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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

APHA

COVID-19: Nursing Students Should Have the Option to Help

My immediate reaction when the pandemic began was to help my fellow medical personnel. I was fully expecting to get a call to help. To my surprise, as a nursing student I was deemed "nonessential" and a liability, which led to feelings of helplessness and anger. In turn, stripped of a purpose and a schedule, my mental health suffered. To me, becoming seriously ill or dying of COVID-19 in the service of helping others was preferable to dealing with isolation and uncertainty.

A global shortage of personal protective equipment coupled with worries about nursing students' preparedness to care for patients stopped the United States from using nursing students as assets in hospitals. These concerns, although understandable, ignored nursing students as a valuable resource (https://bit.ly/2JLnIAX). Instead, hundreds of retired nurses and doctors were summoned to help. Paradoxically, retirees are one of the most vulnerable populations to contract COVID-19 because of their general age group (http://bit.ly/3rW5fCW). In most states, nursing students were removed from clinical sites and provided with subpar virtual experiences in a hasty effort by the National Council of State Boards of Nursing to avoid graduation delays (https://bit.ly/2L4GLH9).

Contrarily, the United Kingdom instituted the Coronavirus Act of 2020, granting emergency registration as a nurse to nursing students to aid hospitals (https://bit.ly/2KUM249). Regulations stipulated that students be supervised by a registered health care professional. The universities and hospitals formed a partnership to share equal responsibility for students. The United Kingdom gave nursing students in years two and three of their program two options: continue with their clinical placement in person (paid at the same rate as nursing assistants) or move to online clinical simulations with the condition that they make up clinicals in the future (https://bit.ly/35cDWea). Similarly, Australia extended the number of hours student nurses could work to maximize their contribution to hospitals (https://bit.ly/2L25Gek).

Following in the steps of the United Kingdom and Australia, the following solutions could have been implemented in the United States with beneficial results. To work well, all participation would be completely voluntary. Additionally, all nursing students would be required to undergo rigorous infection control training before entering hospitals. Lastly, all interested students would sign a legal waiver stating that they understood the risks involved to avoid liability issues. Limiting nursing students' involvement to their scope of practice or certifying them as nursing assistants would further mitigate legal problems.

Giving nursing students the option to help (through either clinical extension or direct employment) during a national crisis is beneficial for two reasons. Nursing students are a cost-effective option compared with retirees and travel nurses, as students typically perform clinical rotations at no cost to health care systems. Alternatively, the United States could have paid nursing students the same hourly rate as nursing assistants, which would have been much less expensive than employing senior nurses (http://bit.ly/3rR0g6J).

During the pandemic, nursing students could have gained a once in a lifetime experience that would have enhanced their knowledge and, in the process, shown them whether they truly want to be in the nursing field. Provision 2 in the nursing code of ethics states: "The nurse's primary commitment is to the patient, whether an individual, family, group, community, or population" (https://bit.ly/38dQylY). What better way to show dedication and passion for nursing than during a national emergency when putting the patient first is risky and even dangerous. Nursing is oftentimes described as a calling rather than a career, and nursing students showing up in a time of international distress exemplifies this sentiment.

All around, this year has been extremely difficult. However, with pain and suffering comes growth. The possibility of change and the hope that public health policies will be revised and prioritized in the future is what we, as a country, must hold on to. AJPH

Chaya L. Dickel, BSN Student
Hunter-Bellevue School of Nursing, New York, NY

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4 Years Ago

Poverty and the Challenge of Vector-Borne Epidemics

Zika, like dengue, is not a disease limited to the poor, but poor housing and sanitation conditions can foster the spread of the disease. Both diseases have found a home in cities like Rio de Janeiro, Brazil, because wide areas of the city are marked by habitations that lack screens or even windows and in which people store water in open cisterns because piped water is unavailable. These water canisters provide breeding sites for Aedes mosquitoes. In addition, these same slum areas are largely outside the control of municipal authorities and public health efforts. . . . As long as slum conditions exist, human populations will be vulnerable to vector-borne diseases like yellow fever, dengue, chikungunya, and Zika.

From AJPH, *January 2017, pp. 8–10*

6 Years Ago

The Moral Challenge of Quarantine in Epidemics and Pandemics

A nation's response to an epidemic depends on more than health care equipment and personnel, the response also reflects the nation's core values. In an epidemic many individuals may be asked to endure personal inconvenience or to make sacrifices to protect the health of others. This situation is exemplified by quarantine, where many possibly exposed but currently asymptomatic individuals are separated from the rest of society and kept from work, social activities, and family contacts. . . . [T]he United States is known for libertarian values, rugged individualism, distrust of government, willingness to invoke legal rights, and a belief that health care is a matter of personal responsibility. Thus, it is fair to ask whether Americans would be willing to enter into quarantine voluntarily . . . especially when, in the case of Ebola, quarantine would last 21 days.

From AJPH, *January 2015, pp. 6–8*

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Public Health Education and Changing Public Health Realities in the Public Health 3.0 Era

Gulzar H. Shah, PhD, MStat, MS

ABOUT THE AUTHOR

Gulzar H. Shah is the department chair and professor of health policy and community health at Jiann-Ping Hsu College of Public Health, Georgia Southern University, Statesboro, GA.

See also Plepys et al., p. 475.

Think about the more than 19 million college students enrolling annually in public and private colleges in the United States, navigating through the maze of questions often targeted at career counselors and college representatives. For many, public health is becoming a logical choice. Because of COVID-19, the interest in public health careers is soaring, evident from the 20% increase nationwide in Master of Public Health (MPH) applicants.[1]

For prospective public health degree–seeking students, many nuanced questions may be about hot jobs, salaries, and potential employers. For instance, which study areas in public health will increase their employability? Should they pursue traditional core areas of biostatistics, epidemiology, environmental health, health policy and management, and community health? Or better yet, seek a generalist degree or a trending subject area such as health informatics, global health, data science, and health equity? Which sectors are the most common employers—government, health care, nonprofit, or for-profit—to upskill themselves in the most relevant learning domains? Should their passion for serving humanity by averting disease and eliminating health inequities be the decision driver, or may they expect a decent salary as well? Plepys et al. (p. 475) have answered these and many other questions. This study provides valuable information for schools and programs of public health, beneficial for prospective students' recruitment.

EVOLVING PUBLIC HEALTH AND STUDY FOCUS AREAS

Public health is continually evolving because of evolving public health threats; changing socio-political, institutional, and cultural environments; and advances in the field.[2,3] Changes in public health practice and policy influence the knowledge, skills, and abilities (KSAs) needed by the future public health workforce. Plepys et al. show that general public health has become the most commonly pursued area of study with the generalist degree's popularity increasing from 14% in 2015 to 26% in 2018.

Several recent developments in the public health field may explain an increasing interest in a general public health degree and the associated KSAs. First, the Public Health Accreditation Board's standards necessitate many generalist KSAs essential for Foundational Public Health Services.[4] Some of these KSAs pertain to health equity, informatics, quality improvement, and strategic planning. Second, a national dialogue about a paradigm shift from Public Health 1.0 to Public Health 3.0 has gained momentum. Public Health 3.0 promotes addressing health inequities and leveraging policies that influence the social determinants of health.[5,6] The emphasis on aligning public health practice and policy with the Public Health 3.0 framework has attracted the spotlight on generalist, behavioral education, and health policy degrees.[2] The Public Health 3.0 framework has also underscored the desirability of leveraging Health in All Policies and encouraging public health leaders to act as "chief health strategists." Increasing focus on Health in All Policies and higher salary positions in health care may explain the popularity of health policy and management and health law programs.

Another significant influence is the three-way partnership of academia, community, and public health practice. Practice-based research and evidence-based practices supported by academic–practice partnerships have gained traction. Moreover, academics are increasingly engaging with community stakeholders, including business people, attorneys, architects, city planners, and park personnel. Section F1 of the Council on Education for Public Health accreditation criteria reinforces this trend requiring

academic–community engagement. The community and practice stakeholders' engagement with academia (e.g., as school advisory boards) provides a valuable feedback loop concerning student learning outcomes and the curriculum. Stakeholders' input and influence reinforce the need to offer competencies that support Health in All Policies, social determinants of health, and Public Health 3.0. The United States' recent socio-political climate's unmasking of structural racism has underscored the need to address social injustices and the resulting health inequities. In addition, the increasing availability of generalist doctoral and MPH degrees online empowers full-time working professionals to pursue these degrees.

There may be competency areas recently appearing on the public health programs' radar. In the era of "Big Data" and "Data Liberation," health informatics is gaining popularity because of its ability to improve clinical care coordination and quality, disease surveillance, disease investigation, and early detection of disease outbreaks.[3] Many schools and programs of public health are beginning to expand their curricula to include health informatics and data science courses, concentrations, and certificates.

FIRST-DESTINATION EMPLOYMENT SECTOR

A disconnect between the competencies covered in public health curricula and those needed by the potential employers may breed discontent. A good alignment can help public health as a discipline to capitalize on the attention public health practice has garnered recently. The analysis of first-destination outcomes offers opportunities for schools and programs of public health to align their curricula with workforce KSAs by employment sector, featured by Plepys et al. Their study shows that health care and nonprofit organizations are the most common first-destination employers for public health graduates, contrary to the prevailing perception that government public health agencies may be the most common employer. While Council on Education for Public Health–mandated competencies limit options for curricula changes, syllabi review may offer room for adjustments in the scope and extent to which the competencies are covered, allowing concentrations to adapt to the changing employment environment. Among the best pieces of advice public health college students receive is to think beyond the degree. They receive encouragement to master soft skills, engage with professionals in various employment sectors, and pick up additional KSAs desirable in their targeted employers. Public health programs should perform a regular assessment of their curricula and realign them with potential employers' essential KSAs.

The salary differences by employment sector can be the deciding factor for students' selection of study areas. The diversity in the employment sectors means better job prospects for public health graduates but at the same time causes recruitment and retention issues for government public health agencies. Better salary structures exist for graduates with specific skills such as informatics and biostatistics in the for-profit sector, particularly in insurance and actuarial jobs. Plepys et al. show that particular fields are more employable and offer higher salaries. Still, some salary trends will need additional, perhaps qualitative analysis—for example, why do roughly 16% of public health doctorate graduates make less than $45 000 annually?

CONCLUSIONS

The study by Plepys et al. is the first of its kind in the past 30 years, providing instrumental scientific evidence for public health students, programs, and employers. The study fills critical gaps in our understanding of the potential employers for public health graduates, salary differences by the employment sector, and unemployment rates by study area. This study uses the most recent data available on first-destination employment outcomes. The authors note several data limitations that should be valuable information for all stakeholders for addressing these limitations, given the significant implications for the students, their employers, and their academic institutions. The unprecedented attention to public health because of the COVID-19 pandemic presents a natural experiment for future studies to examine how the interplay between the increasing number of public health graduates and changes in the type of study areas translates to shifts in salary and employment structure in the post-COVID era. COVID-19–related layoffs are resulting in the retooling of the workforce, with a 20% uptick in public health degree applications.[1] Government public health is chronically underfunded, and, thus, only 17% of public health graduates choose public health agencies as their first employment destination. The employment sector–specific shifts in job growth or reductions and corresponding skills in demand will offer challenges and opportunities that will require schools and programs of public health to keep their curricula aligned with the dynamics of employment and competencies needed therein. AJPH

CORRESPONDENCE

Correspondence should be sent to Gulzar H. Shah, Department Chair and Professor of Health Policy and Community Health, Jiann-Ping Hsu College of Public Health, Georgia Southern University, 501 Forest Drive, Hendricks Hall, Statesboro, GA 30460 (e-mail: gshah@georgiasouthern.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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CONFLICTS OF INTEREST

The author has no conflicts of interests.

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Prevention of Sexual Violence in America: Where Do We Stand?

Randall Waechter, PhD

ABOUT THE AUTHOR

Randall Waechter is with the Department of Physiology, Neuroscience, and Behavioral Health, School of Medicine, and the School of Graduate Studies, St. George's University, Grenada, West Indies.

See also D'Inverno et al., p. 485.

With an annual cost of approximately $1.03 trillion ($921.72 billion in 2013 dollars),[1] rape is one of the most expensive public health problems in the United States. If sexual violence other than rape is included, the number of victimizations increases from approximately 2 million to 12 million annually, and the associated cost is in trillions of dollars, making sexual violence the most expensive enduring public health problem. Although the COVID-19 pandemic has cost an estimated $16 trillion to date, this will theoretically be a one-time cost. Once 70% of the population has become immune, either through infection or vaccination, illness is predicted to drop significantly because of herd immunity. Sexual violence, by contrast, is persistent and pervasive, and the costs outlined do not even account for its emotional impact.

Prevention is one of the pillars of public health. Primary prevention—the avoidance of biological, social, and environmental factors that cause illness and disease—is the ultimate goal of every public health professional, policymaker, and frontline health worker treating patients or, in this case, victims of sexual violence. The most significant historical advancements in human health have resulted from primary prevention efforts. Improvement in providing clean water and sanitization, decreased microbial contamination of food, vaccine development, and reduction in tobacco use are a few examples.

When it comes to the prevention of sexual violence, the United States has a very long way to go. There are a number of potential explanations for the slow progress.[1] Despite the World Health Organization's 1996 call to view violence as a public health issue rather than a criminal justice issue, sexual violence continues to be addressed primarily as a justice concern.[1] There are a number of sociocultural and historical factors driving this justice emphasis that are beyond the scope of this editorial. Investigating crimes and prosecuting offenders is important, but given the potentially enduring impact of sexual violence on victims, prevention is more important.[2]

Sexual violence disproportionally affects the most vulnerable in society: children, women, and lesbian, gay, bisexual, transgender, and queer or questioning individuals. There is abundant evidence that there is an unequal distribution of resources between men and women in the United States[2]; those with more resources tend to have more power, and those with more power are less likely to be victimized than those with less power. Thus, sexual violence victimization might reflect differences between the empowered and the vulnerable rather than males and females per se. Until society addresses these power differentials regardless of gender, sexual violence will likely persist.[3]

In a world of limits, difficult decisions must be made when allocating funding and other resources. Although there is no widely accepted methodology for how to do this, public health experts condone an approach that considers the prevalence, incidence, and economic burden of diseases when allocating resources.[3] Waechter and Ma[1] make the case for greater resource allocation to examine the prevention of sexual violence, given its outsized burden on the population.[4] The evidence base for the effective prevention of sexual violence is lacking, hampering efforts to implement widespread primary prevention programs. The reasons for this lack of evidence are complex, but limited funding to carry out basic research to understand the mechanisms behind sexual violence perpetration and how to effectively prevent it is a significant factor. The methodological pathway for this work has been provided by the Centers for Disease Control and Prevention (CDC). Key components of prevention include the following:

1. awareness and education,
2. research,
3. surveillance at all levels,
4. hazard evaluation,

5 improvement of the public health system, and
6 proactive behavior by individuals.

The article in this issue of *AJPH* titled "Monitoring Sexual Violence Trends in Emergency Department Visits Using Syndromic Data From the National Syndromic Surveillance Program—United States, January 2017–December 2019" (D'Inverno et al., p. 485) contributes to the prevention effort by providing a novel way to monitor sexual violence via emergency department (ED) visits as reported by the CDC's National Syndromic Surveillance Program (NSSP). The authors report a positive trend of sexual violence–related ED visits across the three years of the study and significantly higher rates of sexual violence perpetrated against females than against males, consistent with existing surveillance data.

An interesting finding from the mapping of these NSSP data is a consistent spike seen in ED visits during the warmer months when school is out of session and a consistent decrease in ED visits during colder months when school is in session. If confirmed, this finding provides important insight regarding the potentially protective factor played by schools and provides an evidence-based target for prevention programs and monitoring during the summer months. Although the study provides a way to capture more timely data of sexual violence victimization in the United States, it does have limitations. It includes data only from sexual violence cases that are reported to EDs, and it is likely that only a fraction of sexual violence victimization is reported via this route.[4]

Further, the seasonal effect of sexual violence reporting may reflect reporting bias rather than victimization per se—that is, people may be less likely to report victimization when winter travel to hospitals and EDs is more challenging. When schools are in session, students may be more likely to report sexual violence victimization to school or campus authorities rather than EDs. Sexual assault in schools and on campuses might also differ significantly from those that occur away from school and campuses in the summer, leading to the change in ED reporting. Thus, rates of sexual violence victimization derived from syndromic surveillance should be used in conjunction with other data sources to verify trends in a timely manner, given the near real-time compilation of these data.

In the meantime, the public health community must continue to champion a sexual violence prevention paradigm. Pioneering work in this field, including Risk Reduction,[5] the Violence Prevention Model (Katz), and bystander intervention,[6] have culminated in the CDC STOP Sexual Violence Technical Package.[7] This package promotes social norms that protect against violence, teaches skills to prevent sexual violence, provides opportunities to empower and support those most likely to experience sexual violence victimization, creates protective environments, and supports victims and survivors to lessen harms. It is a practical approach that acknowledges the interaction of individual factors between intimate partners in a community and societal context. It is an excellent starting point that draws on existing evidence about the underlying causes of sexual violence.

The next step is to increase funding and resources to carry out large-scale intervention studies that draw on existing knowledge to reduce the incidence of (i.e., prevent) sexual violence. Given its human impact and cost, randomized control trials of more than 43 000 participants, as was recently achieved in just one COVID-19 phase III vaccine trial, should be commonplace in the field of sexual violence prevention. Longitudinal studies tracking the effectiveness of prevention programs over time and how to boost their efficacy should also be commonplace. Simultaneously, increased funding and resources should be allocated to basic research to identify other factors that contribute to power differentials and sexual violence perpetration, the improvement of existing intervention models, and the piloting of novel interventions. The speed with which the evidence base for large-scale prevention accumulates will be determined by the resources we devote to researching the problem. We are getting there, but there is much more work to do. AJPH

CORRESPONDENCE

Correspondence should be sent to Randall Waechter, WINDREF, St. George's University, Grenada, West Indies (e-mail: rwaechte@sgu.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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Building "Bridges" to Equity

Ann C. Miller, PhD, MPH, and Matthew H. Bonds, PhD

ABOUT THE AUTHORS

Ann C. Miller and Matthew H. Bonds are with the Department of Global Health and Social Medicine, Blavatnik Institute at Harvard Medical School, Boston, MA, and the health care nongovernmental organization PIVOT, Ranomafana, Madagascar.

