-time initial training on an employer's WPV prevention plan for all employees and an annual refresher training for employees who perform patient contact activities. However, the regulation did not mandate a specific class or training module, nor did it require a specific length of training time. Importantly, the standard required acute care and psychiatric hospitals to report violent events within 72 hours of occurrence to Cal/OSHA through a Web-based platform.

To our knowledge, no evaluation of California's safety standard has been conducted to date. Odes et al. analyzed the WPV reports submitted to Cal/OSHA from July 2017 to September 2018 to understand characteristics of WPV in California's various types of health care organizations.[26] During the study period, behavioral health units had 1.82 times greater odds of a physical injury stemming from a WPV incident than did inpatient medical care units. Investor-owned, or privately owned, facilities had nearly 2.5 times greater odds of having a WPV incident resulting in a physical injury than did public facilities. However, Odes et al. did not evaluate the impact of Cal/OSHA's safety standard. Odes et al. chose to look at WPV incidents during the first year under the new reporting rules presumably because they expected the new regulation to produce more complete records of WPV incidents. That was an assumption on their part that has not yet been tested.

We tested this assumption. Given that Cal/OSHA's new safety standard may present a new method for preventing WPV among HCWs, it is imperative to understand its impact on reported WPV. Therefore, we estimated the impact of Cal/OSHA's safety standard on violent intentional injuries among HCWs. We hypothesized that the number of reported violent and intentional injuries involving days away from work would increase in the post–safety standard adoption period corresponding with the increased emphasis the safety standard places on reporting.

METHODS

We used 2 quasiexperimental designs to estimate the impact of adopting the Cal/OSHA safety standard on violent nonfatal injuries involving days away from work among HCWs from 2011 to 2019. We used a longitudinal panel regression with 2-way fixed effects (TWFE) to estimate the incidence rate ratios (IRRs) comparing California to other states. We used a multiple-group, comparative interruptive time-series analysis (CITS) to estimate the difference in injury rates per 10 000 HCWs associated with regulation adoption.

Variables and Data Sources

We defined WPV as violent, intentional, nonfatal injuries involving days away from work as our primary outcome. We ascertained counts of WPV injuries from the Bureau of Land Statistics (BLS) Survey of Occupational Injuries and Illnesses (SOII). We accessed the publicly available data and specified injuries from intentional violence by other person (event code = 111* in the Occupational Injury and Illness Classification System [OIICS; https://bit.ly/3AMkcxU]). We specified data for the standard occupational classification group health care practitioners and technical occupations (code = 29–0000). We aggregated injuries to the state level and indexed them by year from 2011 to

2019, with 2011 being the first year of data availability. Additionally, we obtained counts of slip, trip, and fall injuries (OIICS code = 4*) involving days away from work and non-WPV injuries (OIICS code = 2*, 3*, 4*, 5*, 6*, 7*, 12*, 13*) involving days away from work among HCWs from BLS. We included these other placebo outcomes for comparison, as the WPV standard should not have influenced reporting of non-WPV incidents. We obtained population counts of HCWs for state and year from the Current Population Survey's Annual Social and Economic Supplement to calculate rates per 10 000 population.[27]

Throughout the study period, 41 states and the District of Columbia provided data to SOII or had data that meet publishability criteria set by BLS. Several states did not provide data and so were excluded from the analysis (CO, FL, ID, MS, NH, ND, RI, SD, WY). Cal/OSHA's safety regulation went into effect July 1, 2017.[28] Thus, we operationalized the presence of the regulation dichotomously, with "0" representing the absence of the law and "1" representing the presence of the law. When the law changed, the law variable changed from "0" to "1" in California in the first full year the law was in effect (i.e., 2018).

Because interventions to address WPV exist at the individual, organizational, and regulatory levels, the social ecological model aided our selection of covariates and modeling decisions.[29] Previous evidence examining factors that lead to increased odds or risk of violence suggest at the individual level that having at least a high school education and having private health insurance is protective against general violence.[30] At the organizational or community level, evidence suggests that living in a metropolitan statistical area and the rate of unemployment have harmful relationships with WPV.[31] Being part of a union has been shown to have a protective relationship with WPV.[32]

We ascertained the unemployment rate from the BLS. We acquired all other covariates from the Current Population Survey. Data were available from 2011 to 2019. To control for the regulatory environment, we dropped states with laws similar to the Cal/OSHA WPV safety standard.

Analysis

We provided yearly rates of WPV injuries among HCWs for reporting states and descriptive statistics looking at the average number of injuries and average rate of injuries before and after the Cal/OSHA safety regulation for California and the United States. We conducted 2 separate quasiexperimental analyses. First, we conducted a pooled, cross-sectional time-series analysis with TWFE examining the impact of Cal/OSHA's safety regulation on incidence using a Poisson distribution. We specified robust SEs to protect against heterogeneity. We used a population offset of the number of HCWs to produce IRRs.

We also conducted a multiple-group CITS analysis examining the impact of Cal/OSHA's safety regulation on injury rates per 10 000 HCWs. We compared the difference in predicted pre–post linear trends for California to an average of all other included states to examine the difference-in-difference (DiD) in level and trend change. We compared predicted preadoption trends for California and the United States as a test of model assumptions. We conducted the CITS using the Stata (StataCorp LP, College Station, TX) command itsa specifying Newey–West SEs with a lag of 0.[33] For both the TWFE and the CITS analyses, we included all covariates previously listed.

We conducted several sensitivity analyses. First, we tested our model specification by using falls, slips, and trips, as well as non-WPV injuries among HCWs as outcomes and conducted both TWFE and CITS analyses. Additionally, we tested whether including states with potentially similar legislation affected our TWFE and CITS analyses. We also conducted TWFE and CITS analyses including outcome data from 2020, as the COVID-19 pandemic likely affected how HCWs and patients and families interact.[7,34]

RESULTS

Rates of WPV injuries among HCWs fluctuated from 2011 to 2019, with the number of reporting states increasing over time (Table A, available as a supplement to the online version of this article at http://www.ajph.org). In 2011, 31 states reported WPV injuries, with a yearly average of 4.65 per 10 000 HCWs; 2020 saw 39 reporting states and a yearly average of 5.91 per 10 000 HCWs, indicating an increase in the reported number of injuries over time. California's WPV trended downward in the post–standard adoption period, with rates of 8.08 in 2018 and 7.86 in 2019 per 10 000 HCWs (Table A).

Table 1 provides a descriptive analysis of injuries among HCWs comparing California to the United States. Before regulation adoption, California had a lower average rate of WPV injury per 10 000 HCWs (3.47) compared with the United States overall (3.98). From 2018 to 2019, the average number of WPV injuries increased 134.4%, and the average rate of injuries increased 129.7%. The United States saw much smaller increases in the same period; the average number of WPV injuries

TABLE 1— Descriptive Analysis of Reported Workplace Violence (WPV) Among Health Care Workers, Comparison of California to United States: 2011–2020

	Average No. of Injuries per Year			Average Rate of Injury per 10 000 workers		
	2011–2017	2018–2019	% Change	2011–2017	2018–2019	% Change
WPV injuries[a]						
California	454.28	1065	+134.44	3.47	7.97	+129.68
US[b]	73.62	80.66	+9.56	3.98	4.16	+4.52
Falls, slips, and trips injuries[c]						
California	1450	1710	+17.93	10.83	12.80	+18.19
US[b]	250.71	248.59	−0.85	12.45	12.41	−0.32
Non-WPV injuries[d]						
California	6972.86	7310	+4.84	52.31	54.72	+4.61
US[b]	826.41	788.18	−4.63	40.96	38.86	–5.13

Note. OIICS = Occupational Injury and Illness Classification System (https://bit.ly/3AMkcxU). We calculated rates by dividing injury counts by the estimated number of health care workers per state and year. The WPV standard was issued in California and implemented on July 1, 2017. The following states did not report data to the Survey of Occupational Injuries and Illnesses during the study period: CO, FL, ID, NH, ND, RI, SD, and WY.

[a]We defined WPV as intentional and violent nonfatal injuries involving days away from work (OIICS code = 11*).
[b]The mean US values were constructed with 33 states and Washington, DC.
[c]Slips, trips, and falls had OIICS code = 4*. We included data for fall-related injuries as a means of comparison.
[d]Non-WPV injuries had OIICS code = 2*, 3*, 4*, 5*, 6*, 7*, 12*, 13*.

increased 9.6%, and the average rate of WPV injuries increased 4.5% (Table 1). Rates of other placebo outcomes did not display a large change in the average number or rate of injury.

Primary Analyses

Results from the TWFE models indicate that California, compared with all other states, had an expected rate that was 1.94 times greater for WPV incidents ($P < .001$; 95% confidence interval [CI] = 1.42, 2.65), controlling for state percentage population who had a high school education, lived in a metropolitan statistical area, were part of union, and had private health insurance as well as the unemployment rate. No other covariates displayed significant associations with our outcome. Non–WPV-related outcomes did not display significant associations (falls, slips and trips injuries: IRR = 1.19 [95% CI = 0.97, 1.47]; all non-WPV injuries: IRR = 1.06 [95% CI = 0.95, 1.19]).

Results from the multiple-group CITS analysis suggests that adoption of the WPV safety standard led to an additional 3.48 reported injuries per 10 000 HCWs (95% CI = 0.95, 6.00; Table 2) in the first year of the regulation (Figure 1) above what would have been expected had the safety standard not been adopted. This number translates to approximately 473 additional reported WPV injuries in the first full year that the safety standard was in place (data not shown). Importantly, tests of preadoption slope differences indicate that California's linear trend was not different from the average of the other comparison states (parameter estimate = 0.17; 95% CI = −0.38, 0.72). Furthermore, non–WPV-related outcomes did not display significant changes in rate or slope related to the Cal/OSHA safety standard adoption. Notably, visual inspection of Figure 1 and Table 2 suggest that California and the comparison states had similar slopes in 2018 and 2019 (parameter estimate = 0.02; 95% CI = −1.04, 1.08). Trend lines presented in Figure 1 present results from a univariate model to ease readability.

Sensitivity Analyses

Sensitivity analyses suggest that the inclusion of states with laws similar to the Cal/OSHA safety standard does not affect the found associations. Tables B and C (available as a supplement to the online version of this article at http://www.ajph.org) provide results from the TWFE and CITS analyses on WPV injuries and the 2 non-WPV outcomes. Notably, WPV injuries maintained a similar level of significance and directionality in the sensitivity models compared to the primary model. Figures A, B, and C (available as a supplement to the online version of this article at http://www.ajph.org) represent the CITS models from these sensitivity analyses.

Data from 2020 may influence the results seen in the first 2 years of implementation. With 2020 data, the

TABLE 2— Impact of California's Safety Standard on Workplace Violence Using Multiple-Group Comparative Time-Series Analysis: 2011–2019

	Workplace Violence Standard, b (95% CI)
WVI rate	
Test of equal preimplementation slopes	0.17 (−0.38, 0.72)
DiD for initial level change, 1st year of implementation	3.48 (0.95, 6.00)
DiD for trend, after implementation	0.02 (−1.04, 1.08)
Falls, slips, and trips injury rate	
Test of equal preimplementation slopes	1.04 (0.25, 1.82)
DiD for initial level change, 1st year of implementation	−1.03 (−5.25, 3.19)
DiD for trend, after implementation	−1.79 (−4.86, 1.27)
All non-WVI rate	
Test of equal preimplementation slopes	2.07 (−0.71, 4.85)
DiD for initial level change, 1st year of implementation	−1.47 (−17.03, 14.08)
DiD for trend, after implementation	−0.97 (−8.53, 6.61)

Note. CI = confidence interval; DiD = difference-in-difference; WVI = workplace violence injury. Comparative time-series with multiple groups. The table includes 3 separate models: counts of injuries related to workplace violence; counts of injuries related to falls, slips, and trips; and all nonworkplace violence injuries per 10 000 health care workers. Each model included unemployment rate and percentage population living in a metropolitan statistical area, with a high school education, working as part of a union, and with private health insurance. In each model, workplace violence standard was coded "1" for 2018–2019 in California and "0" for all other state–year indexes. We used the number of health care workers as population to create injuries per 10 000 workers. Model used Newey–West SEs with a lag of "0."