See also Ssewamala et al., p. 504.

Poverty remains one of the most significant social determinants of disease, and both social and life scientists agree that poverty can lead the vulnerable to become even more so. Children who have lost one or both parents (single or double orphans) are among the most vulnerable. Beyond the tremendous grief and psychological toll, the loss of a parent often reduces income for the family; loss of a maternal parent in particular is associated with increases in malnutrition and death in sub-Saharan Africa.[1,2] Orphaned children are at increased risk of loss of education.[3] HIV is still a highly stigmatized condition in many places, and the loss of a parent combined with this stigmatization can lead to mental health issues such as depression. For example, a South African study found that poverty and HIV orphanhood predicted poor child mental health and educational risks.[4] Children with both factors had the highest rates of HIV infection.

In this issue of *AJPH*, Ssewamala et al. (p. 504) provide results from a five-year cluster-randomized clinical trial in Uganda (Bridges and Bridges PLUS) in which families of HIV orphans enrolled in the fifth and sixth grades were provided with either a 1:1 (Bridges) or 2:1 (Bridges PLUS) cash match for savings; both intervention arms also received workshops and mentoring on personal goals and finance for the students. These arms were added to usual services, which included school lunches and scholastic materials, and were compared with usual services as a control in improving self-reported physical, mental, and sexual health with secondary endpoints of financial stability. The investigators found that both intervention arms resulted in significant improvements in self-reported physical health at all time points, adolescent depressive symptoms at 24 months, and longer-term improved self-concept and self-efficacy, with improved savings in the 2:1 matches compared with control or 1:1 matches. However, this economic intervention did not result in differences in the main outcome of attitudes toward risky sexual behavior.

The study highlights the importance of social and financial determinants of the physical, mental, and economic well-being of vulnerable adolescents, and the potential for effective social interventions. Its strengths include a long duration, an assessment of mental health, a clear theory of change, and a robust design. However, a weakness, which was noted by the authors, is that the main endpoints of health and sexual risk are self-reported; no data from testing for HIV or other sexually transmitted infections were collected. So, despite the authors' emphasis on the synergies between economic, mental, and physical health, the intervention included no components directed specifically at physical health.

This latter issue highlights a significant challenge faced by those of us hoping to affect public health in any setting. "Poverty traps" refer to self-reinforcing systems of poverty, where preexisting economic conditions determine future economic conditions. Although this is sometimes regarded as an inability to save money (as suggested by the authors), economic constructs and solutions alone cannot be fully disentangled from other social and biological factors.[5] Poverty traps can spiral across generations as children become ill themselves, which can lead to developmental difficulties and limit their scholastic capacity and ability to acquire human capital, resulting in reduced adult earning capacity. Poverty traps can also occur when a parent's illness lowers a child's educational attainment, either because of an inability to pay fees or from the need of a child to contribute to family earnings. These effects of poverty traps are especially true in low-resource settings where household income is highly dependent on physical labor. Health care expenditures, then, can cause a catastrophic loss of income, allowing a household to fall into poverty from lost income. Additionally, external shocks such as natural disasters, political upheaval, or catastrophic illness can push a family back into poverty even when economic conditions were otherwise improving.

Targeting these highly vulnerable adolescents, the intervention suggested in the Ssewamala et al. article may act as a modest, individualized safety net, although the savings match was

earmarked specifically for participants' scholastics or for a family microenterprise. Interventions that focus on only the economic component, however, may be missing the direct advantages of health interventions to improve health outcomes. Further, combining health and economic interventions could go a long way toward breaking these cycles of poverty and disease, particularly by providing a preferential option for the poorest and most vulnerable. Safety net policies, designed to prevent households from falling below a minimum threshold of poverty or health, could be deployed; indeed, decoupling health access from the ability to pay through Universal Health Care Coverage policies is one of the most prominent of the United Nations' Sustainable Development Goals (https://sdgs.un.org/goals). Models have shown that a combined health and economic safety net results in a faster equilibrium than either individually.[6] Incorporating targeted mental and physical health initiatives as well could be feasible. A 2014 observational study in South Africa found that "cash plus care" (microtransfer plus "care" in the form of positive parenting and teacher–mentor support) was the most effective measure at reducing HIV risk behavior in adolescent girls, and the only effective measure in adolescent boys. Sadly, adolescents affected by AIDS in that study were significantly less likely to have access to the "care" portion.[7] Active intervention to support mental health, such as the mentoring portion of Bridges and Bridges PLUS, is thus a highly important component in interventions with adolescents affected by HIV/AIDS.

Smaller, individual-level interventions, however, will not have the impact of a large-scale system of support, especially in settings of deep poverty where structural factors play a strong role in the ability to engage in health services. For example, important synergies between deep investments in the health, education, and agriculture sectors were demonstrated in the Millennium Villages Project; despite the controversies associated with the initial evaluations, and although many targets were not met, significant improvements were observed in poverty, education, and especially health.[8] The Sustainable Development Goals set ambitious targets for poverty reduction, health improvement (including universal access to health care), and children's development and education, among other factors. As we have seen in the United States during the SARS-CoV-2 pandemic, stressing "personal responsibility" or individual behavior without supplying social supports that prevent vulnerable people from sinking into poverty is inadequate. People with limited access to resources often must continue to work in jobs that are likely to lead to increased exposure, to live and work in more crowded settings, and to have to use public transportation. As has become obvious, COVID, HIV, Ebola, and many other illnesses disproportionally affect the poor. Although the Bridges and Bridges PLUS intervention does target some of the most vulnerable, orphans living outside of families were not included, nor were those not in school. Systemic interventions that address economic, physical, and mental health are needed to break individuals and societies out of these poverty traps. For such combined systemic interventions to be effective, individual components must work; the work of Ssewamala et al. on this important piece of the puzzle is a critical step toward that goal. AJPH

CORRESPONDENCE

Correspondence should be sent to Ann C. Miller, PhD, MPH, Department of Global Health and Social Medicine, Harvard Medical School, 641 Huntington Ave, Boston, MA 02132 (e-mail ann_miller@hms.harvard.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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CONTRIBUTORS

Both authors contributed equally to this editorial.

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Measuring Intersectional Stigma Among Racially and Ethnically Diverse Transgender Women: Challenges and Opportunities

Katie B. Biello, PhD, MPH, and Jaclyn M. W. Hughto, PhD, MPH

ABOUT THE AUTHORS

Katie B. Biello and Jaclyn M. W. Hughto are with the Departments of Behavioral & Social Sciences and of Epidemiology, and the Center for Health Promotion and Health Equity, Brown University School of Public Health, Providence, RI, and The Fenway Institute, Fenway Health, Boston, MA.

See also Wesson et al., p. 446.

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In the United States, transgender women who were assigned a male sex at birth and identify along the feminine gender spectrum experience extensive discrimination, violence, and other forms of stigma.[1] Transgender stigma operates at the structural (e.g., discriminatory laws and policies), interpersonal (e.g., enacted discrimination), and individual (e.g., internalized stigma) levels to restrict access to the resources needed to maintain health, exacerbate psychological stress, and ultimately lead to the development or worsening of health conditions, including HIV.[1,2]

Transgender women are not a monolith: they have a diversity of identities (e.g., racial/ethnic, cultural), experiences, and related health risks. Indeed, regarding gender, there is much heterogeneity in how transgender women identify and visually express their gender, which can affect experiences of stigma.[1] Additionally, owing in part to the effects of racism, Black women, Latinas, and other women of color who are transgender have a substantially higher risk of many poor health outcomes, including HIV, than do White transgender women.[1,2] Notably, however, much of the existing research exploring health outcomes by race/ethnicity and gender treats these characteristics as distinct attributes that independently and additively create risk, rather than considering how these characteristics may interact to uniquely shape risk for people at different intersectional positions (e.g., transgender and Black). An intersectional framework offers an approach for exploring if and how intersecting marginalized statuses synergistically contribute to health disparities.[3] Despite the benefits of using an intersectional lens to examine HIV-related disparities among racially/ethnically diverse transgender women, there is a dearth of quantitative research.

In this issue of *AJPH*, Wesson et al. (p. 446) aimed to fill this gap by quantitatively examining the intersectional relationship between discrimination and HIV risk according to race/ethnicity and gender among a large sample of transgender women in San Francisco, California. In this first of its kind analysis, the authors use an intersectionality framework to assess participants' intersecting racial/ethnic and gender identities, experiences of perceived everyday discrimination, and the extent to which participants attribute experiences of discrimination to their race/ethnicity, gender identity (i.e., female vs transgender), or both. The authors found that Black and Latina transgender women more frequently reported attributing their experiences of discrimination to both their gender and race/ethnicity than did White transgender women.

This finding comes as no surprise given that being White is not a marginalized status in the United States, and thus White transgender women who report discrimination would be expected to attribute their experiences to their marginalized transgender status alone. However, contrary to the authors' hypothesis, dually marginalized transgender women (i.e., transgender identifying and racial/ethnic minority) were significantly less likely than were female-identifying and White transgender women to report experiencing discrimination in getting medical care, verbal abuse, and physical abuse. Moreover, although Black and Latina transgender-identifying women had a higher prevalence of HIV than did White female-identifying participants, this difference was explained by race/ethnicity alone, with no evidence of synergy between race/ethnicity and gender identity.

Quantifying intersectionality is complex, even among the general population[3]; the study by Wesson et al. highlights the

added challenge of measuring intersectional stigma among transgender people. Notably, interpersonal stigma (i.e., everyday discrimination) can occur only when one's marginalized status becomes known to another person.[1] The authors use gender identity as the indicator of transgender marginalization and hypothesize, based on previous research, that transgender women who identify as transgender will experience more discrimination and have worse health outcomes than those who identify as female.

Although the disclosure of a transgender identity (as opposed to a female identity) could lead a transgender woman to experience interpersonal stigma, having a nonconforming gender expression (i.e., an appearance that is inconsistent with societal norms of femininity) often drives mistreatment in social interactions.[1,4] Thus, by failing to include a measure of visual gender nonconformity, the authors may have misclassified the primary indicator of transgender marginalization. Additionally, relative to White transgender women, transgender women of color in this study were twice as likely to report having a transgender identity instead of a female identity; thus, the use of gender identity to explore the impact of intersectional stigma may have contributed to differential misclassification by race. Future studies should assess both gender expression and gender identity in relation to experiences of discrimination among racially/ethnically diverse transgender women.

In their study, Wesson et al. found that transgender women with multiple marginalized statuses (i.e., transgender and racial/ethnic minorities) were actually less likely to report discrimination than transgender women who were White and female-identifying. Indeed, although contrary to their hypothesis, as the authors note, racial/ethnic minorities have been shown to report fewer experiences of discrimination than White people, suggesting that being a Black or Latina transgender woman may actually be protective against perceiving or interpreting interactions as discriminatory. People of color are often taught at an early age to expect racism and navigate it.[5] As a result, it is possible that when White people, who enjoy more optimal treatment in social interactions, come out as transgender and begin to experience discrimination based on their gender expression or identity, they are able to perceive or detect negative shifts in how they are treated. Conversely, transgender women of color who have experienced racism throughout their lives may develop resilience in the face of adversity (i.e., stress-related growth), and this resilience may buffer against the detection of discrimination, independent of whether they identify as transgender or female.[5]

Notably, however, although previous exposure to discrimination and the development of related resilience may explain the lower prevalence of perceived discrimination among transgender women of color, as the authors note, perceived discrimination does not necessarily equate to objective experiences of discrimination. Transgender women of color may actually experience more stigma at all levels than White transgender women, yet detect it less. Future studies with transgender women should incorporate indicators of stress-related growth to assess the potential buffering effects of such resilience on perceived discrimination.

To fully assess the role of intersectional stigma as a driver of HIV-related disparities among racially/ethnically diverse transgender women, future studies must assess multiple sources of stigma, including the structural and individual processes known to contribute to poor health for transgender people.[1] Although the Everyday Discrimination Scale,[6] which was used in this study, is a validated and widely used measure of perceived stigma, as Wesson et al. note, it only measures interpersonal stigma, whereas other forms of stigma (e.g., structural barriers to health care and HIV prevention tools) may actually be stronger drivers of HIV risk.[1,2,7] Previous studies have used composite models of stigma that incorporate both perceived (e.g., self-reported discrimination) and objective (e.g., absence of nondiscrimination laws for transgender people) sources of stigma[8]; this approach could be used in future research to help overcome the methodological challenges of assessing intersectional stigma among racially/ethnically diverse transgender women.

Although faced with multiple methodological challenges, we commend Wesson et al. for centering this significant public health problem and attempting to examine HIV risk and potential intersectional drivers of risk among "the most vulnerable of the vulnerable"—transgender women of color. Like any good and novel scientific exploration, this study answered some questions and raised additional questions for future study. By commenting on the work of Wesson et al., we hope that we have laid out a path for future intersectionality research with transgender women. AJPH

CORRESPONDENCE

Correspondence should be sent to Katie B. Biello, Associate Professor, Brown University School of Public Health, 121 South Main St, 8th Floor, Providence, RI 02912 (e-mail: katie_biello@brown.edu).

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Folate: Its Biological Interactions and Strategies to Achieve Sufficiency Without Causing Excess

Elizabeth K E, MD, PhD, MD, DCH

ABOUT THE AUTHOR

Elizabeth K E is with the Department of Pediatrics, Sree Mookambika Institute of Medical Sciences, Kulasekharam, India, and the Tamil Nadu Dr. M.G.R. Medical University, Chennai, India.

"Prevention of neural tube defects (NTDs), congenital heart diseases (CHDs), facial clefts and other birth defects by folic acid (FA) supplementation" is an important milestone in the history of nutrition.[1(p1437)] The United States recommends FA for women of reproductive age to prevent 50% to 70% of neural tube defects.[2] The prevalence of neural tube defects is 1 to 10 per 1000 births, and food fortification and supplementation led to a decline of 10% to 80%, more with higher baseline prevalence.[3] However, FA supplementation may not reduce the prevalence to less than 0.5 of 1000 births. It is recommended that periconceptional FA supplementation start at least one month before pregnancy and continue throughout pregnancy. The dose recommended for high-risk mothers with an affected child for secondary prevention is 4.0 milligrams per day, and 0.4 milligrams per day is recommended for primary prevention.

The Boston Birth Cohort Study (1999–2014) assessed pre- and postconceptional FA intake among 7612 mothers—3829 Black, 2023 Hispanic, 865 White, and 895 others—and estimated serum folate in one third of them.[3] Less than 5% of mothers started before pregnancy. One third of mothers had lower and one fourth had higher serum folate levels. Compared with Whites, Hispanics had lower values. The Centers for Disease Control and Prevention National Health and Nutrition Examination Survey and National Pregnancy Risk Assessment Monitoring System data[3] showed major differences in serum FA levels among different racial/ethnic groups. Lower levels were noted among smokers and overweight and obese women.[3] Women of reproductive age, pregnant women, and those with malabsorption, alcohol usage, or single nucleotide genetic polymorphisms (SNPs) involving folate-metabolizing genes are prone to deficiency.

Data on the magnitude of sufficiency and deficiency of FA is not available. PubMed and the World Health Organization Vitamin and Mineral Nutrition Information System surveys concluded that more nationally representative data are needed. FA deficiency is attributable to low intake, increased demand, and altered metabolism. As nutrient–gene interaction is a modifiable risk factor, it is important to ensure sufficiency.[4] Thus, food fortification and supplementation may benefit a large subset of the at-risk population, especially in developing countries, which have a high burden of multiple deficiencies and birth defects in offspring.

FA is supplemented periconceptionally, during pregnancy, and in various conditions such as nutritional and hemolytic anemias. The tolerable upper limit is fixed at one milligram per day.[5] But many individuals consume higher doses, because only five milligrams tablets are available in some countries. A study from India reported high serum folate levels in children on FA supplementation for hemolytic anemia, which remained high even after reducing the dose from five to one milligram per day.[6] The potential dangers of excessive folate include cancer, asthma, developmental delay, and autism.[3]

SOURCES AND FUNCTIONS OF FOLIC ACID

Vegetables, fruits, nuts, beans, peas, seafood, eggs, dairy products, meat, liver, poultry, and grains are rich in folate. Folate is also synthesized by the gut microbiome. Total body folate is 15 to 30 milligrams—one half stored in the liver and the rest in blood and body tissues. Folate refers to naturally occurring pteroyl-monoglutamic-acid. Approximately 85% to 100% of supplemental FA, the oxidized synthetic compound, is bioavailable. The active form Tetra-hydrofolic-acid/Tetra-hydrofolate (FH4/THF) plays a definite role in one carbon

metabolism in the body, along with other B vitamins.

THE ROLE OF FOLIC ACID IN EMBRYOGENESIS

The role of folate in embryogenesis[4] and normal cell division makes it vital throughout gestation, unlike vitamin B12, which is not uniformly expressed throughout embryogenesis. Hence, vitamin B12–metabolizing genes exert mainly "moonlighting" functions.

Epidemiological and genetic studies highlight that FA prevents birth defects by the cellular methylation process, known as the "methylation hypothesis." Genetic modulation by external factors, without causing mutation, is called epigenetics. Thus, genes can be switched on and off to modify gene expression. Folate acts in two ways: via the methylation cycle and as an epigenetic factor.