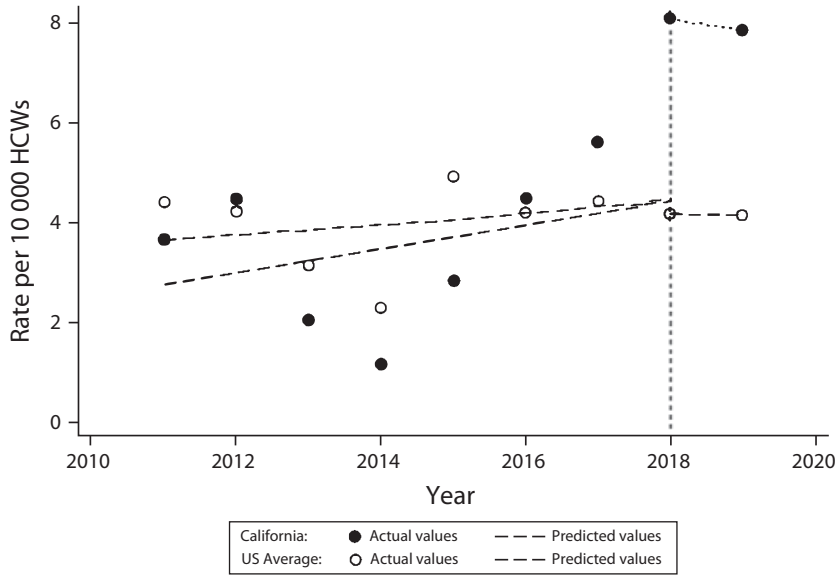

FIGURE 1— Impact of California's Safety Standard on Workplace Violence per 10 000 Health Care Worker (HCWs): California vs Control States: 2011–2019

incidence of expected WPV injuries was 1.66 times greater in California than in all other states ($P < .016$; 95% CI = 1.10, 2.50; Table D available as a supplement to the online version of this article at http://www.ajph.org). Although the DiD comparing initial level change associated with the safety standard's adoption was similar to the primary CITS analysis (3.48 vs 3.96 per 10 000 HCW), the DiD comparing slope change (coefficient = −1.70) was significantly larger than the primary model and displayed a significant decrease (95% CI = −2.59, −0.80; Table E; Figure D, available as a supplement to the online version of this article at http://www.ajph.org). This indicates that the inclusion of 2020 data likely caused California's WPV injury rate to decrease significantly. Trend lines including 2020 data for 2 non-WPV outcomes are available in Figures E and F (available as a supplement to the online version of this article at http://www.ajph.org).

DISCUSSION

California reported an additional 473 WPV injuries above expectation in the first year after the Cal/OSHA WPV prevention standard was adopted, controlling for covariates. Moreover, we found that in the year after adoption, the WPV injury rate remained significantly higher than the US average. To our knowledge, this is the first attempt to quantify the longitudinal impact of the Cal/OSHA safety standard on WPV.

The reported number of WPV injuries increased after Cal/OSHA safety standard adoption. This finding was likely driven by the standard's emphasis on reporting. For this study, we defined WPV as violent and intentional nonfatal injuries involving days away from work as our primary outcome. Thus, our

results likely reflect WPV incidents involving a moderate to severe physical injury. As injuries of that severity are likely to have been recorded even before the standard, it was important to test whether the additional WPV incidents observed after the standard's onset reflected an increase in the total number of reported incidents or incidents that previously would have been coded as other types of injuries that were correctly coded as WPV incidents after the standard. In the latter case, we should see a reduction in the expected number of non-WPV incidents after implementation of the standard. We found that non-WPV injuries did not show a decrease across both statistical techniques. This suggests that the increase in WPV injuries involving days away from work after standard implementation is likely attributable to more WPV incidents being reported.

The safety standard's emphasis on training and reporting possibly changed how organizations and employees view WPV and may have led to improved WPV reporting. In addition to the WPV training required by the standard, health care organizations may have adopted procedures that promote WPV reporting because of the standard. Employees may have internalized the safety standard and its required yearly training as an organization's newfound commitment to reducing WPV. These potential outcomes may have also happened in tandem: organizational-level changes may have caused employees and managers to increase their commitment to workplace safety culture, which includes timely reporting of incidents. However, without hospital-level data, this is not possible to confirm.

California saw a reduction in reported WPV injuries in 2020. The results of our sensitivity analyses including 2020 data suggest that the year may not be representative of previous trends. In our CITS sensitivity analysis (Table E), there was a significant difference in trends in the postadoption period comparing California to the average of the United States, indicating a divergent trend from the analysis using data from 2011 to 2019. There are several reasons for this. First, it may be that the Cal/OSHA's emphasis on safety training for employees, especially its yearly training requirement for employees with patient contact, led to decreased WPV injuries. However, previous evidence of individual-based training leading to reductions in WPV is weak,[14] and there is no set standard for how the WPV training is implemented on a facility-to-facility level.

The COVID-19 pandemic may explain California's decrease in WPV in 2020 that we saw in the sensitivity analyses. Throughout 2020, California was among the hardest hit states in terms of COVID-19–related hospitalizations and deaths.[35] As of this writing, Los Angeles County, California, had the greatest number of COVID-19–related deaths in the United States (27 166).[35] The pandemic affected how patients and families interact with HCWs. Recent research found that nurses who cared for COVID-19 patients experienced more physical violence and verbal abuse than did those who did not care for COVID-19 patients, but they also found that nurses who cared for COVID-19 patients had more difficulty reporting their incident to management.[36] Another possible explanation for the drop in WPV in the content of COVID-19 is that health care facilities reduced or eliminated visitors. As patients and their families accounted for the largest portion of WPV incidence,[34,37] it may be that California's HCWs reported less WPV incidents overall because of their high interaction with patients who had COVID-19.

Although increased reporting of WPV is certainly a desirable outcome, from a public health perspective, increased reporting should be viewed as secondary or tertiary prevention at best. There is some reason to believe that the increased emphasis on reporting WPV injuries among HCWs may cause hospitals and their managers to enact more primary prevention–motivated interventions. However, the Cal/OSHA safety standard for WPV stops short of requiring those types of changes. Practically speaking, as states consider ways to reduce WPV among HCWs, it may be prudent to incorporate primary prevention interventions into these efforts.

Future research is needed to investigate whether the drop in WPV seen in 2020 in California was a result of the safety standard or other external factors. An examination of Cal/OSHA reporting data, combined with qualitative exploration, would likely go far toward this end. OSHA has recognized WPV and violence against HCWs as a workplace hazard, issuing guidance in 2016 aimed at reducing or preventing WPV against HCWs and social service workers.[2] WPV has also been the subject of OSHA citations for employers who fail to protect HCWs from the hazard of occupational violence.[21] However, violence against HCWs continues to occur. In the absence of federal OSHA standard making and congressional legislation, states should endeavor to better ensure HCW safety, especially considering HCW shortages and burnout and the increasing strains on the health care system.

Limitations

The use of SOII as our outcome of interest was necessary but had

limitations. The accuracy of SOII depends on employer compliance regarding injury and illness recordkeeping, and evidence suggests employers have a limited understanding of proper reporting protocols.[38] Previous research also suggests possible systematic differences in SOII reporting at the state level.[39] However, SOII is currently the only nationally available, public longitudinal data source for nonfatal occupational injuries. Our use of a national average as a control group reduces some of the bias introduced by possible systematic differences in state reporting.

Multiple-group CITS are susceptible to the selection bias that can occur when evaluating social policy. Because of data reporting in SOII, we elected to use the US average as our control for CITS, excluding states with laws similar to the safety standard. However, this was potentially problematic, as there was no randomization driving our control selection. To combat this problem, we conducted a sensitivity analysis that included all states. The relationships we found in our primary analysis was nearly the same when we included the control states, indicating that the absence of these state-level laws had minimal impact on our primary analysis. Both CITS and longitudinal TWFE are susceptible to omitted variable bias. However, the use of TWFE with a pooled cross-sectional, time-series design reduces the bias seen from omitted variable bias.

The COVID-19 pandemic posed a challenge to this study.[40] We attempted to assess the impact of the pandemic on our posttrend analysis through sensitivity analyses. We could not discern whether the drop in reported WPV in California was a direct result of the safety standard or an externality related to the COVID-19 pandemic. However, changes to visitation rules and the increase in use of ventilators for COVID-19 patients indicate that there was less day-to-day exposure to potential WPV from type II offenders, the group most responsible for WPV against HCWs.[2]

Conclusions

Cal/OSHA's Workplace Violence Prevention in Health Care standard may have led to an increase in the reported number of WPV incidents in the years after its implementation. This increase in reporting is likely a function of the emphasis placed on reporting through a Web-based program. Thus, the reported number of WPV injuries after safety regulation implementation may better reflect the actual counts compared with the numbers from previous years. We noted a decrease in reported WPV injuries in the third year after the standard was implemented. Although we cannot attribute this decrease to the policy alone, we suspect that the decrease is partially driven by the COVID-19 pandemic. More research is needed to fully understand the future impact of the Cal/OSHA safety standard. AJPH

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CONTRIBUTORS

M. L. Doucette conceptualized the study and wrote the initial draft of the article. M. L. Doucette, M. T. Bulzacchelli, and C. K. Crifasi contributed to the statistical approach. S. J. Surber contributed to the legal research. B. C. Dal Santo acquired the data. All authors revised the article and approved the final version.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to report.

HUMAN PARTICIPANT PROTECTION

This article is based on publicly available, aggregated, and nonidentifiable secondary data and therefore does not require human participant research approval.

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Gender, Race/Ethnicity, and Unionization in Direct Care Occupations

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Objectives. The goal of this study was to measure unionization in the direct care workforce and the relationship between unionization and earnings, looking closely at differences across race/ethnicity and gender.

Methods. Using data from the Current Population Survey from 2010 to 2020, we first used logit analyses to predict the probability of unionization among direct care workers across race/ethnicity and gender. We then measured the relationship between unionization and weekly earnings.

Results. We found that male (12%) and Black (14%) direct care workers were most likely to be unionized, followed by Hispanic and other direct care workers of color. Unionized direct care workers earn wages that are about 7.8% higher than nonunionized workers, but unionized workers of color earn lower rewards for unionization compared with White direct care workers.

Conclusions. Unions are a mechanism for improving job quality in direct care work, and protecting workers' rights to unionize and participate in collective bargaining equitably may be a way to stabilize and grow the direct care workforce. (*Am J Public Health*. 2022;112(11):1676–1684. https://doi.org/10.2105/AJPH.2022.307022)

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Direct care workers, also known as certified nursing assistants, home health aides, and personal care assistants, face physically and emotionally challenging work as they provide basic health and personal care assistance to older adults and persons with disabilities across home, hospital, and long-term care settings. They represent a large and increasing share of the US economy, employing more than 4.6 million individuals with 1.3 million new jobs expected to be added by 2029.[1] Job quality in direct care work (e.g., wages, fringe benefits, stability, and job protection) is notoriously poor; more than one third of workers are below 150% of the federal poverty line, more than one fourth rely on government assistance (including Medicaid), and upward mobility among direct care workers is rare.[2,3] As a result, workforce shortages have long been a concern, and these became a crisis during the COVID-19 pandemic.[4] Direct care workers have higher exits from the labor market than any other health care occupation (remaining above 6% after the pandemic).[5] In response to poor job quality, direct care workers are taking actions like organizing and unionizing to improve conditions for themselves and their patients.[6]

It is clear that solutions are needed to improve on-the-job conditions for direct care workers and, in turn, improve recruitment and retention challenges that prohibit the health care system from functioning at full capacity. Unions, experiencing record levels of support,[7] provide an opportunity to do so by lifting the voices of workers and centering the concerns most important to them. This is particularly important for direct care workers who are predominately women (87%) and disproportionately Black, Hispanic, or other people of color (61%) and immigrants (27%), who have historically experienced significant disadvantages in the labor market.[1,8] It is well established that unions improve job quality, particularly wages, across skill levels and industries, but past research has primarily focused on industries that are predominately White and male.[3,8,9] In this study, we aimed to understand the impact of unions and job quality within direct care work and, specifically,

on the interactions of race/ethnicity, gender, and being represented by a union. Throughout this article, we use the terms "unionized workers" or "represented by a union" to indicate both workers who belong to a union and those who are covered by a union contract.