FOLIC ACID'S INTERACTION WITH OTHER NUTRIENTS

The interaction of folate with other nutrients is crucial. FA and vitamin B12 are important for the formation and maturation of red and white blood cells. These are cofactors in several metabolic steps involving one carbon metabolism, DNA synthesis, stability, repair, conversion of homocysteine to methionine, 5-methyl tetrahydro folate (5-MTHF) to THF and production of *S*-adenosyl methionine (SAM), and the methylation, demethylation, remethylation processes (Figure 1). DNA modulation, like silencing of genes, by virtue of methylation is essential for the development and closure of the neural tube in the brain and spinal cord and other structures at the appropriate time. SNPs involving the methylene tetrahydrofolate reductase (MTHFR) gene results in deficiency of 5-MTHF, affecting methylation reactions in the body, which is important in a variety of body functions and gene expression. SNPs involving folate-metabolizing genes reduce the enzyme efficiency by 70%, with medical implications. Approximately 10% to 30% of the population has such SNPs. A study on children with congenital heart diseases and their mothers showed a four- to fivefold increase in related SNPs compared with the control mother–child dyads.[1]

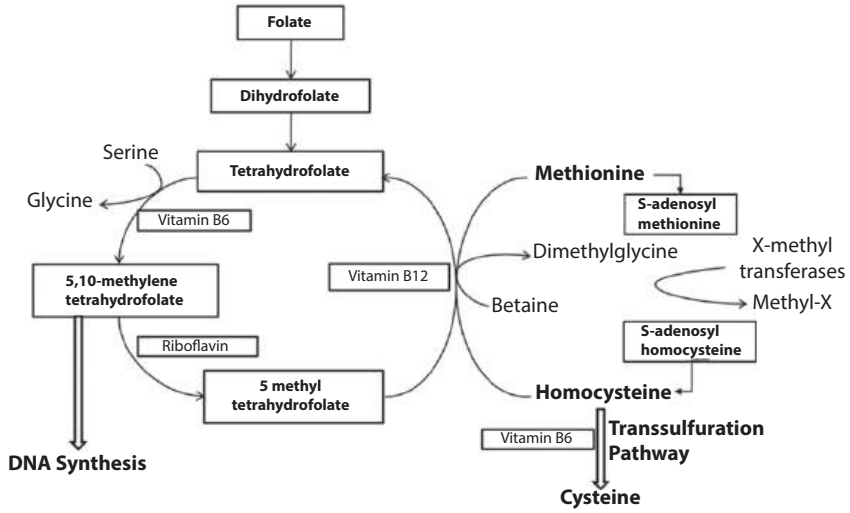

FIGURE 1— Metabolic Pathways and Functions of Folate and Vitamin B12

During folate transformation, a proportion of folate accidentally gets converted to the inactive metabolite 5-MTHF; this is known as the "methyl folate trap" and leads to a deficiency of 5,10-MTHF, which is essential for the synthesis of nucleic acids and DNA. In vitamin B12 deficiency, the methyl group cannot be transferred from methyl folate to the methionine cycle, so 5-MTHF accumulates. Thus, any folate from the diet is likely to get stuck in the inactive folate trap. This results in dyserythropoiesis, anemia, and cell damage. As the methionine cycle comes to a standstill (Figure 1), there is an increase in homocysteine, with multiple harmful effects in the body and a decrease in the SAM-dependent production of myelin, acetylcholine, and neurotransmitter synthesis.

Even though FA is a water-soluble vitamin, an excess can aggravate vitamin B12 deficiency by virtue of the folate trap. Vitamin B12 deficiency is rampant in strict vegans, those with malabsorption syndrome, those with absorption defects such as intrinsic factor deficiency, and other genetically susceptible individuals. Vitamin B12 deficiency leads to delayed milestones and neuroregression in infants, especially among offspring of deficient mothers, and juvenile pernicious anemia and spinal cord degeneration in older children and adults. Vitamin B12 is obtained from milk and milk products and nonvegetarian items. High folate with low vitamin B12 status during pregnancy is a risk factor for insulin resistance in the offspring.[7]

A study from South India reported FA, vitamin B12, and iron deficiencies as important public health problems, especially among 50% of women of reproductive age.[8] However, there are no universal supplementation and food fortification programs, except a targeted approach for iron and FA

supplementation. The supplementation recommendation is as follows: daily starting at 14 weeks of gestation through the first six months of lactation, biweekly from aged 6 to 60 months, weekly from aged 5 to 15 years, and among women of reproductive age. Standalone FA supplementation is given periconceptionally and whenever there is a medical reason.

REAPPRAISAL OF STRATEGIES

Many children and adults are on FA supplementation for different reasons. It is prudent to prevent FA excess, especially when there is possible vitamin B12 deficiency. Universal FA supplementation for all women of reproductive age without first establishing deficiency needs reappraisal—especially because most women are not planning a pregnancy. Nutrition education plays a key role in a healthy outcome with no deficiency or excess of the nutrient. Dietary diversity to ensure an adequate supply of all essential nutrients is the best strategy, as dietary sources are unlikely to cause excess vitamin consumption. FA supplementation, if undertaken, should be closely monitored, tailored on a weekly basis, and optimized to the tolerable upper limit.

SUMMARY

- Periodic surveillance is recommended to assess nutrient sufficiency and deficiency.
- Approaches such as dietary diversification and food fortification and supplementation should be adopted as needed and when feasible.
- Even though targeted FA supplementation to regulate gene expression is an exciting option, its interaction with other micronutrients and the possibility of excess FA must be considered. Ensuring enough other nutrients, especially vitamin B12, is important.
- A personalized rather than a one-size-fits-all approach is recommended to maximize health benefits and minimize adverse effects.
- Supplementation should not exceed the tolerable upper limit of 1000 micrograms per day and may be considered on a weekly basis, except for special therapeutic benefits. AJPH

CORRESPONDENCE

Correspondence should be sent to Elizabeth K E, Mangalathumannil, Nalanchira, Thiruvananthapuram, Kerala, India-695015 (e-mail: drelizake@gmail.com). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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Preparing the Public Health Workforce for the Post–COVID-19 Era

Sandro Galea, MD, DrPH, and Roger Vaughan, DrPH, MS

ABOUT THE AUTHORS

Sandro Galea is with the School of Public Health, Boston University, Boston, MA. Roger Vaughan is an AJPH *associate editor and is with the Department of Biostatistics, The Rockefeller University, New York, NY.*

See also Plepys et al., p. 475.

The COVID-19 pandemic changed everything. No event in living memory has had such a ubiquitously felt impact on all aspects of daily living all over the world. During the first wave of the pandemic alone, in spring 2020, more than half of the world's population was under lockdown, with about four billion people in 90 or more countries and territories having been ordered or asked to stay at home by relevant authorities. COVID-19 has now dominated all news headlines for the past 12 months, and it is only in recent weeks that the contours of the pandemic's end—as a COVID-19 vaccine became available in record time—began to take shape.

There remains much to be understood and written about the COVID-19 pandemic and much that will become clear with time, but there is little doubt that this pandemic will be remembered as the moment when public health took center stage. It was, after all, a public health crisis that resulted in the complete upending of the way of life for much of the world's population and that precipitated a global economic recession unrivaled for nearly a century. It became commonplace worldwide to have epidemic curves on the front page of newspapers and on social media feeds, and epidemiologic concepts such as R_0, previously familiar only to those in the field, became the subject of public debate and discussion. Public health experts worldwide gained prominence that they had never had before, and the field vaulted into visibility, attracting attention and interest as never before.

This all may have been heartening, if a bit dizzying, for those in public health. But perhaps more importantly, this galvanizing interest in public health has implications for the next generation of public health professionals. It remains to be seen whether the increased interest in public health will translate into growing numbers of public health students and professionals in coming years. It is not too early, however, to pause and reflect on the future public health workforce and what that workforce should look like, taking into account what we have learned during COVID-19.

An article in this issue of *AJPH* by Plepys et al. (p. 475) affords an opportunity for early reflection on this topic. The authors use data collected by the Association of Schools and Programs of Public Health to document students' occupational choices after graduating from public health programs between 2015 and 2018. Analyzing data from more than 50 000 graduates, Plepys et al. found that 94% of graduates were employed and that employed graduates went to work in health care (27%), corporations (24%), academia (19%), government (17%), and nonprofit organizations (12%) primarily. These data were clearly collected before the COVID-19 pandemic but show, with implications for how we may think of public health employment looking forward, both that public health graduates are highly employable and that the breadth of occupations in which public health graduates engage is more expansive than is perhaps typically recognized within and outside the field. Reflecting on these data, and on the COVID-19 moment, we find three ideas that may serve us well as we prepare the best possible public health workforce to meet the challenges of the coming decades.

REFLECTIONS ON PREPARING THE FUTURE WORKFORCE

First, we are probably undertraining students to meet the demands of the coming decades. The case has been amply made that we, as a country, have long underinvested in public health[1] and that it is partly that underinvestment that resulted in the United States being underprepared for the COVID-19 pandemic. Although the United States has been perhaps an extreme example of lack of preparation during the past year, many other countries were underprepared as well.[2] Pre–COVID-19 analyses showed that the number of persons

engaged in the public health workforce has been declining over the past several years, leaving a substantial projected shortfall of public health workers in coming decades.[3] This was the case before COVID-19 and will certainly be even more so in its aftermath. We imagine, and hope, that there will be a reinvigorated commitment to public health spending in the coming decades. This will doubtless need to be accompanied by an expansion of the public health workforce, which will require an expansion of training opportunities.

Second, the Plepys et al. article is striking in reinforcing that it is a minority of public health graduates who are working in what we may consider the traditional public health sector, that is, governmental work that aspires to promote public health goals. A majority of public health graduates go on to work in health care and corporations. This is an important reminder of the essential, tight links between health care and public health. Recent years have seen, appropriately, a growing effort to assert the difference between public health and medicine and the importance of a public health approach to the world as opposed to a medical approach[4]; however, the two areas remain intimately connected by their aspirations to generate health and functionally connected by a workforce that is committed to this goal. Public health graduates are trained to bring their perspectives and their leadership and management skills to developing the programs and structures that promote health. Many of these programs and structures are grounded in health care systems and will likely continue to be so in coming decades.

For example, the emergence of vaccine delivery through large-scale systems to end the COVID-19 pandemic demonstrates the need for public health's engagement with health care systems. We must redouble our effort to bridge the gaps between public health and medicine, to capitalize on the growing recognition of the role of foundational factors as the best focus for public health, and to understand how that role complements a curative and medical approach to treating sickness. This will require a greater commitment to interprofessional education and to teaching health care in public health and teaching public health in clinical fields, to create a workforce conversant in the full scope of the aspirations of the health enterprise.

Third, that fully a quarter of public health graduates are working in the private sector is an important evolution and one that we suspect will only grow in coming decades. Relatively few of those in prominent or leadership positions in public health today have had substantial experience in the private sector; this is clearly changing and will change further if, as expected, more private sector actors recognize the need to embed public health as a core part of their operations. The emerging conversation about the role of chief public health officers is simply the tip of the iceberg in terms of the potential to engage public health graduates in the private sector.[5] Those of us in public health today should welcome this shift. After all, insofar as our goal is to create the conditions for people to be healthy, and those conditions are created in no small part by the private sector, our future students will be better served by training that prepares them for engagement with all sectors—including the private sector. This will require some rethinking of our intellectual engagements with public health, moving beyond categorical injunctions against private sector engagements toward thinking about how we can learn from and better work with private sector colleagues. This promises to be interesting and potentially challenging, but it is clearly a challenge whose time has come.

CONCLUSIONS

Public health's emergence into the global limelight stands to transform how we work. The work of students who are attracted to public health in particular will transform, as will what they might expect from, and can bring to, the work of public health. Thinking ahead to the coming decades requires us to conceptualize an expansion of the public health workforce and think creatively of how we can better train future public health experts to engage with both the health care and the private sectors. This will require curricular and programmatic imagination and is a compelling opportunity in time for the transformation of public health education. AJPH

CORRESPONDENCE

Correspondence should be sent to Roger Vaughan, The Rockefeller University, 1230 York Ave, New York, NY 10065 (e-mail: roger.vaughan@rockefeller.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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The Syndemics of Emergency: How COVID-19 Demands a Holistic View of Public Health Promotion and Preparedness

Vinyas Harish, BCompH

ABOUT THE AUTHOR

Vinyas Harish is with the MD/PhD Program, Temerty Faculty of Medicine, University of Toronto and the Institute of Health Policy, Management and Evaluation, Dalla Lana School of Public Health, University of Toronto, Toronto, ON, Canada.

For all the suffering brought on by the COVID-19 pandemic, a broader examination of 2020 news headlines reminds us that it is not an event occurring in a vacuum—but rather within a complex interplay of crises in global public health. Some of these crises are acute events with immediately devastating consequences, such as the Australian wildfires. Others, such as the epidemic of misinformation, are more insidious and slowly erode at a population's ability to promote and protect health. To borrow language from clinical medicine, most crises are "acute-on-chronic," as with the boiling over of longstanding racial tensions in the United States following the murder of George Floyd. When COVID-19 is placed in the context of these other public health crises, it is clear that their causes and effects are deeply intertwined. The current pandemic has changed my perspective of public health by demanding a reckoning of the "syndemics of emergency."

Health emergencies encompass both acute events (e.g., pandemics, mass casualty events) and chronic ones (e.g., climate change, systemic racism and inequality) because both can overwhelm a community's ability to respond to them, albeit on different timescales.[1] Syndemics, or synergistic epidemics, are the presence of multiple disease states that adversely interact with one another as well as their social and environmental contexts—ultimately amplifying their deleterious effects.[2,3] COVID-19 is undeniably a syndemic. Environmental degradation contributed to the original viral spillover event, globalization fostered the virus's rapid spread, and political partisanship and failures in governance resulted in the pandemic spiraling out of control in countries such as the United States. In the months that followed, COVID-19 triggered economic freefall, ravaged those with preexisting conditions such as asthma and diabetes, and threatened progress on a wide range of health and development targets[4]—all of which disproportionately affect marginalized communities.

By considering the syndemics of emergency, the necessary future directions for a postpandemic recovery are clear: holistic efforts to address all cooccurring health emergencies and not merely targeting the "disaster du jour."[1] This view is not Sisyphean but empowering because it inherently values cross-cutting initiatives. For example, efforts to curb carbon emissions as seen through this lens would not only strive to reduce the consequences of extreme weather events but also recognize the need for social justice as communities of color are disproportionately affected by the downstream effects of air pollution. In the context of emerging infectious diseases, a syndemics approach mitigates ongoing crises and prevents outbreaks, snuffs out outbreaks before they turn into pandemics, and guides communities to equitable recoveries. Syndemics ultimately is a useful framework across the spectrum of public health initiatives.

There are five tangible ways to incorporate a syndemics lens into the work of the next generation of public health professionals. First, systems thinking offers public health practitioners an important conceptual and methodological toolbox for understanding and tackling problems in real-world environments.[5] This toolbox is vital because health emergencies involve many actors (i.e., individuals, communities, and institutions) whose interactions and interdependencies lead to outcomes as emergencies arise and unfold.

Second, we must seek and use data for precision and population-level interventions.[6] Accurate, timely, and actionable data are necessary both to understand the extent of issues threatening community health and to measure the effectiveness of solutions for health promotion and protection. This may also involve critically appraising and filling gaps in surveillance infrastructure; for example, the reliance on fax machines has been widely held as a limitation in the public health response to COVID-19 across jurisdictions.

Third, holistically addressing health emergencies requires collaboration across disciplines. As a student in a clinician–scientist training program, I am training to bridge the gap between clinical medicine and public health. However, these perspectives alone are not sufficient. As I have emphasized throughout this editorial, health emergencies are "wicked problems" and necessitate collaboration between experts in economics, governance, engineering, environmental science, and more. Uniting professionals across these disciplines with the common goal of promoting and protecting health, perhaps also with systems thinking as a shared toolbox, can ensure that solutions to health emergencies are not "dead in the water" because of critical oversights when relevant expertise goes unfilled.

Fourth, public health practitioners must have a firm commitment to emergency prevention and response that is grounded in intersectionality. This is important because individuals at the intersection of multiple marginalized groups (e.g., a temporary worker who is housing insecure and a racial/ethnic minority woman) face interlocking systems of oppression from structural inequities and are at the highest risk of morbidity and mortality during emergencies.[7] We must strive to ensure that health promotion and emergency preparedness are tailored to addressing the different experiences and needs of these intersecting groups and not settle for one-size-fits-all solutions.

Finally, as the next generation of public health professionals, we must not hesitate to champion our communities in the political arena. Evidence is only as good as the decisions that are made with it, and thus public health concerns must be taken into consideration when and where political decisions are made. COVID-19 has propelled many of the ideas I have outlined into public awareness, and ongoing democratic engagement can allow us to capitalize on this momentum to enact lasting change. These suggestions are relevant not just for COVID-19 but also for crises yet to come.

In Greek mythology, Heracles's second labor was to slay Hydra, a multiheaded monster who could regenerate its heads when they were severed. As public health practitioners, we are now facing our own Hydra. Addressing one crisis at a time is doomed to fail, as crises are not discrete and distinct entities but rather are deeply linked. Adopting a syndemics approach is a sorely needed change in strategy by which we can address the root issues underlying these crises and work toward preventing new ones from emerging. Only by doing so, can we prevail. AJPH

CORRESPONDENCE

Correspondence should be sent to Vinyas Harish, MD/PhD Student, Population Health Analytics Laboratory, Dalla Lana School of Public Health, 6th Floor, Health Sciences Building, 155 College St, Toronto, ON M5T 3M7, Canada (e-mail: v.harish@mail.utoronto.ca). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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Communicating Effectively About Emergency Use Authorization and Vaccines in the COVID-19 Pandemic

Sandra Crouse Quinn, PhD, Amelia M. Jamison, MAA, MPH, Vicki Freimuth, PhD

ABOUT THE AUTHORS

Sandra Crouse Quinn is with the Department of Family Science and the Maryland Center for Health Equity, School of Public Health, University of Maryland, College Park. Amelia M. Jamison is with the Maryland Center for Health Equity, School of Public Health, University of Maryland. Vicki Freimuth is with Center for Health and Risk Communication (Emeritus), University of Georgia, Athens.

The Emergency Use Authorization (EUA) mechanism is central to the US response to coronavirus disease 2019 (COVID-19). It allows the US Food and Drug Administration (FDA) to respond quickly to novel threats by approving a new drug, device, or diagnostic procedure or expanding off-label use of an existing drug through an accelerated approval process.[1] To obtain authorization, evidence must support that a drug or product "'may be effective' to prevent, diagnose, or treat serious or life-threatening diseases or conditions," and the known or potential benefits of the product must outweigh known or potential risks.[2(p7)] The authorization also stipulates that when feasible, a fact sheet is provided to address risks and benefits and make clear that acceptance is voluntary.[2]

Since March 2020, the FDA has issued EUA for several therapeutics to treat COVID-19: chloroquine phosphate, hydroxychloroquine sulfate, remdesivir, and a monoclonal antibody drug from Eli Lilly to help the immune system fight COVID-19.[3] The FDA later revoked its approval of chloroquine phosphate and hydroxychloroquine sulfate, stating that the drugs did not meet the legal criteria for approval.[4] The FDA also revised its fact sheet for remdesivir to reflect potential drug interactions.[5] Given the rapidity of changing knowledge of COVID-19, it is not surprising that the FDA would revoke or modify EUA approvals. However, its decisions about several EUAs have called into question the extent to which the FDA can withstand political pressure as it faces all decisions.