Direct care work, deeply intertwined with systemic racism and sexism, has long been devalued, meaning that wages are lower in direct care occupations compared with other occupations of that require similar skill and education levels.[10,11] These are heavily femininized occupations—disproportionately performed by women of color—and reflect the devaluation of women's work.[12,13] Domestic workers, which include a large share of direct care workers, were originally excluded from the 1935 National Labor Relations Act along with agriculture workers to appease primarily southern Congressmembers who extracted this compromise from Franklin D. Roosevelt in exchange for not voting down the entire Act.[14] While these workers are no longer excluded from collective bargaining and other rights enacted by the Act, this has been a dominant factor in suppressing wages and benefits in direct care work.

HOW UNIONS IMPROVE JOB QUALITY

Unions are recognized for improving all aspects of job quality,[17,18] most notably wages and benefits, particularly in low-skill occupations with low wages and benefits—such as direct care work.[19] However, union membership, while universally low, has shifted so that middle- and high-skill workers are most likely to be unionized even though the positive union wage effects are greatest for those in low-skill occupations.[3,20] In health care, this is demonstrated by the rise of nurses' unions, which represent around 20% of registered nurses, while around 8% of direct care and other low-skill workers are represented by a union.[21]

Commonly described as the union difference, the positive effects are largely accomplished through collective bargaining, which is the negotiation process between employers and unions (on behalf of the workers) that establishes a legally binding contract, setting wages, benefits, hours, and other conditions important to workers.[22–24] In contrast to other solutions aimed at improving job quality such as increased minimum wage or reimbursement rates, expanding access to training and education, and developing career ladders, collective bargaining offers an advantageous path for 3 distinct reasons. First, it is comprehensive of all job attributes that affect worker experiences and, by extension, their physical, mental, and financial well-being.[1,24] Second, it centers workers' voices by focusing on the factors most important to them. Third, collective bargaining elevates worker power through unity in numbers and democratic processes.[22,24] Particularly when considering the impact for a largely marginalized workforce like direct care workers, unions—and collective bargaining—have an opportunity to amplify voices that have been historically excluded.

Importantly, the collective bargaining process is also instrumental in achieving wage equity. Unions have been effective in narrowing racial and gender wage gaps, particularly for Black and Hispanic workers and women.[23,25] As gender and race are contributing factors in the devaluation and poor job quality in direct care work, unions have the potential to mitigate the influence of racism and sexism in the existing low wages and insufficient benefits that permeate direct care work.[26]

In this research, we aimed to understand the association between unionization and job quality in direct care occupations. Using the Current Population Survey (CPS), we first measured rates of unionization among direct care workers by gender and race/ethnicity. We then measured the association between wages and unionization, focusing on differences between men and women, and among White, Black, Hispanic, and other workers of color. Recruitment and retention of the direct care workforce is a critical public health issue, and we explored unionization as a mechanism for improving job quality in these occupations.

METHODS

We used the IPUMS CPS to analyze the relationship between wages and unionization. The CPS is a monthly US household survey conducted jointly by the US Census Bureau and the Bureau of Labor Statistics; IPUMS CPS harmonizes microdata from the monthly data from CPS.[27] The analytical sample included individuals that (1) were employed as a wage or salaried worker, (2) worked full time, and (3) worked in a direct care occupation, including personal care aides, home care workers, home health workers, and nursing assistants. We tested whether rates of unionization varied between institutional direct care workers and home health workers and found similar rates of unionization among both groups; for this reason, we combined both institutional and home health workers in our sample of direct care workers. The sample included 16 292 direct care workers.

Measurement

We had 2 dependent variables. In our first analysis, the dependent variable

was being represented by a union. The CPS indicates whether the respondent is a union member or is a covered by a union contract in their job.

The dependent variable in our second analysis was the natural log of weekly earnings. We used a log transformation of weekly earnings to normalize the distribution of the dependent variable.[28] Weekly earnings were inflation-adjusted to 2020 dollars. To standardize weekly earnings across workers, we only included full-time workers in our sample and controlled for hours worked per week in our analyses.

We included a number of demographic variables in our models, including whether an individual was a woman (1) or man (0). The race/ethnicity categories we included were White (0), Black (1), Hispanic (1), and other racial/ethnic identity (1). We also included whether someone was an immigrant (1) and age and age squared. The inclusion of the squared term generates a quadratic curve, which allows the effect of age to change over the life course. We included educational attainment level as a time-varying categorical variable: high-school graduate or less (0); some college, but no degree (1); associate degree (1); or a 4-year college degree or more (1). We included 4 geographic regions in our models: the Northeast (0), South (1), Midwest (1), and West (1). We included dummy variables that indicated the calendar year of data collection (not shown in tables). Finally, we used the variable EARNWT in IPUMS USA to weight all analyses to ensure that the sample was representative of the US population.

Analyses

This article includes 2 sets of analyses. First, we used a logit regression model to predict which workers were more likely to be unionized, focusing on demographic variables as key independent variables. Second, to address our research question of the rewards for unionization, we ran a model using logged inflation-adjusted weekly earnings as the dependent variable and included unionization as the key predictor. We then calculated the predicted earnings of unionized and nonunionized workers across key demographic groups, including men and women, and racial/ethnic groups. To calculate predicted earnings of workers across key demographic groups, we ran a series of models with interaction terms between gender and unionization and race/ethnicity and unionization. These models are not included in the article but are available on request. We calculated the predicted probability of unionization and predicted earnings by using the MARGINS command in Stata (StataCorp LP, College Station, TX). All statistical analyses were conducted with Stata version 17.