Daily news coverage tracks progress in the accelerated COVID-19 vaccine development process.[6] On November 13, 2020, Pfizer became the first company to seek approval of its COVID-19 vaccine through the EUA mechanism, making it the first instance of EUA approval for a vaccine.[7] Therefore, it is vital to assess how the public understands the EUA mechanism and how this may influence willingness to accept COVID-19 vaccines.

LEARNING FROM PAST RESEARCH

Given the severity of the COVID-19 pandemic, it will be essential that the public willingly take a vaccine once it is available. However, multiple polls report substantial hesitancy about a potential vaccine.[8] Previous research suggests that when it comes to EUA therapeutics and vaccines, the public may have significant hesitancy. During the influenza A (H1N1) pandemic, a national survey assessing willingness to accept existing EUA therapeutics and a hypothetical EUA vaccine found that only 8% of the respondents were willing to accept an EUA vaccine, with 28% reporting uncertainty and 64% outright refusal.[9] Hispanic adults reported the highest willingness at 16.6%, followed by White adults at 7.2% and African American adults at only 4.2%. A 2010 survey examining the acceptance of peramivir, approved as an EUA, found that use of the term "experimental" on the fact sheet decreased willingness across the board, and particularly for African Americans.[10] Given the history of research abuses and ongoing racial bias in health care, this reaction is not surprising. Both studies found that greater trust in government action was associated with willingness to accept EUA products.[9,10]

In a qualitative study on public understanding of medical countermeasures, Liu et al.[11] assessed willingness to comply with protective actions during a hypothetical novel respiratory virus scenario. Respondents had poor understanding of terminology used to describe novel drugs and EUA. Free

association with terms used in EUA fact sheets like "experimental," "accelerated approval," and "off-label" prompted respondents to have strong negative emotions.[11] The phrase "Emergency Use Authorization" triggered mixed responses, ranging from "important" and "helpful" to "risky," "suspicious," "desperate," and "over-controlling."[11] Only 15% of the participants reported likely compliance with EUA recommendations in this scenario.[11] All participants reported a significant need for more information beyond what is typically included in a fact sheet. Liu et al.[11] concluded that a single fact sheet for the public will not be effective, and tailored and targeted fact sheets are necessary for different populations. They concluded that "pre-emergency education" about medical countermeasures is needed.[11]

CRAFTING AN EFFECTIVE COMMUNICATION STRATEGY

This literature suggests that unique challenges exist when communicating about drugs or vaccines offered under an EUA. The health threats they address are extraordinary, clinical experience is limited, and the development and approval processes are frequently accelerated.[12] With these challenges and an active antivaccine movement already campaigning against any COVID-19 vaccine, we recognize the significant reluctance among the American public. Public health leaders face multiple barriers to communicating effectively to ensure vaccine uptake when available. To overcome these barriers, we offer recommendations based on our previous research and the principles of effective emergency risk communication (see the box on p. 357).

First, we need to begin communication immediately. Most people form judgments about new ideas based on mental models they have developed from past experiences. Few people have a clear mental model of the vaccine development process, making it difficult to understand what it means for the process to be accelerated. The White House's adoption of Operation Warp Speed and promises of a vaccine by fall 2020 have undermined trust in any vaccine, whether as an approved EUA or not.[13] Graphic representations of the vaccine process, such as the *New York Times* "Coronavirus Vaccine Tracker," may be helpful to demystify the complex process and reassure individuals about the multiple levels of quality control and the independence of various entities along the production chain.[14] Greater transparency about the process may potentially address underlying fears about the pharmaceutical industry's motives or concerns about the politicization of the process.

We also need to be sensitive to the language we use when communicating about new vaccines. Messages should be jargon-free, accurate, confident, and consistent. Formative research should start now while vaccines are in development to understand socioeconomic, cultural, and other issues that can inform message development and appropriate personal and media sources when communicating to different segments of the public, recognizing that Black, Latinx, and Native communities will require specific attention. EUA fact sheets present their own communication challenges, because they are required to balance legal mandates while still communicating effectively to both medical and public audiences.[9]

Transparency is key, particularly as new data become available. The release of trial protocols by Moderna and Pfizer, and now other trial sponsors, is a step in the direction of transparency but will require further translation for public audiences.[15] Any vaccine will likely have risks associated with its use, and these must be clearly communicated. Two vaccine candidates now in clinical trials are using technologies not previously approved for vaccines, and given the speed of the research process, it would not be surprising to learn more about potential side effects after any EUA.[14] It would behoove the FDA to be forthright and clear in communicating with the public and to avoid overpromising on results, balancing optimism with realistic assessments of existing research. We already have evidence that some elected officials and individuals do not recognize that change is a given in this fast-moving pandemic and may interpret any new findings about a vaccine given EUA as problematic. We must inform the public that even after a vaccine is approved as an EUA, the FDA and the Centers for Disease Control and Prevention will continue to monitor for safety and adverse events and will adjust its guidance as needed.[2] Clarifying this process and identifying how the FDA will communicate any revised guidance will be critical.

We know that public health and government officials are not the only ones who will be communicating about these new vaccines. With the antivaccine movement already fully engaged in spreading misinformation and elected officials sharing inconsistent and contradictory information, the United States has a competitive communication environment. All this communication should be monitored and judgments used to determine when misinformation should be addressed and when it should be

Recommendations for Effective Emergency Risk Communication to Ensure Vaccine Uptake
Transparency
FDA must communicate to the public about the monitoring process during vaccine trials and after any EUA.
FDA must confirm that they will release full data on adverse events and modify EUA approvals and fact sheets accordingly.
FDA needs to develop guidelines for the timing of reporting adverse events.
Pharmaceutical companies must release protocols for review by independent scientists.
Pharmaceutical companies must continue to update the public on enrollment.
Pharmaceutical companies should release findings on safety and efficacy from their Data Safety and Monitoring Boards, including data and recommendations.
Partnerships
Local, state, and federal public health agencies must engage with partners, both public agencies and other organizations, including health professional associations; national public health partners such as Association of State and Territorial Health Officials and National Association of County and City Health Officials; national organizations that represent diverse members including civil rights groups, faith communities, civic groups, and media and communication firms that specialize in reaching Black, Latinx, and Native Americans and Alaska Natives.
Public health agencies must work with these partners before release of a vaccine to understand community concerns and begin to tailor communication messages and channels.
Public health agencies must share key messages with these partners to increase FDA and CDC reach.
Agencies need to sustain this engagement to help monitor community reactions, clarify misconceptions, and amplify messages.
Training for health care providers
Public health agencies should distribute tested talking points for providers and community leaders to help them answer questions about the EUA mechanism and the new vaccine, such as: How do we know these products are safe? How does this new vaccine work? How is an EUA different from a "normal" vaccine?
Public health leaders must recognize that the initial vaccines will have been tested only on adults, which therefore will require that health care providers who treat adults, and may have less experience with vaccination, will need extra assistance in preparing for patients' questions and concerns.
Fact sheets
Public health leaders should start testing terminology before vaccine availability.
Public health leaders should examine understanding of terminology and affective responses.
The sponsor submits fact sheets in the EUA application, and then FDA should engage their communication staff and legal staff in reviewing fact sheets and, ideally, work with the sponsor to test them with audiences before using them.
FDA and the sponsor must ensure that the messages in the fact sheets are consistent with information disseminated before vaccine administration.
FDA and the sponsor must test for readability and clarity and avoid language that stimulates negative responses (i.e., experimental).
FDA and the sponsor should consider formats that may facilitate understanding, including questions and answers and inclusion of a glossary.
Local, state, and federal public health agencies must widely circulate fact sheets through multiple channels and in advance—under ideal circumstances.
Uncertainty and changing guidance
FDA, CDC, and others must continue to acknowledge uncertainty and prepare the public for change.
FDA should share with the public the difficulties faced while making decisions about an EUA vaccine, particularly with continually evolving information.
FDA should inform the public that they will share new information even after approval of an EUA vaccine.
FDA, CDC, and others must remind the public that changes in fact sheets or even approvals occur because ongoing monitoring identifies new data.
Monitoring media communication
FDA, CDC, and other public health leaders should monitor communication in traditional and social media and make sound judgments about when to ignore and when to respond to misinformation.
FDA and public health agencies should monitor social media to identify emerging issues with FDA communication about an EUA vaccine.
FDA needs to work with agency and external partners to use social media to amplify key messages.
Effective use of role models for taking the EUA vaccine
Public health agencies can use photographs and quotes from role models, such as community leaders, celebrities, elected officials, and health care providers, as they take the EUA vaccine.
Public health agencies must be cognizant of tailoring these messages to specific audiences.
Clear communication
Public health communicators should use the CDC Clear Communication Index to assist in ensuring readability of all fact sheets and printed materials and understandability of online materials (https://www.cdc.gov/ccindex/index.html).

Note. CDC = US Centers for Disease Control and Prevention; EUA = Emergency Use Authorization; FDA = US Food and Drug Administration.

ignored, weighing the risks of inadvertently amplifying a fringe conspiracy theory against the need to publicly debunk a widespread and dangerous falsehood.

This task of communicating effectively must be a shared one. In a crisis when the public has an intense need for information, one organization cannot do it alone. Local, state, and federal public health agencies must form partnerships with community organizations, health care providers, faith communities, the media, the private sector, unions, and civic associations. These organizations are closer to their audiences; know how to effectively tailor information; and, most importantly, have trusted leaders who can be effective spokespersons for any upcoming vaccine receiving EUA. Ideally, this communication is a bidirectional process, with feedback that enables public health leaders to adapt and tailor their communication strategies.

LOOKING AHEAD

Today, we face a unique constellation of factors that will affect the public's acceptance of any vaccine given EUA. With the steadily rising death toll, the public's perception of risk may remain high, but with clear communication about the vaccine, acceptance may be higher than history and today's polls would tell us to expect. However, accelerated timelines and active antivaccine misinformation, coupled with distrust of expert opinion and declining trust in governmental agencies, present an unprecedented challenge. Public health agencies and their partners must start communicating effectively now. AJPH

CORRESPONDENCE

Correspondence should be sent to Sandra Crouse Quinn, PhD, Professor and Chair, Department of Family Science, School of Public Health, University of Maryland, 4200 Valley Dr, Suite 1142, College Park, MD 20470 (e-mail: scquinn@umd.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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Priorities for Alcohol Use Disorder Treatment and Prevention During COVID-19's Second Wave

Jennifer Attonito, PhD, Karina Villalba, PhD, and Shelley Fontal, BS

ABOUT THE AUTHORS

Jennifer Attonito is with Health Administration Programs, College of Business, Florida Atlantic University, Boca Raton. Karina Villalba and Shelley Fontal are with Population Health Sciences, College of Medicine, University of Central Florida, Orlando.

Comical memes have circulated referencing the US population emerging as "alcoholics" from COVID-19 quarantine. Although these are amusing, the intersection between substance use disorders and global pandemic conditions is far more menacing. By the end of 2020, deaths from COVID-19 surpassed 300 000, and more than 19 million cases were reported in the United States. Although the pandemic affects everyone, the risk is especially severe for the millions of vulnerable Americans with alcohol use disorder (AUD) and, alternately, for those at risk for developing this condition as a result of pandemic-related factors.

Consensus is emerging among disaster researchers that the severity and incidence of substance use disorders increase as a result of disaster-related psychological changes. Disaster exposures involve behavior changes and readjustment related to unanticipated problems, such as job loss, housing insecurity, and loss of a loved one.[1] Research shows that coping with such trauma-related stressors as well as posttraumatic stress symptoms may manifest in increased alcohol consumption.[2] Moreover, substantial research has shown that the tensions of having children at home, financial instability, lack of mobility, and other pandemic stressors may exacerbate domestic violence against partners or children. These associations are further augmented by alcohol consumption.[3]

The pandemic's stressors and alcohol consumption are reciprocal. It is well-recognized that alcohol abuse is associated with a range of communicable and noncommunicable conditions such as HIV/AIDS, cardiovascular disease, and liver disease. Furthermore, persons with AUD have increased susceptibility to respiratory pathogens and lung injury, including a two to four times greater risk of acute respiratory distress syndrome, which is a key cause of death in COVID-19.[4] Thus, the World Health Organization (WHO) and the Centers for Disease Control and Prevention have issued statements about the short- and long-term physical and mental impacts of alcohol abuse during the pandemic. Serious implications for access to services for patients with alcohol-related issues have also been noted.

The confluence of fear, routine disruption, financial distress, and isolation experienced throughout the world during a global pandemic can certainly affect mental health and substance use at a population level. For example, research on the psychological sequelae of SARS (severe acute respiratory syndrome) and MERS (Middle East respiratory syndrome) showed substantial increases in posttraumatic stress symptoms, which were correlated with substantial increases in alcohol use up to three years after the SARS epidemic.[5] Moreover, evidence from previous mass traumas, such as the 9/11 attacks and Hurricane Katrina, suggests that the stress of these events and anxiety about the future can increase alcohol consumption and exacerbate AUD.[6] Similarly, COVID-19 has resulted in an overall increase in fear, anxiety, and depressive symptoms among the general population. In a recent cross-sectional survey, about one fourth of respondents indicated experiencing a trauma or stress-related disorder, and at least 10% reported an increase or initiation of alcohol use specifically related to COVID-19.[7]

Although an overall decrease in alcohol-related sales at bars and restaurants has been observed as a result of COVID-19 closures, other forms of alcohol distribution have reported record-level activity. Such findings may be cause for concern, as research shows that a greater overall alcohol intake is associated with an increased risk of developing AUD. Off-premise sales of alcoholic beverages rose by 55% during May 2020 compared with May 2019.[8] Online sales went up 477% since the start of quarantine, and ready-to-drink cocktails rose by 106% compared with

last year.[9] Alcohol home delivery and cocktail carryout services have taken the place of bars during quarantine, and in most states, liquor stores remain open for business; although the service industry is slowly reopening, home delivery could become the new normal. With these changes in alcohol consumption and distribution, it is important to activate a multidimensional range of approaches to mitigate the more serious alcohol-related harms arising from this pandemic.

Routine access to drug treatment is vital to avoid relapse and to treat AUD-related comorbidities. However, not only is COVID-19 making access to in-person treatments nearly impossible, but it is limiting the amount of services available. One avenue to alleviate the lack of access for in-person consultation is to increase access to telebehavioral health services. In addition, we need to support longitudinal research to further understand the impact of COVID-19 on substance use. Finally, we need to review current alcohol policies and suggest changes that may be warranted.

TELEMEDICINE

Although this is a highly isolative time for most, many AUD recovery programs rely on peer support, behavioral therapies, and in-person treatments that help patients avoid relapse or escalation in alcohol use. However, in-person visits might prove difficult during the pandemic: traditional in-person therapies or support groups have been cancelled or moved online, COVID-19 has affected staff availability for work, and some patients may require home isolation. A study of substance use disorder service utilization after Hurricane Katrina observed a downward trend in admissions over time because of systemic interruptions in access. However, it may be possible to circumvent such interruptions related to COVID-19, engaging and retaining patients in treatment. Nora Volkow, director of the National Institute on Drug Abuse, reported that COVID-19 has resulted in increased availability of telephone- and Web-based peer support channels to aid individuals' recovery.[10] For example, Alcoholics Anonymous meetings, an effective method for drug and alcohol abstinence when used in conjunction with other treatment options, is now widely available via common online meeting platforms.[11]

Online support may present challenge: access to a computer or the Internet may be limited, messaging can be easily misinterpreted, and communication challenges can arise from the lack of visual and aural cues typically relied on in face-to-face communication. It is critical to provide alternative options to virtual groups. A recent study in London, United Kingdom, demonstrated that virtual clinical contact with an alcohol nurse specialist during lockdown was positively correlated with avoiding relapse and even developing new abstinence behaviors during isolation.[12] Because of a decrease in accessible in-person treatment options, aggressive outreach programs should be put in place to retain existing patients in care and encourage new patients to seek treatment; research shows that patient outreach interventions result in increased treatment attendance and continuity of care.[9]

Policy changes have also been enacted to support rapid adoption of telebehavioral health services to ensure continuity of care for people with AUDs, and many states are expanding Medicaid and reopening insurance exchanges under the Affordable Care Act. The Substance Abuse and Mental Health Services Administration (SAMHSA) has relaxed regulations governing telehealth, broadening access to recovery services.[13] Although these are steps in the right direction, we must continue to expand and improve existing telebehavioral health services to prepare for a coming mental health and substance use disorder crisis—a "second wave" as described by the mental health community—and support from the government will be required to reinforce the behavioral health system.

LONGITUDINAL RESEARCH

It is important that longitudinal research be conducted on the potential psychological effects and comorbid AUDs anticipated from this unprecedented health crisis. Drawing from past observation, we can predict that we are likely to witness a long-term increase in AUD cases stemming from both an increase in current consumption and psychological distress related to COVID-19. Research from China found that alcohol use increased substantially up to three years after the SARS epidemic.[5] It is important to note that the SARS epidemic did not require mass, long-term isolation as we have experienced with COVID-19. Research shows that longer durations of quarantine are associated with poorer mental health and posttraumatic stress symptoms, thus psychological consequences from the current pandemic may be more severe.[14]

Post-9/11 research showed that alcohol use increased as a result of posttraumatic stress symptoms and that the intensity of exposure predicted a greater likelihood of binge drinking.[15] With recent studies showing that the COVID-19 pandemic is having similar psychological effects and that alcohol is being used as a coping mechanism, an increase in alcohol use and a

subsequent increase in the amount of AUD cases is to be expected. Health registries such as the World Trade Center Registry and similar longitudinal analyses will help us better understand and respond to the complex relationship between pandemic-related trauma, AUD, and other psychological comorbidities.