RESULTS

Descriptive statistics for the sample are included in Table 1. We separated

TABLE 1— Descriptive Statistics for Direct Care Workers: United States, IPUMS CPS, 2010–2020

	Nonunionized	Unionized
Weekly earnings, $	682.36	754.24
Observations	14 843	1 449
Population size	148 436 955	16 622 839
Demographic variables		
Age, y, mean	41.7	44.3
Gender, %		
Male	13.9	18.3
Female	86.1	81.7
Race/ethnicity, %		
White	50.3	41.4
Black	21.6	25.6
Hispanic	20.3	21.9
Asian or another race	7.8	11.1
Born in the United States, %	79.0	71.0
Education, %		
High-school degree or less	38.4	38.2
Some college	26.0	26.1
Associate degree	20.7	18.9
4-year college degree or higher	14.9	16.9
Region, %		
Northeast	16.8	32.3
Midwest	19.7	16.6
South	37.2	9.4
West	26.2	41.8

Note. IPUMS CPS = Integrated Public Use Microdata Series Current Population Survey. "Unionized" indicates both workers who belong to a union and those who are covered by a union contract.

workers by whether they were represented by a union or not a union member. Workers without union coverage were the largest group, making up about 91% of workers in our sample. Among nonunion workers in our sample, the average weekly earnings were $682, 86% were women, approximately 50% were White, 22% were Black, 20% were Hispanic, and 8% identified as another race. Thirty-eight percent of nonunionized direct care workers had a high-school degree or less, followed by some college (26%), an associate degree (21%), and a 4-year degree or higher (15%).

Workers who were represented by a union earned $754 per week. Approximately 82% were women, and a lower percentage of workers who were represented by a union were White (41%) compared with nonunionized workers. A higher percentage of workers who were represented by a union were Black (26%), Hispanic (22%), or Asian (11%) compared with nonunionized workers. Educational attainment was similar between unionized and nonunionized workers: 38% of direct care workers represented by a union had a high-school degree or less, followed by some college (26%), an associate degree (19%), and a 4-year college degree or higher (17%). There was significant regional variation in union representation among direct care workers; rates of union representation were highest in the West (42%) and Northeast (32%) and were lower in the Midwest (17%) and South (9%).

Likelihood of Unionization

Table 2, model 1, shows a logit model that predicts whether direct care workers were represented by a union. We found that female direct care workers were significantly less likely to be represented by a union than male workers ($P < .001$), but workers of color, including Black, Hispanic, and workers who identify as another race/ethnicity, were significantly more likely to be represented by a union. Educational attainment was not significantly related to union representation. Direct care workers in the Midwest, South, and West were significantly less likely to be represented by a union than workers in the Northeast ($P < .05$).

In Figure 1, we present the predicted probability of being represented by a union, calculated with the model shown in Table 2. Male direct care workers had a predicted probability of about 12% of being represented by a union, while female workers had a predicted probability of around 10% when we controlled for demographic characteristics,

TABLE 2— Models of Predictors of Unionization (Model 1) and Weekly Earnings (Model 2): United States, IPUMS CPS, 2010–2020

	Unionization (Model 1), OR (95% CI)	Logged Inflation-Adjusted Weekly Earnings (Model 2), b (95% CI)
Unionized	. . .	0.076 (0.050, 0.102)
Demographic variables		
Female (Ref = male)	0.797 (0.674, 0.943)	−0.130 (−0.154, −0.106)
Race/ethnicity		
White	0 (Ref)	0 (Ref)
Black	1.938 (1.636, 2.296)	−0.097 (−0.119, −0.076)
Hispanic	1.280 (1.066, 1.537)	−0.043 (−0.066, −0.020)
Asian or another race	1.322 (1.048, 1.668)	0.002 (−0.031, 0.035)
Born in the United States	1.054 (0.896, 1.240)	0.051 (0.030, 0.073)
Age	1.102 (1.052, 1.155)	0.016 (0.010, 0.022)
Age squared	0.999 (0.999, 1.000)	−0.000 (−0.000, −0.000)
Education		
High school or less	0 (Ref)	0 (Ref)
Some college	1.103 (0.943, 1.291)	0.108 (0.090, 0.127)
Associate degree	1.097 (0.924, 1.304)	0.137 (0.117, 0.156)
4-year college degree or higher	1.131 (0.936, 1.366)	0.308 (0.281, 0.336)
Region		
Northeast	0 (Ref)	0 (Ref)
Midwest	0.464 (0.385, 0.558)	−0.059 (−0.083, −0.035)
South	0.124 (0.099, 0.154)	−0.060 (−0.082, −0.037)
West	0.873 (0.748, 1.019)	−0.010 (−0.034, 0.014)
Other statistics		
Constant	0.014 (0.005, 0.040)	6.087 (5.959, 6.215)
Survey observations, no.	67 100	66 706
R^2	. . .	0.094

Note. IPUMS CPS = Integrated Public Use Microdata Series Current Population Survey. "Unionized" indicates both workers who belong to a union and those who are covered by a union contract. Dummy variables for year were included in the model but are not shown in Table 2. The odds of being a union member were significantly higher in 2013 compared with 2010 (OR = 1.432; $P < .001$). Wages were significantly lower in 2012 and 2014 (b = −0.035 and −0.046, respectively; $P < .05$) compared with 2010, and significantly higher in 2020 (b = 0.055; $P < .001$) compared with 2010.

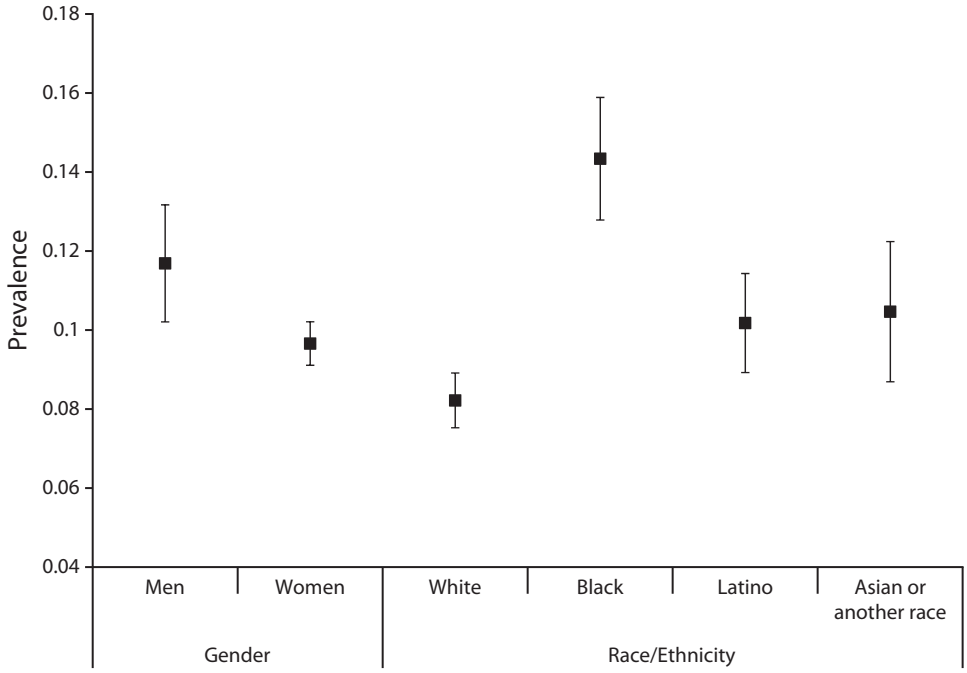

FIGURE 1— Prevalence of Unionization Among Demographic Groups (Corrected by Age, Region, and Educational Level): United States, IPUMS CPS, 2010–2020

Note. IPUMS CPS = Integrated Public Use Microdata Series Current Population Survey. Whiskers indicate 95% confidence intervals. Models used for calculating predicted weekly earnings shown in Figure 1 are not shown in the article but are available on request. Models include all control models described in the Measurement section.

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education, and region. Black direct care workers had the highest rate of being represented by a union, at around 14%, while Hispanic and Asian or another race direct care workers have a predicted probability of around 10%. White workers had the lowest predicted probability of approximately 8% of being represented by a union.

Unionized vs. Nonunionized Weekly Earnings

Table 2, model 2, shows a linear regression model of the natural log of inflation-adjusted weekly earnings for unionized and nonunionized direct care workers. To interpret the coefficient of the log-transformed dependent variable, we exponentiated the coefficient, subtracted 1 from this number, and multiplied by 100. We found that workers who were unionized had weekly earnings that were 7.8% higher than workers who were not unionized ($P < .001$) when we controlled for demographic characteristics, education, and region.

Figure 2 contains predicted weekly earnings for workers represented by a union and nonunionized direct care workers by gender and race/ethnicity. Figure 2 shows that men who were represented by a union had the higher weekly earnings ($743) compared with men who were not unionized ($690), which indicates that men who were represented by a union had weekly earnings that were 7.2% higher than those who were nonunionized, even when we controlled for demographic characteristics, education, and region. Women who were unionized earned $654 per week compared with $605 earned by nonunionized women, indicating that women who were represented by a union had weekly earnings that were 7.4% higher than those who were not unionized.

White direct care workers who were represented by a union had weekly earnings of $689 compared with weekly earnings of $635 of nonunionized White workers (a difference of 7.7%), but the earnings difference between those who were represented by a union and nonunionized workers was lower for Black and Hispanic workers (4.3% and 5.7%, respectively). Workers who identified as Asian or another race had higher weekly earnings when they were unionized ($739) compared with nonunionized workers ($629), a difference of 14.9%.

Sensitivity Tests

To test the robustness of our findings, we used propensity score matching to

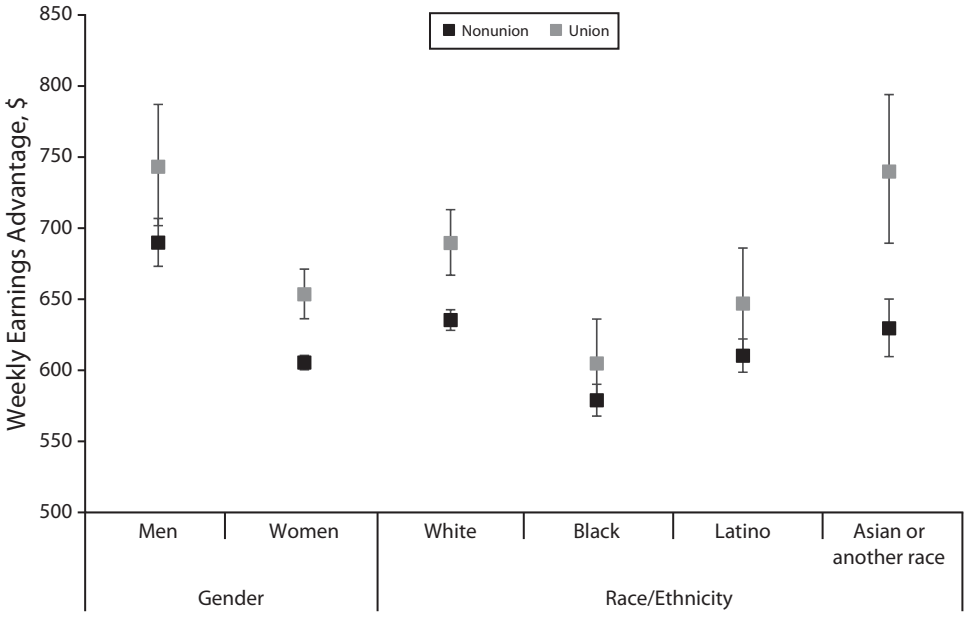

FIGURE 2— Weekly Earnings Advantage of Unionization for Direct Care Workers by Demographic Groups (Corrected by Age, Region, and Educational Level): United States, IPUMS CPS, 2010–2020

Note. CPS = IPUMS CPS = Integrated Public Use Microdata Series Current Population Survey. Whiskers indicate 95% confidence intervals. Models used for calculating predicted weekly earnings shown in Figure 2 are not shown in the article but are available on request. Models include all control models described in the Measurement section.

estimate the effect of union representation on earnings while matching participants using the TEFFECTS command in Stata. The models estimated using propensity score matching strengthened the effects of union representation on wages, indicating that direct care workers who were represented by a union had wages that were 12.2% higher than their nonunion peers. Male direct care workers had earnings that were 14.0% higher, while women had earnings that were 11.4% higher when they were represented by a union. White workers had earnings that were 14.6% higher, Black workers had earnings that were 5.0% higher, Hispanic workers had earnings that were 10.9% higher, and workers who identified as another race/ethnicity had earnings that were 12.2% higher when they were represented by a union. The wage penalty experienced by Black direct care workers represented by a union was highlighted when we used propensity score matching.

To examine patterns of unionization among female direct care workers only, we included rates of unionization and predicted wages for female direct care workers only, including White, Black, Hispanic, and other workers of color, in Figures A and B (available as supplements to the online version of this article at https://ajph.org). The patterns for women only mirror our findings for all direct care workers.