POLICY ANALYSIS

The vast majority of states have allowed alcohol takeout and delivery, and at least 40 states deemed liquor stores essential businesses during shelter-in-place orders. However, relaxed sales policies that may serve to protect restaurants and bars contribute to major long-term costs from alcohol harm. The relaxation of licensing restrictions is allowing establishments such as restaurants and bars, which are not usually authorized to sell alcohol to go, to sell alcohol for at-home consumption. In addition, home delivery services such as contactless delivery may result in alcohol being left unattended without verifying the condition or even the age of the customer, contributing to possible alcohol abuse.[16] A WHO alcohol policy review describes the importance of restricting physical access to alcohol, and literature reviews have shown that regulating the hours, days, and density of alcohol availability are effective strategies for reducing alcohol-related harms, including alcohol-related violence.[17,18]

Undoubtedly, ease of alcohol access is warranted as an approach to harm reduction: restriction of access to alcohol could result in dangerous withdrawal symptoms among people with severe AUD, and there is a risk that people will stockpile alcohol to manage anxiety. However, it is important to ensure that these loosened restrictions are examined and possibly reversed as bars and restaurants reopen and more so when the epidemic recedes. Relaxed alcohol access policies should serve only to maintain population health, not to benefit alcohol-related industries.

Finally, it should be noted that federal- and, in some cases, state-level operations policies were already in place before COVID-19 to guide behavioral health services during large-scale crises. In 2013, SAMHSA published *Disaster Planning Handbook for Behavioral Health Treatment Programs*, which has specific guidance for organizations to modify services in times of a flu pandemic.[19] The publication deals with planning for telebehavioral care, hygiene, staffing, communication, and vulnerable patients, as well as steps for implementing emergency plans. An evaluation of substance use disorder treatment services related to 9/11-related trauma reported the need for agencies and administrators to develop, communicate, and practice emergency operations, emphatically stating, "States, counties, cities, and programs must have a disaster plan!"[20(p30)] Many municipalities likely have response plans that may or may not encompass disasters such as pandemics. Where such plans are in place, it is essential that stakeholders conduct thorough examinations of the degree to which their plans were executed, the effectiveness of the plans, and elements of the plans that require revision in light of COVID-19. SAMHSA's disaster planning handbook provides helpful guidance for programs to develop, enhance, and evaluate their emergency preparedness plans.

CONCLUSIONS

COVID-19 poses a major threat not only to the general public but to the AUD population especially. The physical effects of the virus, along with related stressors, may lead to a growing AUD population. It is our contention that alcohol-related harms may be managed and even prevented through the activation of various channels; in particular, we focus on telebehavioral health to treat AUD and the future reversal of relaxed alcohol access policies in states. Further, by engaging in extensive longitudinal research from here forward, we can better understand the interplay between substance abuse and traumatic events, prepare for and possibly avoid a second wave of COVID-related AUD, and improve AUD care in pandemic and other future crisis situations. AJPH

CORRESPONDENCE

Correspondence should be sent to Jennifer Attonito, PhD, Florida Atlantic University, Health Administration Programs, College of Business, 777 Glades Rd, Boca Raton, FL 33431 (e-mail: jattonit@fau.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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The Urgent Need for Public Health Preparedness Funding and Support

Linda C. Degutis, DrPH, MSN, Kimberley Shoaf, DrPH, MPH, Tomás J. Aragón, MD, DrPH, Christopher Atchison, MPA, David Dyjack, DrPH, Lisle Hites, PhD, MS, MEd, Jonathan Links, PhD, Debra Olson, DNP, MPH, RN, Margaret Potter, JD, MS, Jack Thompson, MSW, and Bernard Turnock, MD, MPH

ABOUT THE AUTHORS

Linda C. Degutis is with the Department of Chronic Disease Epidemiology, Yale School of Public Health, New Haven, CT. Kimberley Shoaf is with the Department of Family and Preventive Medicine, Public Health Division, University of Utah, Salt Lake City. Tomás J. Aragón is with the San Francisco Department of Public Health, Population Health Division, San Francisco, CA. Christopher Atchison is with University of Iowa (Emeritus), Iowa City. David Dyjack is with the National Environmental Health Association, Denver, CO. Lisle Hites is with the Institute for Rural Health Research, College of Community Health Sciences, University of Alabama, Tuscaloosa. Jonathan Links is with the Johns Hopkins Bloomberg School of Public Health, Baltimore, MD. Debra Olson is with the Division of Environmental Health Sciences, School of Public Health (Emeritus), University of Minnesota, Minneapolis. Margaret Potter is with the Graduate School of Public Health, University of Pittsburgh, Pittsburgh, PA. Jack Thompson is with the Department of Health Services (Emeritus), School of Public Health, University of Washington, Seattle. Bernard Turnock is with the Division of Community Health Sciences (Emeritus), School of Public Health, University of Illinois at Chicago.

As former directors of public health preparedness practice and research centers, we ask that the US Congress and the presidential administration provide funding and strong national support for public health in its work to prepare for, prevent, and mitigate the impact of pandemics and other disasters. Although public health continues to operate with limited resources and a very limited investment in its system, a pandemic is raging. Resources and top-level support to act based on the science behind effective interventions are lacking. Public health actions that are known to be effective ways of controlling the spread of the coronavirus are not being implemented, and in some places requiring their use is being prohibited.[1] These actions have been politicized, rather than understood as ways to decrease cases of COVID-19, and are symbolic of the politicization of public health.

Criticism of the Centers for Disease Control and Prevention (CDC) and its efforts to put forth recommendations and data based on core public health practice and principles is contrary to the realities of the work that the CDC has done on preparedness in past decades. The CDC awakened the public to risks of emerging infectious diseases and warned of the potential for pandemics. The CDC implemented simultaneous efforts to establish academic health department strategies, aligning university research with state and local agency needs. In 2001, the CDC funded a project intended to facilitate the development of an integrated national system of Academic Centers for Public Health Preparedness (CPHPs) to train frontline public health professionals who respond to bioterrorist incidents and other emerging infectious diseases. These centers, established in schools of public health, were designed to link the schools with state and local public health agencies and other partners. Nineteen CPHPs were funded until the program was discontinued in August 2010 and replaced by 14 Preparedness and Emergency Response Learning Centers, whose funding ended in 2018.[2]

CPHPs worked to identify core principles for public health preparedness and response, strategies for local and state data collection, and curricula and best practices for educating the public health and first responder workforce. Educational products developed by the centers were not saved in a repository, and most are no longer available. Additional grants funded disaster preparedness and response research at academic institutions. Through all of these grants, the CDC fostered increasing attention and capability of public health agencies and health care institutions to prepare for possible disasters and mitigate the impact of disasters on the population, particularly after the terrorist events of September 11, 2001, and the subsequent anthrax attacks. These initiatives were seen as innovative, as this type of effort had not been part of the standard for collaboration between practice and academia in public health.

The educational offerings provided professionals with information about their roles in disasters as well as the types of disasters in which they might be involved. Strategies for practice emphasized the importance of the inclusion and integration of public health in disaster preparedness and response. The research programs provided findings that enhanced planning and response for a range of disaster events, including terrorist events. Unfortunately, when Congress cut CDC funding for these programs, the educational offerings and research programs could not be sustained and were discontinued.

For those of us who were directors of the CDC-funded centers, it is profoundly disappointing to see the current state of pandemic response and guidance from the CDC. We recognize that the response has become politicized to the point that it is not possible to recommend or implement proven public health strategies that could aid in decreasing the toll that the pandemic is taking on the United States. We watch the press conferences in which scientists and science are ignored and during which leaders with no science background or commitment to science make false statements about the pandemic and its health impacts.[3,4]

As the cases of COVID-19 increase, with record numbers of new cases appearing in the United States, we are saddened because the US public is so disadvantaged by the CDC's lack of ability to bring forth proven public health strategies to mitigate the pandemic.[5] Public health has become politicized—so that we are far from the initiative that John Snow, a public health hero, took in London in 1854 when he found that people were contracting cholera from a contaminated well and stopped the spread of the disease. Instead, we see unnecessary cases of COVID-19 filling our hospitals and their intensive care units and the deaths of citizens, including health care workers. We continue to lack solid recommendations and guidance from the CDC, and when strong guidance is put forward, we see it changed or withdrawn. We know that much can be done to decrease COVID-19 spread, illnesses, long-term health effects, and deaths, and to protect the health of the public regardless of age, sex, ethnicity, race, socioeconomic status, geographic location, job, and preexisting conditions—yet a race to reopen continues to risk lives and livelihoods.

We have evolving information on who is at the highest risk of severe illness or death if they contract COVID-19, and we know how to protect them by sheltering in place, using masks, handwashing, and avoiding exposures to people who do not live in the same home. We are arguing for taking steps that can decrease the spread of the coronavirus. We know that proper mask wearing and social distancing are effective. We know that outdoor activities create less risk than indoor activities and that prolonged lengths of time indoors with people who are not part of one's household increases risk. We know that outdoor dining is safer than indoor dining in a restaurant and that bars are high-risk environments. We know that the preventive strategies can be implemented. Other countries have shown that protecting health does not mean sacrificing the economy. It is possible to protect both, without making a trade-off,[6] as strong evidence suggests that improving health improves the economy.[7] It is possible to implement strategies to protect people where they live, work, play, and learn.

We call for our government to recognize and respect the public health and science expertise in our federal, state, and local public health agencies and to follow the recommendations of experts in public health and infectious disease to protect the public. We envision that renewing the initiatives, including refunding the academic and public health practice linkages, can benefit ending this pandemic and decreasing the toll of future pandemics and disasters. We recommend increasing collaboration between practice and academia in designing and developing science-based educational and support structures for disaster and pandemic preparedness and response. We recommend a stronger focus on practice-informed research linked with research-informed practice and consideration of a model for academic centers that incorporates educational initiatives and research in each center to optimize the partnership between research and practice. We recommend that there be a central coordinating center to create a repository for the educational offerings and initiatives.

Science and social values and what we know and what we choose to do with what we know have long been the twin pillars of public health response. To strengthen the connection between them, future public health preparedness initiatives will need to better address both. AJPH

CORRESPONDENCE

Correspondence should be sent to Linda C. Degutis, 225 Mountain View St, Decatur, GA 30030 (e-mail: linda.degutis@yale.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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CONTRIBUTORS

The authors contributed equally to this editorial.

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Building Trust in COVID-19 Vaccines and Beyond Through Authentic Community Investment

Bisola O. Ojikutu, MD, MPH, Kathyrn E. Stephenson, MD, Kenneth H. Mayer, MD, and Karen M. Emmons, PhD

ABOUT THE AUTHORS

Bisola O. Ojikutu is with the Department of Medicine, Brigham and Women's Hospital, Harvard Medical School, Boston, MA. Kathyrn E. Stephenson is with the Center for Virology and Vaccine Research, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA. Kenneth H. Mayer is with the Fenway Institute, Fenway Community Health Center, Boston, MA, and Harvard Medical School, Boston, MA. Karen M. Emmons is with the Department of Social and Behavioral Sciences, Harvard T.H. Chan School of Public Health, Boston, MA.

COVID-19 vaccine development has advanced at lighting speed. Research that would normally require years has been completed in months. As a result of this unprecedented effort, two vaccine candidates, mRNA-1273 (Moderna, Cambridge, MA) and BNT162b2 (Pfizer, New York, NY), have been found to be safe and more than 90% effective in preventing symptomatic COVID-19 shortly after vaccination. These vaccines are extremely promising and will eventually be distributed widely. Unfortunately, as the science of vaccine development has swiftly progressed, the equally important science of community engagement, which should guide the establishment of mutually beneficial partnerships and promote eventual vaccine uptake, has lagged behind. Research methods focused on the development of effective public health interventions place communities—groups with shared culture, norms, beliefs, or language—at their core and emphasize the primacy of community ownership as essential for uptake and sustainability.[1] Yet, communities of color (i.e., Black, Latinx, and Indigenous communities), who remain at highest risk for infection, have been peripheral, not central actors in the pursuit of COVID-19 vaccines. Instead, the tripartite relationship between industry, government, and academia has dominated the research enterprise related to COVID-19.

The peripheral position of community has been evident since early in vaccine development. Notably, initial trial recruitment consisted of short-term community outreach, and more detailed plans for longer-term community engagement to support enrollment and eventual vaccine uptake commenced late in phase III trials. Such a critical oversight may be the Achilles' heel of this unprecedented effort. Deeply rooted mistrust bred by centuries of well-documented, abusive medical experimentation and ongoing structural racism impedes racially and ethnically diverse individuals' participation in clinical trials and threatens the uptake of future COVID-19 vaccines, particularly among Black individuals.

This history may be overcome by reimagining how industry, government, and academic institutions partner with marginalized communities. COVID-19 vaccine development offers an opportunity to shift from transient outreach to true investment in communities of color, which may mitigate mistrust, improve vaccine uptake, and have far-reaching effects beyond COVID-19.

TRUSTWORTHINESS AND VACCINE DEVELOPMENT

Vaccine development is a continuum, from clinical trials to allocation plans to distribution and eventual uptake. If any stage of this continuum fails to build trust and to demonstrate the trustworthiness of those involved, the overall effort will be undermined. For example, as phase III trials began, concerns were raised regarding lack of transparency in reporting participant demographics and suboptimal enrollment of diverse populations. Given the threefold higher rates of COVID-19 infection among Black, Latinx, and Indigenous individuals compared with non-Hispanic Whites,[2] the National Institutes of Health recommends that these groups be represented in COVID-19 vaccine trials at higher rates than their population proportion.[3]

Pfizer reported participation rates of Black and Latinx individuals of 10% and 13%, respectively, in its vaccine trial,[4] which is lower than the proportion of these two groups in the US population. Suboptimal diversity in clinical trial participation may translate into low vaccine uptake. As several vaccine candidates entered phase III trials in the United States, anticipated acceptability decreased significantly—from 54% to 32% among Black and from 74% to 56% among Latinx individuals.[5] Although the

National Academy of Science, Engineering, and Medicine has proposed a comprehensive allocation framework for vaccine access,[6] without diversity in clinical trials, complete transparency, and clear demonstration of the trustworthiness of all partners, skepticism surrounding COVID-19 vaccines will continue to grow.

CURRENT OUTREACH AND ENGAGEMENT APPROACHES

We believe that efforts to end the pandemic through vaccination will be hampered because of an overemphasis on short-term strategies, such as community outreach, delayed community engagement, and absent investment in at-risk communities. For clarification, community outreach is the act of connecting with stakeholders or groups in communities to provide information and is often used for clinical trial recruitment. By definition, community outreach is temporary, unidirectional, and focused on limited goals. By contrast, community engagement is the longer-term process of working collaboratively with groups of people to address issues affecting the well-being of those people. Public health research and practice have increasingly employed community engagement to build trust and improve overall health outcomes. Although community engagement in COVID-19 vaccine trials has been initiated, it began after the studies were designed and, in some cases, already under way.

Neither short-term community outreach nor post facto community engagement will contribute to building a foundation of trust. Conversely, these approaches may further exacerbate mistrust and raise questions regarding the motivations of researchers, industry, and policymakers. For example, when stakeholders are asked to recruit participants after trials have been initiated, they are rarely able to address community needs, which may limit study participation. A more authentic community engagement process would begin earlier (i.e., during study development) and result in raised awareness of barriers to participation and study redesign if needed. In the end, we have created "outreach fatigue" among many stakeholders (i.e., exhaustion related to interactions with researchers with little foreseeable benefit to the communities themselves) and doubt regarding the trustworthiness of engagement efforts.

AUTHENTIC COMMUNITY INVESTMENT

Decades of systematic disinvestment and structurally racist policies have resulted in deficits in material resources in many communities of color. As a result, partnerships with external entities, such as academia and industry, are inherently unequal. Meaningful community investment would acknowledge the need for capacity building that would

Selected Investment Strategies to Support Communities of Color as Partners in COVID-19 Vaccine Research and Beyond

Invest in community-based organizations and institutions.	**Provide direct, longitudinal financial investment in community organizations that partner in clinical research.**
	Engage community organizations for participant recruitment "plus" (e.g., for vaccine education, deployment, distribution), and fund interventions to increase vaccine uptake (e.g., vaccine educators).
	Provide in-kind resources, including technical expertise, mentoring, and clinical and nonclinical resources to help strengthen and build capacity in community organizations.
	Provide development resources to minority-owned businesses that are engaged in research-relevant work.
Invest in community participation in research.	**Cover the cost of adverse events for study participants who do not have insurance or are underinsured.**
	Establish a seamless system to access care if participants become infected.
	Guarantee that all trial participants have access to an approved vaccine, even if from a different trial.
Invest in building trust.	**Increase transparency of government contracts for manufacturing and distribution.**
	Require that industry establish contracts with minority-owned businesses in proportion to the public dollars invested.
	Engage a nongovernmental "honest broker" organization to monitor vaccine access, community investment, and investment in minority-owned businesses.
Invest in community education and research leadership.	**Establish programs to improve health and science literacy in communities of color, and increase funding to support the development of careers of racial and ethnic minority investigators who are committed to the study of vaccines and other public health approaches to mitigate pandemics.**

lead to more equal partnerships in defining and achieving shared priorities, such as ensuring the uptake of safe and effective COVID-19 vaccines. Investment strategies would contribute to the establishment of partnerships between communities of color, industry, academia, and government that build on assets in each entity and ensure mutual and bidirectional benefit. Drawing on the principle of shared-value creation, as Porter and Kramer propose,[7] community investment involves creating economic value in a way that also supports societal needs and challenges. For example, providing direct, longitudinal financial investment in stakeholder organizations now may lead to more collaborative research and intervention development in the future.

Furthermore, community investment may build trust and shift the perception of a COVID-19 vaccine from a questionable intervention to a trustworthy, collective good from which all will benefit. To our knowledge, there is no systematic effort to invest in communities in ways that will change the fundamental nature of the relationship between communities of color, industry, academia, and government. Given the enormous investment of federal funds in the public–private partnership to develop candidate COVID-19 vaccines, the inclusion of communities of color who are at highest risk in this partnership is warranted. To that end, community investment could be promoted by a series of systematic strategies, examples of which are provided in the box on p. 367.

CONCLUSIONS

With many COVID-19 vaccine candidates still under study, the race to find effective and safe options is far from over. Therefore, we must consider relevant ways to maximize the return on the extensive public investment in COVID-19 vaccine development and ensure equity in access. We would be well served if these recommendations were routinely integrated into the conduct of clinical trials and intervention development so that investment in communities of color is an ongoing process. The pandemic has not created health inequities: it has amplified those that have long been tolerated. We have an opportunity to create new and innovative approaches to the long-standing problem of ensuring participation among diverse groups in clinical trials, to improve broader health literacy, and to enable communities to be robust partners in the research enterprise. Let us learn from this crisis to create a new normal, one that uses public investment and leads to true public good. AJPH

CORRESPONDENCE

Correspondence should be sent to Bisola O. Ojikutu, Associate Physician, Brigham and Women's Hospital, Department of Medicine, 75 Francis St, Boston, MA 02115 (e-mail: bojikutu@partners.org). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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Contact-Tracing Apps: Time to Confront Broader Societal Change

Kimberlyn Marie McGrail, PhD

ABOUT THE AUTHOR

Kimberlyn Marie McGrail is with the Centre for Health Services and Policy Research, Faculty of Medicine, University of British Columbia, Vancouver, BC, Canada.

AJPH recently published an essay by Bernard et al. titled "COVID-19 and the rise of participatory SIGINT: an examination of the rise in government surveillance through mobile applications."[1] That essay raises important issues about data collection and surveillance using the intriguing lens of signals intelligence (SIGINT). At its essence, the essay is a call to classify contact-tracing apps (and other COVID-19–related digital surveillance) as "participatory SIGINT" and to regulate this activity accordingly, that is, with the greater rigor associated with intelligence techniques. At the very least, the authors call for transparency of the intended use of contact-tracing apps and the data they collect, for recognition of the heightened sensitivities of health data, and assurance that such apps are limited in their use, not becoming the "new normal."

As Bernard et al. note, contact-tracing apps are a feature of the pandemic response in many countries. There are nuances in what these apps are intended for, but in general they are meant to help control the spread of the virus by identifying and notifying people who have been in contact with those who are infected. The apps are often proposed as adjuncts to human contact tracing and usually are put forward as voluntary. At the same time, the authors note:

> Of the 47 applications currently available, 24 contain Google and Facebook tracking, 11 have no privacy policy, 25 do not disclose the length of time that they hold the data for, and 28 have no publicly disclosed anonymity measures.[1(p1782)]

This essay is likely to generate debate about the nature of signals intelligence and the overall utility of contact-tracing apps. It is right to point out the varied implementation of the apps and the shortcomings related to transparency and oversight, especially considering how data derived from Internet-based communication have been used and misused in various ways.[2] More importantly, however, Bernard et al. encourage us to take a broader view of what contact-tracing apps and their digital cousins (e.g., symptom trackers) signify. They force an examination that moves us upstream, past the "how" of implementing apps in a privacy-sensitive manner (as has been the focus of most articles on such apps) to questioning whether they will deliver on their promise. They also encourage moving downstream, to consider the longer-term consequences of genies let out of bottles during a crisis.

Continuing with this broader view, there are several additional trends that should inform discussions about data and technology in society. The response to the pandemic can then be seen as a manifestation of broader societal changes, albeit a pointed and likely pivotal one.

THE FOURTH INDUSTRIAL REVOLUTION

We live in a time of rapid change, driven by digital technology. Easy and accessible storage and computing power have enabled the proliferation of data (now described as the "exhaust of everyday life"), and this in turn enables complex and increasingly opaque analytics, including artificial intelligence. This rapid change, and likely fundamental transition, has been called a "fourth industrial revolution." The first three industrial revolutions took us through mechanization (steam), mass production (electricity), and automation (computers). The fourth involves technological fusion that is "blurring the lines between the physical, digital, and biological spheres."[3]

It can be difficult to see the implications of change while it is occurring, but we all experience the ubiquity of data collection through stores, apps, physical activity monitors (e.g., Fitbit Trackers), our cars, and even our refrigerators. We also experience targeted advertising, talking devices, and digital reminders. Some of these experiences are helpful and wanted, whereas others may be unexpected or downright creepy. More things are automated or at least computer enabled, and the pace of change is, if anything, accelerating. Contact-tracing apps are a manifestation of these

developments, and it is difficult to know what to do with them, in part because we have yet to grapple with the larger and underlying forces that are reshaping society.

EQUITY

The fourth industrial revolution has implications for all aspects of society, including work, education, cities, the climate, and global relations. Much has been written about the "digital divide," but this may quickly grow to a digital chasm. The pandemic lays bare the effects of the existing inequalities, particularly those related to race and socioeconomic position, and conversations over the last several months are the first signs of broad public recognition that these inequalities, and large inequities, are systemic and structural.

It is certainly clear that contact-tracing apps have equity implications. The apps by definition only confer potential value (and it is important to underline *potential*) to users. Although smart phone adoption is broad, it is still estimated to reach only 81% of the US public.[4] And that adoption increases with higher income and higher education and decreases with age and rural residence. The question then is whether the form of regulatory control over these apps matters: are equity and other implications tempered by treating them as SIGINT as opposed to more traditional data? It is not clear how they would be and, more importantly, whether such a push would be a distraction from the other thorny but necessary debates about a data-driven economy.

PUBLIC TRUST

These current conversations about structural inequality combined with the fourth industrial revolution and the pandemic bring us to the notion of public trust. Taylor et al. noted, "The true legitimacy test for any government is whether it can convince its people to do something difficult, together."[5(p22)] If contact tracing—or any other aspect of pandemic management—is going to work, it requires the population as a whole to do something different: to stay home, to stay distant, to download an app. The pandemic should by now have made it very clear that public trust in government is perhaps the single most important public health tool. The introduction of surveillance technology will be difficult (or impossible) in a context where public trust is already low. And very few (or no) jurisdictions have taken public engagement seriously when contemplating these technologies—or really the response to the pandemic more broadly.

As Charles Eisenstein eloquently wrote in March 2020:

> The crisis could usher in totalitarianism or solidarity; medical martial law or a holistic renaissance; greater fear of the microbial world, or greater resiliency in participation in it; permanent norms of social distancing, or a renewed desire to come together.[6]

Bernard et al. raise interesting issues that implicitly suggest that ignoring the surveillance capabilities of those apps and similar technology may lead us to the darker version of these choices.

Whether you agree or disagree with the particular policy position the authors put forward on SIGINT, there is no question that contact-tracing apps raise issues that we have yet to address as a society. We are now a data-driven world. Private companies, multinational corporations, and local and national governments all collect data about us, our behaviors, purchases, friends, activities, likes and dislikes. These data are used to provide services but have been and are likely to continue to be used for less positive activities as well. A broader and more inclusive conversation, one that includes the public, is urgently needed to bring our ethical and social norms up to speed with current technological capabilities. AJPH

CORRESPONDENCE

Correspondence should be sent to Kimberlyn McGrail, 201-2206 East Mall, Vancouver, BC V6T 1Z3, Canada (e-mail: kim.mcgrail@ubc.ca). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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Enhancing the WHO's Proposed Framework for Distributing COVID-19 Vaccines Among Countries

Ezekiel J. Emanuel, MD, PhD, Florencia Luna, PhD, G. Owen Schaefer, DPhil, Kok-Chor Tan, PhD, and Jonathan Wolff, MPhil

ABOUT THE AUTHORS

Ezekiel J. Emanuel is with the Department of Medical Ethics and Health Policy, Perelman School of Medicine, University of Pennsylvania, Philadelphia. Florencia Luna is with the Program of Bioethics, FLACSO (Latin American University of Social Sciences) and CONICET (National Scientific and Technical Research Council), Buenos Aires, Argentina. G. Owen Schaefer is with the Centre for Biomedical Ethics, Yong Loo Lin School of Medicine, National University of Singapore, Singapore. Kok-Chor Tan is with the Department of Philosophy, University of Pennsylvania, Philadelphia. Jonathan Wolff is with the Blavatnik School of Government, University of Oxford, Oxford, UK.

As the global death toll of COVID-19 exceeds 2 million the distribution of a vaccine continues to be an urgent global priority. A key question in regard to this is which countries should get the vaccine first? The framework for distributing the COVID-19 vaccine among countries will have both ethical and life or death consequences. One of the most prominent frameworks is the one adopted by COVAX (COVID-19 Vaccines Global Access Facility), which is co-led by Gavi (the Vaccine Alliance), the Coalition for Epidemic Preparedness Innovations, and the World Health Organization (WHO) and aims to guarantee fair and equitable access to every country in the world. As of January 2021, 190 countries are engaged with COVAX. Although the United States is not at present a party to COVAX, the Biden administration is likely to reconsider entering COVAX. COVAX is taking the lead in ensuring an equitable distribution of vaccine among countries. Its allocation formula will affect billions of people throughout the world.

COVAX has adopted the WHO's recently proposed "fair allocation mechanism," which is based on the principle of equal proportional share per country. After 20% of each countries' population is vaccinated, allocation becomes based on health need.[1] This framework is motivated by concerns about international fairness, and it attempts to provide a check against vaccine nationalism in which richer countries would hoard vaccines to the detriment of poorer countries.[2] Although equal proportion may seem like an appealing starting point, it has significant ethical limitations even by the WHO and COVAX's own standards. If the WHO and COVAX framework is to serve as the global standard for fair vaccine distribution, it requires supplementation by other principles. The fair priority model (FPM) can bring the WHO and COVAX approach more in line with their own ethical framework.[3,4]

WHO'S PROPORTIONAL ALLOCATION SCHEME

The WHO and COVAX "proportional allocation scheme" (PAS) is motivated by the need to counteract vaccine nationalism and to realize equal concern. The WHO and COVAX system is a two-phase approach. Phase 1 calls for equal proportional distribution to all COVAX countries, proceeding in tiers. Initially, all countries will receive enough doses to cover 3% of their population, and by gradual and staged increases in allocation they will reach 20% of the population. Once countries receive enough vaccine to cover 20% of their population, phase 2 will begin and proportional allocation will be replaced by a weighted allocation based on country risk assessments that take into account a wider array of population threats and vulnerabilities.[1]

The PAS lays out the general principles of allocation. Further pragmatic questions remain to be addressed, such as how to address differential capacity to distribute vaccines in relation to dose and cold chain requirements. Although pragmatics are important, in this editorial we focus on the principles of allocation.

THE WHO'S PROPORTIONAL ALLOCATION SCHEME

The WHO and COVAX framework is intended to be fair, dynamic, and responsive to changing conditions of

urgency. But proportional allocation in phase 1 neither fulfills fairness nor can it be responsive to dynamic changes in the pandemic. Equal proportional distribution among countries is fair only in the abstract. In reality, it fails to account for the varying impact of COVID-19 on different countries. Hence, at a fundamental level, proportional allocation does not reflect equal concern, which requires sensitivity to different country situations. By analogy, equal concern for patients is not shown by giving every patient the same medical attention and resources. Instead, different allotments of time and resources are needed depending on the nature and urgency of people's particular health needs.

In times of urgency and incomplete information, equal proportional distribution can be a useful heuristic for fairness, and the PAS can serve as the default standard for distributive fairness. But a default standard is only a starting point: real fairness must allow deviations as more information becomes available.

The WHO and COVAX scheme explicitly accepts that there are required and justifiable departures from its baseline of equal proportional distribution, but it does not provide details or elaborate an ethical framework that can be applied. The framework says, "A special consideration will be given to countries that may suddenly face major outbreaks or national disasters throughout the allocation process."[1(p27)] But how do we know which cases are exceptional and when exceptions are to be made? What are the criteria the PAS proposes? Hospital bed occupancy is proposed as a possible measure, for example, but nothing is said about how it is to be taken into account.[1]

THE FAIR PRIORITY MODEL

The FPM can appropriately supplement the WHO and COVAX's PAS. The FPM is guided by three basic values: (1) benefiting individuals and limiting harm, (2) prioritizing the disadvantaged, and (3) global equal concern.[3] Like the PAS of the WHO and COVAX, the FPM proceeds in phases. In phase 1, the primary goal is to reduce premature deaths; in phase 2, distribution is aimed at reducing economic hardships in addition to controlling morbidity; in phase 3, the objective is to reduce community transmission and to restore normalcy.

Unlike the PAS, the FPM immediately allocates vaccines based on risk of premature deaths directly and indirectly from COVID-19. Another important ethical difference is that fairness in the FPM is among individuals across state boundaries. The FPM allocates vaccines to countries based on the relative needs of the individuals in those countries, promoting more equitable allocation of vaccines to populations that are in more dire straits as a result of COVID-19. Conversely, the PAS treats global fairness in terms of fairness among countries. This is politically understandable given the structure of the WHO, a member organization. But in ethics, the unit of concern for justice is individuals, not countries.

It might appear that the FPM, unlike the PAS, rewards countries that had suboptimal COVID-19 management and prevention strategies. A fair distribution of vaccine among countries must evaluate the effective minimization of health, economic, and other harms spawned by COVID-19, not past performance. The aim of vaccine allocation schemes is to promote the interests of global citizenry, rather than reward or penalize governments for their responses. Failing to equitably prioritize vaccines to countries whose people need them most would be failing to address the disadvantages they face. Furthermore, typically the individuals whose lives are at stake because of COVID-19 have had little influence on their government's response. They should not be penalized.

Notwithstanding these substantial conceptual differences between the FPM and the PAS, the two approaches can work side by side. The PAS is a reasonable default standard. But a default standard is defeasible and, as acknowledged by the WHO and COVAX, must allow exceptions. Giving countries equal amounts of vaccine is ethically sound if those countries are in similar circumstances. Thus giving vaccine in proportion to population makes sense between Brazil and the United States or the United Kingdom and France when their rates of cases and deaths are similar. But it is not defensible when the countries' circumstances differ greatly, such as between South Africa and South Korea.

APPLYING THE FAIR PRIORITY MODEL

Even if the 20% target of proportional allocation is accepted, the WHO and COVAX acknowledge that it might have to be preempted if some countries face particularly severe outbreaks, natural disasters, or other types of emergencies, such as a refugee crisis.[1]

As vaccines are distributed even below the WHO and COVAX's 20% threshold, countries that become hotspots and are in evidently greater need should receive priority access. This is consistent with COVAX's existing commitments.[1] More importantly, it follows the ethical principles of the FPM framework of reducing harm and primarily trying to minimize premature deaths. It also fulfills the WHO's Strategic

Advisory Group of Experts principles, particularly human well-being and global equity, which aim to "reduce deaths and disease burden from COVID-19 pandemic" and "ensure that vaccine allocation takes into account the special epidemic risks and needs of all countries."[4] Providing a country that has very low community transmission the same proportion of vaccine to its population as a country that is extremely hard hit and facing devastation surely fails to fulfill the ethical principles of human well-being and global equity.

Prioritizing one country by definition means deprioritizing another, a cost that must be acknowledged. In line with the value of global equity, it may be justifiable to deprioritize countries that are in much less urgent need of the vaccine compared with the rest of the world.

The WHO and COVAX make the important point that there is great uncertainty in adjudicating precise differences in impact between countries.[1] But these concerns dissipate when the differences in impact are very large, as measured by relatively straightforward indicators of urgency such as magnitude of the outbreak and lives lost.

Indeed, there are very stark differences between many countries in terms of COVID-19 cases and deaths, differences that can be used immediately and can justify significant deviations from the WHO and COVAX proportional allocation of vaccine. For example, by mid-January Peru (population 33 million) had had about 1 million COVID-19 cases and 38 399 deaths, whereas Malaysia (population 32 million) had had about 147 855 cases and 578 deaths. The PAS allocates Malaysia about the same number of doses as Peru even though Peru has 7 times more cases and more than 66 times more deaths. Our proposed amendment to the PAS would provide more vaccine to Peru than Malaysia. Similarly, South Africa (population 60 million) has had about 1.3 million cases and 35 852 deaths, whereas South Korea (population 51 million) has had only 71 241 cases and 1217 deaths.[5] The PAS would allocate a similar number of doses although South Africa has more than 18 times the number of cases and more than 29 times the number of deaths as South Korea.

Depending on the circumstances at the time the vaccine is ready for distribution, prioritizing countries that are as severely affected as Peru and South Africa have been will save many more lives, and in places that are worse off, than pure proportional distribution. Thus, the PAS as proposed by WHO and COVAX should incorporate the FPM to address the special cases.

CONCLUSIONS

Within the confines of proportional allocation, some countries can and should receive a degree of priority access, that is, more vaccines than would be warranted based on population size alone. There need be no attempt to fine-tune the distribution of vaccine to every small detail in every country. Instead, those countries that clearly have much greater need based on cases and premature deaths would receive priority fine-tuned access to vaccines on the basis of the ethical principles set out in the FPM and the WHO's Strategic Advisory Group of Experts framework. The FPM provides the details on how to deal with difficult cases that are both special and common. It will improve both the equity and the effects of vaccine distribution in accordance with the goals the WHO and COVAX have affirmed, without giving up the political advantages of a default that distributes vaccines to countries to cover up to 20% of their population. AJPH

CORRESPONDENCE

Correspondence should be sent to Ezekiel Emanuel, Department of Medical Ethics and Health Policy, 423 Guardian Dr, Blockley Hall, 14th Floor, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA 19104 (e-mail: mehpchair@upenn.edu; zemanuel@upenn.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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CONTRIBUTORS

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Opportunities to Support Optimal Health for Children in Medicaid Beyond the COVID-19 Pandemic

Kelli DePriest, PhD, RN, Sandra Hassink, MD, MA, FAAP, Kim Tuck, RN, Chloe Bakst, BA, Steve Fitton, BA, Linda Genen, MD, MPH, Anna Potere, MS, and Kelly Bower PhD, MSN/MPH, RN

ABOUT THE AUTHORS

Kelli DePriest, Sandra Hassink, Kim Tuck, Chloe Bakst, Steve Fitton, and Linda Genen are with the Institute for Medicaid Innovation, Child and Adolescent Health Subcommittee, Washington, DC. Anna Potere is with First 5 LA, Los Angeles, CA. Kelly Bower is with the Johns Hopkins University School of Nursing, Baltimore, MD.