DISCUSSION

Direct care jobs are a large and growing share of the health care industry and the overall US economy,[29] yet recruiting and retaining workers in these jobs has become a crisis issue during the pandemic.[30] We explored the role of unionization as a mechanism for improving wages and job quality among direct care workers. Recent research has demonstrated that unionization may have positive outcomes for patients and patient care in skilled nursing units (research on unionization in the home health context is extremely limited).[31,32] We extended this research to measure the rewards for unionization for direct care workers, with an emphasis on differences across gender and race/ethnicity.

We first examined rates of union representation among direct care workers. We found that around 11% of direct care workers were represented by a union. This is slightly lower than the national average of 12%.[21] Consistent with national statistics of unionization, direct care workers of color were more likely to be unionized compared with their White counterparts. Black direct care workers had the highest rate of union representation, at around 14%, while Hispanic and Asian or another

race direct care workers have a predicted probability of around 10%. White workers had the lowest predicted probability of around 8% of being represented by a union, which was below the national average of unionization for White workers (12%). Male direct care workers were more likely than female workers to be represented by a union.

We found that unionized direct care workers and those represented by a union earned consistently higher wages than those who were not unionized, but the rewards for unionization varied by race/ethnicity. Overall, direct care workers who were unionized had weekly earnings that were 7.6% higher than workers who were not unionized. Among male and female direct care workers, men earned higher wages, a finding that was consistent with past research on the gender wage gap among direct care workers.[10] But the rewards for unionization—meaning the percent difference in wages between those represented by a union and nonrepresentation—were about the same for men (7.2%) and women (7.4%).

However, there were differences in the rewards for unionization for direct care workers of color. Black direct care workers were the most likely to have union representation, but they had the lowest rewards for union representation, with unionized Black direct care workers earning 4.3% higher wages that nonunion Black direct care workers. Hispanic workers also had lower rewards for unionization, with wages that were 5.7% higher than those of nonmembers. These findings indicate that despite workers of color organizing to gain power in the labor market, their efforts are undermined by structural racism and discrimination that devalues the work of direct care workers of color.[33]

Limitations

This study had an important limitation: we were unable to track individuals over time to measure the causal impact of being represented by a union on subsequent wages. Future research should capitalize on longitudinal data that can more precisely measure the causal link between unionization among direct care workers and wage outcomes. We also did not have precise measures of location or job tenure, which are important omitted variables in predicting wages and the probability of unionization.

Public Health Implications

We explored the issue of whether unionization is an effective strategy for improving direct care occupations within the health care sector, which has a number of public health implications. First, it has become increasingly clear during the pandemic that changes need to be made in the job quality of direct care occupations to stabilize the workforce so that we can provide high-quality care for older and disabled adults who need care in the United States. The US health care system—and public health more broadly—depends on the supply of workers who have the skills needed to provide hands-on care for others, and unionization may be one mechanism for stabilizing this workforce and recruiting new direct care workers.

Second, structural racism in the labor market, linked to historical legacies of slavery and domestic service, has had a strong impact on shaping the direct care workforce; unionization has the potential to strengthen job quality and wages in these marginalized occupations, ultimately contributing to better health for this large and growing workforce and their families.

Policy Recommendations

The Biden Administration has publicly announced its support for unionizing efforts, including the Protecting the Right to Organize (PRO) Act of 2021.[34] Some of the PRO Act's key features include overriding state "right-to-work" laws, which prevent unions from collecting dues from workers that they represent by contract but not membership; forbid employer interference in organizing efforts, including mandatory meetings that are often used for anti-union propaganda; permit workers to cast organizing ballots off company premises; and implement stronger penalties (financial and otherwise) to employers that violate workers' rights.[34,35] Critically for workers in direct care jobs who are often considered self-employed or contract workers and therefore exempt from many labor laws, the PRO Act would allow them the right to unionize.[35] Cumulatively, this Act would provide workers in direct care jobs more protection in unionizing efforts, which could be instrumental in increasing the share of unionized workers, improving wages, and overcoming the systemic racism and sexism contributing to suppressed wages and job quality in direct care work.

Conclusions

Direct care workers are an integral part of the US health care system, particularly in providing and supporting services for older adult and disabled populations. However, job quality is poor across these occupations with low wages, few benefits, unstable hours, and limited job protections. For the health

care system and care recipients, poor job quality among direct care workers creates high turnover and threatens the stability and quality of care. Unions are a mechanism for improving job quality in direct care work, and stronger supports, such as the PRO Act, are needed to improve workers' rights to unionize and participate in collective bargaining equitably. AJPH

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HUMAN PARTICIPANT PROTECTION

This study is not considered to be human participant research and was exempted by the University of Minnesota institutional review board.

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Further Cautions When Modeling the Public Health Impact of Infectious Diseases

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The article by Reich et al.[1] presents an interesting perspective on how modeling expertise in infectious diseases can be enhanced during pandemic situations and the key role of collaborative hubs with optimization of this expertise. We believe, however, that additional comments could be made. First, there is a need to develop or create expertise in mathematical modeling in different centers within the same country when the capacities are available. It remains essential to develop and compare different models of spread or control of infectious diseases with the aim of obtaining consensus for prioritization of control initiatives at the population level. The existence of a single source of expertise by country is too restrictive and potentially biased. Bias might be related, for example, to previous training, experience, and methods used by a group of scientists, or to the source of data available. Therefore, an increase in academic training is needed for generate more groups with modeling expertise.

Second, models should be more adapted to exposed populations. In the case of the current COVID-19 pandemic, disease incidence and severity varied by country and also within the same country, for many reasons, such as population density and age distribution, sociocultural and geographical determinants, and affected neighboring countries.[2] Consequently, models need to take into account such variables or confounders. For instance, models could be stratified by key determinants such as urban versus nonurban areas or age distribution.

Finally, the culture of risk and uncertainty[3,4] should be taken into account when modeling results are shared with the general population, media, policymakers, politicians, and scientists. Predictive mathematical models have come to play an increasingly important role when very little empirical scientific evidence is available to support quick decision-making processes. The COVID-19 pandemic has changed how scientific information is communicated and increased the swiftness with which such evidence is published and consumed. AJPH

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