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COVID-19 affects all segments of the population in the United States, including children, who experience physical, social, and emotional consequences from the pandemic.[1] Given substantially higher rates of COVID-19 infections and deaths in low-income communities and communities of color, the disproportionate impact of social determinants may widen health disparities as a result of the pandemic.[2,3] Medicaid provides health coverage to approximately 30 million children from low-income families. This includes many Black, Indigenous, and Latinx children who disproportionately experience inequities in exposures to social determinants, leading to increased health-related disparities.[4,5] From a social determinants of health (SDOH) lens, we suggest programmatic interventions to decrease negative health impacts of the pandemic among children enrolled in Medicaid, exploring strategies to reduce health inequities.[6]

SOCIAL DETERMINANTS, CHILD HEALTH, AND THE PANDEMIC

Children from low-income, Black, Indigenous, and Latinx communities have wide varieties of backgrounds and experiences, yet are affected similarly by racial and economic oppression. SDOH inequities prevent some children from accessing the opportunities necessary to achieve optimal health, and many of these influences are compounded during the pandemic.[1] We assessed the impact of the intersection of stay-at-home and shelter-in-place orders, economic downturn, and school disruptions in five key SDOH areas.[6]

Economic Stability

Factors that create economic instability for children and families—including lack of employment opportunities, job loss, food insecurity, unstable housing, and poverty—are exacerbated by the pandemic.[7] Five months into the pandemic, the Bureau of Labor Statistics reported that communities of color were disproportionately affected by job loss.[8] Current predictions estimate that almost six million children will become newly eligible for Medicaid by 2021 through job loss.[7] Along with the racial wealth gap, food and housing insecurity are expected to increase, disproportionately affecting Black, Indigenous, and Latinx children through the accumulated effects of inequity and racial discrimination.[1,2,7]

Social and Community Context

During the COVID-19 pandemic, social and community factors associated with worse health outcomes are exacerbated, including exposure to the effects of systemic racism, a key driver of health inequities for children in Medicaid.[9] There are higher rates of COVID-19 infections and deaths in communities of color, partially because of higher rates of employment in service industries, lower pay, and decreased ability to work remotely, increasing potential exposure to COVID-19.[2] The culminating effects of nationwide protests highlighting the history of marginalization and systemic racism against Black Americans, and decades of collective intergenerational trauma and chronic stress, are compounded by communal distress from the pandemic.[10]

Neighborhood and Built Environment

Over half of low-income individuals live in high-poverty neighborhoods in high-density metropolitan areas, limiting their

ability to socially distance.[11] Marginalization and structural racism contribute to higher rates of residence in high-poverty neighborhoods among Black (70%) and Latinx (63%) populations relative to Asian (40%) and White (40%) populations.[11] A child's neighborhood influences their access to multiple determinants, including health care and high-quality education.

Education Access and Quality

Individuals at educational institutions are weighing the social and health concerns of in-person schooling—which risks spreading COVID-19 to educators and students—versus online and hybrid options. The latter two may disproportionately negatively affect students with limited access to technology and broadband Internet, thus increasing the digital divide.[12] Schools provide services to children, including access to food, mental and behavioral health support, and health care. In-person schooling allows staff to observe and report suspected child abuse or neglect, which appears to be on the rise.[1] Whether online or in-person, disruptions in schooling are predicted to cause declines in learning and development, especially for students who were behind before the pandemic.[13]

Health Care Access and Quality

Access to health care, an important determinant of overall health, affects children enrolled in Medicaid, who receive well-child visits and age-appropriate vaccinations from their primary care providers. Stay-at-home and shelter-in-place orders, issues around public transportation, and parent–caregiver concerns regarding risks of exposure when seeking care, contribute to delays in accessing care. Many primary care providers, hospitals, school-based health centers, and specialists closed or limited visits to acute illnesses. Transitioning to telehealth was time-consuming, delayed access to care, and potentially exacerbated the digital divide.[12]

The American Academy of Pediatrics (AAP) released recommendations supporting continuation of well-child visits during the pandemic; however, service delivery for children enrolled in Medicaid was heavily affected. Vaccinations decreased 22% from previous years, with pronounced declines among the Medicaid population; seven-month-old infants in Medicaid were less likely to be up-to-date on vaccinations than non-Medicaid-enrolled infants (35% vs 55%, respectively).[14] Experts fear an upcoming outbreak in vaccine-preventable diseases, further widening disparities for children in Medicaid. Although in-person care is ideal, telehealth provides elements of well-child, chronic, and acute care visits, and behavioral health services. Providers can help caregivers understand when telehealth is appropriate.

Nearly one third of children in Medicaid experience chronic conditions, including asthma, diabetes, and physical or developmental delays. Accessing tailored health care requires access to primary and specialty providers, pharmacies, and other support services. For children with special health care needs, half of whom are covered by Medicaid, parents and caregivers are concerned about exposure from in-home care providers. Some families have reduced or eliminated outside providers' access to their homes, resulting in the parent or caregiver providing the bulk of the child's care, with remote direction from primary care providers. Behavioral health concerns are escalating, with increased rates of depression and anxiety. Telehealth has been a critical avenue to address children's behavioral health during the pandemic.

OPTIMIZING HEALTH FOR CHILDREN IN MEDICAID LONG TERM

Optimal health for children covered by Medicaid requires support at the state, health plan, and provider levels, with a comprehensive approach to address SDOH. As strategies are developed, the following opportunities should be considered.

Facilitate Medicaid Enrollment

By decreasing barriers to enrollment, states assist newly eligible children to quickly access coverage. Opportunities to enhance enrollment include increasing the number of presumptive eligibility categories, extending the type of qualified entities to determine presumptive eligibility, and minimizing eligibility documentation requirements.[15] Where applicable, states should also consider expanding Medicaid.

Respond to Increasing Social Needs

Medicaid health plans should forge connections with social service providers that administer developmental and maternal–mental-health screenings and encourage vaccination adherence and preventative visits. Help Me Grow (https://helpmegrownational.org) is a national model that leverages existing community resources to ensure comprehensive support of child

development through outreach, screening, and referral to services. Maternal, infant, and early childhood home visiting programs are another opportunity to promote health, development, and school readiness for young children through parent–caregiver support.

Recognizing that children of color are disproportionately affected by COVID-19, the AAP president released a statement urging individuals to "dismantle racism at every level" (https://www.aappublications.org/news/2020/06/01/racism060120). AAP's policy statement provides recommendations for how pediatricians can address and ameliorate the effects of racism on children and adolescents—by optimizing clinical practice, bolstering workforce development and professional education, and supporting community engagement, advocacy, and public policy.[9]

Improve Access to Health Care

Increased flexibility to cover and deliver care. State Medicaid agencies and Medicaid health plans could pay for telehealth at the same rate as for in-person visits, even after the COVID-19 pandemic. Telehealth improves access for children in Medicaid and is an effective way to initiate well-child visits. Payment reform supporting a two-part well-child visit that uses a combination of telehealth and an in-person visit would support this care delivery change. One consideration is that increased reliance on telehealth will exacerbate the digital divide for families with limited access to technology or to broadband Internet and cellular networks.[12] Telehealth options should be tailored to the needs and capabilities of families who receive care.

Vaccine delivery innovation. Many states have vaccine registries (e.g., https://phpa.health.maryland.gov/OIDEOR/IMMUN/Pages/immunet.aspx), which track administration regardless of where a vaccine is received. Vaccine drive-ins might bring children up-to-date on vaccines and should connect services back to primary care providers to ensure documentation.[3] Efficient vaccine administration infrastructure is critical as we approach a COVID-19 vaccine. Vaccinating entire families at the time of a visit should also be considered.

Data systems innovation. Data system integration strategies that address coordination of care could be developed, thus facilitating communication between data systems to inform providers of the care their patients received through other providers via telehealth or other delivery sites. The registry could be created through public–private partnership or in coordination with school-based health centers focused on children with chronic illnesses, special health care needs, and physical or developmental delays. This registry would track children and notify providers when they need to reach out to ensure the child is up-to-date on necessary care.

LOOKING AHEAD

The COVID-19 pandemic has further highlighted inequities in the current health care system, which does not adequately support crucial health coverage and access for children from low-income, Black, Indigenous, and Latinx communities covered by Medicaid. Factors that widen disparities must be addressed to improve or alter processes that marginalize children and families who experience the effects of SDOH inequities, including racism, that negatively influence their health. Strategies to maintain optimal health for children in Medicaid during and after the COVID-19 pandemic are crucial, so that essential health care for children does not become another casualty of the pandemic. AJPH

CORRESPONDENCE

Correspondence should be sent to Kelli DePriest, 104 N Luzerne Ave, Baltimore, MD 21224 (e-mail: KDePriest@MedicaidInnovation.org). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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CONTRIBUTORS

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Effects of the COVID-19 Pandemic on the Competency of Clinical Year Medical Students, With Special Reference to Community and Public Health

Vivaswan Dutt Mishra, MBBS, Sameer Saleem Tebha, MBBS, Rahul Jagdishchandra Mittal, MBBS, and Aritra Paul, MBBS

ABOUT THE AUTHORS

Vivaswan Dutt Mishra is an MBBS student at Motilal Nehru Medical College, Allahabad, India. Sameer Saleem Tebha is an MBBS student at Jinnah Medical and Dental College, Karachi, Pakistan. Rahul Jagdishchandra Mittal is an MBBS student at Gujarat Medical Education & Research Society Medical College, Gandhinagar, Gujarat, India. Aritra Paul is an MBBS student at Nil Ratan Sircar Medical College and Hospital, Kolkata, West Bengal, India.

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Efforts to reduce the spread of COVID-19 have prompted the widespread shutdown of educational institutions in most countries. This stay-at-home policy implemented by governments around the world is intended to slow the spread of COVID-19 among the most vulnerable to ensure a manageable hospital patient load.

As part of modern pedagogy's evolution, medical colleges around the world are trying to shift from predominantly theoretical classroom-based teaching to a more practical approach focusing on deeper communication and clinically oriented curricula. However, most educational institutions have had to shift to online learning to comply with the new norm of the pandemic.[1] Clinical learning is the most important part of medical students' education, especially those in their prefinal and final years. They complete their clinical rotations in hospitals, where they learn history taking, observe clinical presentation of different diseases, and learn how they are being managed.[2] Clinical postings help (1) improve academic performance, (2) increase interest in relevant specialties, (3) increase confidence and reduce stress, and (4) acquire communication and basic clinical skills.[3]

Many students fear that the decrease in clinical knowledge owing to the discontinuity of classes may haunt them throughout their careers.[4] Many of those graduating this year are uncertain about how they will perform on their final examinations. Needless to say, their performance on postgraduate examinations are also likely to be affected. These budding doctors' confidence is flailing, leaving them perplexed regarding their professional worth to their local communities and their usefulness to their nation's public health.

Various professional medical exams have also been put on hold, for example the US Medical Licensing Examination. Thousands of students take this examination every year, accounting for a large number of both US and non-US medical school graduates. The US Medical Licensing Examination assesses not only candidates' knowledge of the basic sciences (step 1) but also their clinical knowledge and clinical skills (step 2), for which many medical students feel underprepared. Owing to the pandemic, the step 2 clinical skills examination has been suspended until at least June 2021.[5] Additionally, because of travel restrictions, students are unable to opt for their electives and rotations or reach international examination venues, thus contributing to their anxiety.

Like any challenge, the present pandemic has both positive and negative aspects. There are concerns regarding receiving clinical training, competency, and the ability to handle community health issues effectively. However, in many places around the world, the pandemic has provided medical students remarkable experiences that otherwise would have been difficult, such as involvement in community- or hospital-based health care facilities and in the auxiliary health care workforce, as seen in the United States and Europe.[6] Medical students have been given the opportunity to serve in their chosen fields during a historic public health crisis and to prepare for the next one. This can be viewed as a remarkable chance for medical students to show gratitude to

the community that has allowed them access to higher education. The inability of several medical education systems to engage medical students in this crisis or provide them credit for it is a missed opportunity.

Students currently in the final year of medical school and internship are meeting the requirements of their institutional schedules in a difficult and hazardous situation. This may lead to overwork, diminished mental health, and immense stress. Performing duties for long hours unabatedly, with largely inadequate access to personal protective equipment amid a deadly virus is not something medical students are mentally prepared for. This is making many students question the medical education system as well as forcing them to reconsider their career choices. As a result of this, many students are considering changing their specialty from emergency medicine or critical care to specialties perceived as being less hazardous, such as radiology or dermatology, where interaction with potentially infectious patients is minimal.[7] In the long run, such decisions might also lead to severe job satisfaction issues, as choosing the right specialty is one of the most important decisions for a budding doctor. This could lead to a shortage in the public health care workforce, especially where it is already constrained, such as developing countries.

Various medical institutions are seeking solutions to these problems. Although online classes are not as desirable as working in wards during clinical rotations, we believe that, if properly executed with the systematic participation of both doctors and students, tele-rotations is a potential solution. COVID-19 has demonstrated how unprepared we are to handle a global pandemic within our own communities. Medical students must be skilled in proper disaster management with special emphasis on an effective service schedule in infectious environments.

We suggest that institutions set up mental health helplines for medical students. This is long overdue, and we hope this would be a trend that continues well into the future, even after the pandemic is over, so this unique situation will not be a missed opportunity. Students must also be encouraged to participate in online group activities to enable them to be part of a team and strengthen their teamwork and leadership abilities during this pandemic. We sincerely hope that this pandemic does not compromise the health care workforce in our already constrained public health care system. AJPH

CORRESPONDENCE

Correspondence should be sent to Aritra Paul, Nil Ratan Sircar Medical College and Hospital, 138, Acharya Jagadish Chandra Bose Rd, Sealdah, Raja Bazar, Kolkata, West Bengal-700014, India (e-mail: aritra98paul@hotmail.com). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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CONTRIBUTORS

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Future Infectious Disease Outbreaks and Collective Responsibility: Students' Experiences and Perspectives

Jynx K. Frederick, BSPH

ABOUT THE AUTHOR

Jynx Frederick is a first-year master's student at Tulane University in the Master of Public Health and Tropical Medicine program, New Orleans, LA. She has a Bachelor of Science in public health, health promotion, and health behavior from Oregon State University, Corvallis.

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My introduction to disease came when I was diagnosed with a rare heart condition at age 14. Stark words like "code blue," "pediatric," and "charge the defibrillator panels" rushed around me as doctors and nurses crowded the emergency department, primed for the next time I might slip into cardiac arrest. Awaiting my prognosis, I thought about how decades earlier both my aunt and great-grandmother had died of the same heart condition, and it became obvious to me that my battle to survive was more than just mine—it was also my family's.

DISEASE, COMMUNITY, AND COLLABORATION

This shift in my perspective of health from a characteristic of the individual to one that was generational turned wellness and disease into attributes of the family, community, and population. However, I was not able to wholly articulate this bigger picture of health until I took my first public health course. Foundational phrases like "health determinants" and "health disparities" that had been missing from my previous experiences with medicine painted a more complex image of illness. The acquisition of this new language propelled me toward the field of public health.

As a public health student sitting in an aged lecture hall at the London School of Hygiene and Tropical Medicine years after my diagnosis, quarantined from the statues of disease vectors that adorn the building's entryway, words like "global burden of infectious disease" allowed me to see the immediate need to control and prevent emerging threats. Learning about the devastating impacts of communicable pathologies that I had never seen, I was able only to conceptualize the vital importance of collaboration and systems thinking on disease intervention.

But in late February, standing in the early morning rain on a train platform in rural Portugal, I felt the tangible personal, community, and global burdens of coronavirus. I had been living in Spain for a research internship and was days earlier accepted into a Master of Public Health program back home in the United States. Small, spherical droplets of water beaded on my forehead as I stood solitary on the darkened platform, looking on as public health officials and police pulled a passenger suspected of having coronavirus from our car. Under the flickering of a streetlamp, I thought about how I had just used the same bathroom as that passenger had moments earlier. Touched the same door handle, breathed in the same musky, unfiltered air.

The light above me intensified, almost as if illuminating the patient zero that I feared I might become if I returned to my small hometown in the United States. The next few days and weeks were a blur of conversations with my university and personal physicians followed by preparations to facilitate my speedy travel home and a three-week quarantine. As a cardiac patient, I knew I could not stay abroad during an emerging pandemic, but the fear of exposing my community weighed on my conscience.

DISEASE CONTROL AND SHARED RESPONSIBILITY

In the age of COVID-19, words like "community," "health disparities," and "global burden of infectious disease" have become universal and portents for communal experience. The effects of infectious diseases like coronavirus are dynamic and far-reaching. Despite any reluctance that we may have to act together as communities, we are affected together, we suffer together, we thrive together. It has been almost a year into

the pandemic and my small, rural hometown that was once insulated from the worst effects of COVID-19, like many other small, rural towns throughout the country, is experiencing the shortage in intensive care unit beds that has already devastated larger cities for months. We are now seeing first-hand that an absence of resources has dire implications for communities, as it means that access to health care for patients in need of critical care as a result of COVID-19, or any life-threatening illness, is limited. In circumstances like our current one, in which resources for treatment are scarce, the spread of the virus literally begins and ends with the individual's willingness to follow public health recommendations.

My hometown is not unique in its present state of ambiguity. Our experiences are representative of many other communities throughout the country and throughout the world. If we are to improve our public health responses and better control infectious diseases like coronavirus in the future, we must embrace our responsibility to each other on the population level. Infectious disease prevention and management begins with the individual but quickly moves from the personal to the family, the community, the population. More integrated responses to future outbreaks will rely on our widespread literacy of the responsibility that we all have to each other to protect ourselves and the most vulnerable among us. AJPH

CORRESPONDENCE

Correspondence should be sent to Jynx K. Frederick, 220 N Pierce St, New Orleans, LA 70119 (e-mail: jfrederick@tulane.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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When Studying Cannot Help: A Medical Student's COVID-19 Experience

Collin Dickerson, BA

ABOUT THE AUTHOR

Collin Dickerson is a third-year medical student at the Warren Alpert Medical School of Brown University, Providence, RI.

On March 18, 2020, I was scheduled to take the US Medical Licensing Examination (USMLE) Step 1 exam, the ominous culmination of 2 years struggling through the murky waters of preclinical medical education. On March 17, 2020, USMLE exams were cancelled until further notice. The intent of this commentary is not to complain. The purpose is to explain one answer to the question that many medical students faced: what do I do now? All I was at that point in my medical education was a hurricane of unorganized factoids, skimming to the surface of my consciousness at seemingly random intervals. *Tetracyclines bind reversibly to the 30S subunit of ribosomes—so what?* I did not have the skills to go to a hospital to care for patients. In fact, I was strictly forbidden from going there. Is my only recourse to continue the Sisyphean task of studying?

Although I had no practical skills, I did have a cell phone. I was one of dozens of medical and physician assistant students in Rhode Island to answer the call from the Rhode Island Department of Health to be a contact tracer. For those unfamiliar with the term, contact tracing involves calling individuals with a transmissible disease (in this case, COVID-19), obtaining information on their close contacts, alerting those contacts of their exposure, and advising them on quarantine and testing guidelines. After weeks of isolation and uncertainty, I crossed my first boundary, entering the government building like I was breaking some newfound cultural taboo. I was swiftly whisked into a meeting full of young men and women in army fatigues. My business casual suddenly seemed too casual. But I studied the guidelines and learned what to say, so I started making phone calls. There was a single mother, angry and frustrated because she could not return to work and was not sure how long she could support her family. Her daughter had just come down with a cough. There was a woman with multiple sclerosis who took an immunosuppressive drug. She lived with her elderly mother who had chronic obstructive pulmonary disease. There was also a young man who believed the virus was a government conspiracy to track civilians. He refused to give me any of his contacts. The pandemic was a thousand intertwining stories, each connected to the next like a complex assortment of dominos.

What I learned working as a contact tracer was how truly unprepared we were for this pandemic. If a phone number could not be reached, there was no system in place to contact an individual to tell them of their test result, their exposure, or overall quarantine guidelines. There was no electronic system to keep records of each person and their contacts. Each person under investigation had simply one folder with no backup. In Rhode Island, many of the positive cases were not English-speaking. There were few epidemiologists or contact tracers fluent in Spanish, and even fewer for the prominent Portuguese, Cambodian, and Mandarin-speaking populations in Providence and the surrounding area. Finally, the state had to rely on the unpaid and undertrained labor of medical students and other volunteers. While these systems changed and improved, it is telling that only a pandemic could overcome the inertia of decades of budget cuts and complacency.

When we recover from this pandemic, I hope that our society acknowledges the value of a robust and functioning public health system. Much like how the AIDS epidemic spurred change a generation ago, we can already see how this pandemic has catalyzed innovation in our health care system. From uncovering tenuous supply chains to necessitating reimbursement for telemedicine visits, COVID has exposed fault lines in our health care system and made us reevaluate our day-to-day practices. Even our public health experts have had to revise their stance on the simplest of interventions: wearing masks. Here, too, we can see how the subjective experience of the pandemic has varied based on perception of who is telling the truth. I hope that there will not be a continued, polarized divide among those who trust

in science and public agency and those who deny data and refute their responsibility to others. Although I will not be surprised if this happens, I am also optimistic that the majority will outweigh the outspoken.

My story is by no means unique. Across my state and across the country, medical students organized to 3-D print N95 masks and to staff phone lines to provide the latest guidelines on the pandemic. To any students still wondering what they can do, join your local public health organization. Advocate for causes you believe in, strive for leadership roles, and make your voice be heard. I speak for many students when I say that COVID-19 has defined our educational experience. We know that we cannot simply practice medicine and ignore the systems-level changes necessary to overcome this pandemic and to prevent the next. I hope this understanding translates to an investment at the local, state, and federal level to develop a public health infrastructure that all Americans need and deserve. My generation saw the need, and we found our own answers to what we can do to help. Studying for another test can wait. AJPH

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CORRESPONDENCE

Correspondence should be sent to Collin Dickerson, Warren Alpert Medical School, Brown University, Box G-9071, 222 Richmond St, Providence, RI 02903 (e-mail: collin_dickerson@brown.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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Black, Indigenous, People of Color, and International Students: Experiences and Resolutions Beyond COVID-19

Hassanatu Blake, MPH, MBA, Nashira Brown, MS, Claudia Follette, MS, RDN, Jessica Morgan, MPH, and Hairui Yu, MEd

ABOUT THE AUTHORS

All of the authors are public health doctoral students in the Department of Health Behavior, School of Public Health, University of Alabama at Birmingham.

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The Black Lives Matter Movement has awakened many to racism and anti-Blackness during the COVID-19 pandemic. The recent Centers for Disease Control and Prevention COVID data tracker reveals that Black people nationwide are dying from COVID-19 at twice the rate of White people.[1] The data also disclose that Black people, Indigenous people, and People of Color (BIPOC) are disproportionately affected by COVID-19.[2] Racial disparities are also seen in academia. In June 2020, Shardé Davis and Joy Melody started #BlackInTheIvory on Twitter to talk about their journeys as a Black female professor and doctoral student, respectively.

As BIPOC public health doctoral students at a US Deep South university, these kinds of discussions have motivated us to share our own stories and contemplate solutions to help spur change. As students of color from the same cohort at a predominately White institution, we are facing a few realities that impede both our identities and our lived experiences, and we seek resolve in this time of uncertainty. We have provided four personal accounts of our diverse public health doctoral student experiences and recommendations to address some of our challenges.

SYSTEMATIC RACISM, COVID-19, AND ANXIETY

As a Black woman living during COVID-19 and protests against systemic racism across the United States, generalized anxiety disorder has been a personal perpetual battle. The COVID-19 pandemic has unearthed a multitude of racial injustices across the United States, particularly regarding social distancing guidelines, mask requirements, health care stigma, and socioeconomic status. Many Black Americans endure health care stigma from health care providers leading to refusal of care and disregard of pain, which inhibits adequate treatment of chronic conditions; this puts them at an increased risk for adverse health outcomes from COVID-19. Students of color who are clinically or self-diagnosed with generalized anxiety disorder are faced with unmet needs because of inadequate access to mental health services, food, safe housing, and employment opportunities.

The pandemic has created uncertainty in regard to future employment opportunities because of the likelihood of a pending recession and undue financial burden of medical insurance. The Affordable Care Act is under constant attack from the Trump administration, and its abolishment would force many Americans to go without medical insurance, thus limiting mental health care services. Preexisting inequalities owing to classism, sexism, racism, and so on have only added to the growing anxieties of what it means to coexist in the United States and in a Black body.

STRESS AND COVID-19

As an underrepresented female graduate student, there is already an ongoing challenge to maintain resilience in a predominantly White doctoral program and institution. During the COVID-19 pandemic, in-person classes have been suspended and remote responsibilities, including virtual group meetings, assignments, and projects, have increased along with looming uncertainty. Frequent feelings and thoughts of existing inadequacy are coupled with intensifying stress levels. Unfortunately, this has led to the onset of a new stress-related disorder, which is a hindrance to navigating the problematic, academically isolated, and pressured pathway to a PhD.

The pressure to exceed academic and research expectations during this time

has resulted in a desperate need for social support. However, minority student group meetings and scheduled gatherings have been postponed indefinitely. Furthermore, seeking support from a mentor who does not identify as a person of color or from family and friends who have not experienced doctoral student realities has not been effective. Therefore, coping with stress in isolation with mounting responsibilities has left me perplexed with nowhere to turn.

FAMILY RESPONSIBILITY AND GRADUATE PROGRAM

The shutdown triggered by COVID-19 resulted in sheltering in place while working and schooling from home. Before the closure, my own silo—being a working woman, wife, and mom—did not make me feel like a champion. The expectation to fulfill the roles of wife and mother persisted even if they conflicted with my career and educational pursuits. While comforting my children through their young relationships and navigating them through school rituals and routines, my own assignment deadlines always loomed. COVID-19 slowed things down to allow reflection on the difficulties of balancing school, work, and home. Seemingly, nontraditional graduate BIPOC students have no one with whom to share their experiences and discuss difficult decisions to successfully complete doctoral studies.

IMMIGRATION AND CONTINUED GRADUATE STUDIES

The rapid growth of COVID-19 cases in the United States and its associated uncertainty have led to anxiety among international doctoral students. About one third of new doctorate recipients every year in the United States are international students. Many US universities announced campus closure in response to COVID-19. Campus closure increased the stress and anxiety among international doctoral students. I, as an international doctoral student, no longer feel secure to study in the United States. According to a governmental modification announced on July 6, the US Department of State would not issue visas to international students who take fully online classes for the fall 2020 semester. If a doctoral program merely provided online classes under COVID-19, international students would have to leave the United States or transfer to another university.

In response to the Trump administration's new international student immigration rule, Harvard University and the Massachusetts Institute of Technology filed lawsuits opposing the July 6 ruling. Consequently, there was a reversal of the guidance that allows international students already in the United States to stay. However, new students still abroad are out of luck. With less access and a lack of connection to the university community and resources, the support international students receive from campus and departments has declined. Furthermore, a recent Department of Homeland Security federal proposal to limit student visas to a fixed four-year term places international doctoral students' mental status and academic progress in jeopardy.

RECOMMENDATIONS

As BIPOC doctoral students, we are facing a number of challenges, including institutional racial biases and structures, stress and anxiety, a lack of social support, and discriminatory immigration policies. To address these issues during and after COVID-19, understanding differences among racial and immigrant groups is essential to develop multifaceted and equitable resolutions that will improve BIPOC and immigrant doctoral students' experiences. We provide some recommendations imperative to our career development and progress:

1. *Assign graduate students to academic mentors who share and are familiar with diverse cultures.* Universities should provide additional and continuous diversity and inclusion training and implicit bias training to non-BIPOC faculty to ensure the best engagement between student and faculty advisors and to aid student progress. Some preexisting beliefs can reinforce stereotypes and stigma attached to BIPOC students. Therefore, more consistent training can initiate a path to a more comfortable relationship between BIPOC students and faculty who may not look like them.
2. *Develop and implement a diverse course curriculum.* Courses that highlight microaggressions, cultural issues, and lived experiences would further incorporate key university commitments of diversity, equity, and inclusion. A few institutions, such as Purdue University and the University of Pennsylvania, have developed an implementation action plan and integrated antiracist education into their coursework.[3] In turn, the curriculum will help improve the livelihoods of students across their campuses.
3. *Develop a university child care and virtual education assistance strategy.* A university strategy will ensure the safety of nontraditional students' children and reduce some of

nontraditional graduate students' burdens in a fast-paced environment. Currently, a few universities provide support specifically for graduate students with spouses and children. The Harvard University Graduate School of Arts and Science provides parental accommodation and financial support following the birth of a child, a student–parent organization, and child care and lactation support. Graduate BIPOC students juggling multiple roles would be well served with programs that consider specific support needs.

4 *Support efforts toward a collective university policy protecting international students.* To support international students during this unpredictable time, several universities, such as the University of California at Los Angeles and the University of Alabama at Birmingham, promote mental health services among international students and provide culturally relevant counseling services.[4,5] These efforts illustrate universities' solidarity in protecting international students.

The world is in an unprecedented time ripe for learning and change. At US universities, BIPOC doctoral students require their institutions to be committed to their diverse concerns during and after the COVID-19 pandemic. By enacting the aforementioned recommendations, universities can get closer to securing antiracist and safe campuses for BIPOC doctoral students. AJPH

CORRESPONDENCE

Correspondence should be sent to Hassanatu Blake, Center for the Study of Community Health, Edge of Chaos, Lister Hill Library, University of Alabama at Birmingham, Birmingham, AL 35294 (e-mail: hblake@uab.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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CONTRIBUTORS

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Addressing COVID-19 in Resource-Poor Settings: Comparing the Experiences of Vietnam and Sri Lanka

Saroj Jayasinghe, MD, PhD, Sanjiva Weerawarana, PhD, and Dushyantha T. Jayaweera, MD

ABOUT THE AUTHORS

Saroj Jayasinghe is with the Department of Clinical Medicine, University of Colombo, Colombo, Sri Lanka. Sanjiva Weerawarana is with the Lanka Software Foundation, Colombo, Sri Lanka. Dushyantha T. Jayaweera is with the Miller School of Medicine, University of Miami, Miami, FL.

COVID-19 is causing devastation across the globe. The experience of individual countries and their outcomes has attracted the attention of researchers and policymakers who wish to learn from the pandemic and prepare for future pandemics. Vietnam's response is considered a model for resource-poor countries facing the COVID-19 pandemic.[1] Its ability to maintain a persistently low infection rate and prevent a major second wave is remarkable. Although generalizing from a single example may be fraught with errors, comparing such experiences with other well-performing countries may help to identify elements for a successful model in pandemic preparedness for resource-poor countries.

Sri Lanka, another middle-income nation (per capita gross national income [GNI], as determined by the Atlas method, of US $4020 vs Vietnam's US $2540) performed relatively well early in the pandemic.[2] By October 5, 2020, it had a cumulative total of 3402 cases in a population of 21.8 million (156.1 cases per million) compared with Vietnam's 1096 cases in 95.5 million (11.5 cases per million), but its performance was well above many high-income countries, including New Zealand (1499 cumulative cases or 306.8 per million; per capita GNI: US $42 670), South Korea (24 164 cumulative cases or 467.9 per million; per capita GNI: US $33 720), and Australia (27 136 cumulative cases or 1060.0 per million; per capita GNI: US$ 54 910).[2,3]

Vietnam and Sri Lanka implemented several common responses; both took early, swift, and decisive action to prevent entry of the infection into their countries.[4,5,6] On January 26, Sri Lanka appointed a multisectoral national action committee to formulate strategies to overcome the pandemic.[5] This was a day before the first case was detected in a tourist and four days before the World Health Organization declared COVID-19 a Public Health Emergency of International Concern. Several institutions, including the defense forces, proposed overall strategies and plans to prevent the pandemic.[5] As a result, a whole-government and civil society approach was proposed. The strategies were regularly modified to meet emerging crises.[5]

Similar to Vietnam, Sri Lanka implemented strategies to control contagion: restricting mobility (strict isolation), early detection, contact tracing, and compulsory quarantine.[1,5,6] The first Sri Lankan citizen to have COVID-19 was reported on March 11, and all schools were closed on March 13 and ports and airports by March 19. Island-wide curfews were imposed on March 20, with suspension of public transportation.[5] Wearing a mask and social distancing were enforced universally. The Sri Lanka government provided institutional care for all PCR (polymerase chain reaction)-positive individuals in 12 designated hospitals. Primary and secondary contacts were traced through the preventive health care networks, which were supported by mobile phone data and the security forces. Primary contacts were transferred to quarantine centers.[4,5] By March 15, defense forces rapidly established 12 centers, which soon increased to 62. In some instances, villages and cities with patient clusters were isolated. Secondary contacts were confined to home quarantine and were supervised by preventive staff and, when appropriate, the police and defense forces.

Defense forces played a crucial role in Vietnam. Vietnam's prime minister Nguyễn Xuân Phúc stated, "The Army has mobilized hundreds of thousands of military officers and soldiers to support

tens of thousands of quarantined people regardless of day or night, sunny or rainy day."[7] Similarly, Sri Lanka mobilized its defense forces for quarantine, contact tracing, and logistics. The National Operation Center for Prevention of COVID-19 Outbreak (NOCPCO), headed by the army commander, was established to coordinate and facilitate the implementation of plans formulated by the action committee and other institutions.

The Vietnamese government used the media and social marketing to keep the public informed.[1] The Sri Lankan government, too, launched health education programs through print and social media, mobile phones, and Web pages. The director general of health services and NOCPCO held regular press conferences.[4,5] Such communication strategies may have caused people to perceive measures such as quarantines, lockdowns, and face masks favorably rather than as intrusive—a sentiment that triggered mass protests in the United States and Europe. Social solidarity was further promoted by providing free essential food items and financial aid to vulnerable households during curfews; a task force appointed by the president coordinated and facilitated this action. Concessions were also granted on loan settlements, electricity bills, and water bills, and work and education were shifted to online modes.

As the COVID-19 pandemic has evolved, crucial differences have emerged between the two countries. Sri Lanka experienced a second wave, and its seven-day rolling average of new cases per million people dramatically increased after October 5: from approximately 0.3 to more than 21.0 by November 27.[3] In comparison, Vietnam's figures remained low: approximately 0.03 to 0.04. By November 27, Sri Lanka had 22 028 cumulative cases (1028.7 per million), whereas Vietnam had only 1331 (13.7 per million).[3]

These differences partly reflect higher PCR testing rates in Sri Lanka: 0.52 per 1000 persons compared with Vietnam's 0.03 per 1000 (last available date for these data was October 15). However, Vietnam may genuinely have a lower infection rate because its well-planned responses were more effective owing to using their previous experiences of tackling the 2005 H5N1 (influenza A virus subtype H5N1) epidemic. These responses included empowering its citizens and encouraging the early detection of cases through widespread availability of mobile apps, which enabled voluntary medical declarations, provided updates on individual health status, allowed access to a virtual medical assistant, and detected suspected cases.[6]

By contrast, Sri Lanka's law-enforcement approach may have facilitated the spread of COVID-19 among marginalized groups, such as those with substance use disorders, who experienced outbreaks as part of the first wave.[4] The second wave originated in late September in a garment factory and a fish market because of delays in case detection. In retrospect, this resulted from unempowered people not seeking help early, inadequate mass screening of people crowded into confined spaces (e.g., factories), and delays in detecting those with COVID-19 symptoms.

The other difference between Sri Lanka and Vietnam was Sri Lanka's low case fatality rate of 0.4% (99 deaths among 22 028 cases) compared with Vietnam's 2.6% (35 deaths among 1331 cases).[3] Although Vietnam had many deaths among already ill hospitalized patients, the figures may reflect the superior quality of Sri Lanka's health services. This is supported by its higher per capita health expenditure of US $503.56 current purchasing-power parity versus Vietnam's US $375.64 and larger number of hospital beds (3.6 per 1000 people vs Vietnam's 2.6 per 1000 people).[2] Furthermore, Sri Lanka offers health care and quarantine at zero cost to users, which encourages poorer patients to access and utilize these services.

The COVID-19 pandemic continues to cause thousands of deaths and overwhelm many high-income countries that have advanced health infrastructure.[3] By contrast, Vietnam and Sri Lanka are resource-poor countries that successfully crushed the pandemic in its early phases. Their experiences suggest the importance of early decisive government action that consists of limiting entry, restricting population mobility, detecting cases, contact tracing, and institutional care. These interventions incur relatively low direct costs and are based on sound epidemiological principles of controlling pandemics. As a result, populations in both countries sacrificed their individual freedom but took measures that have saved thousands of lives. It also enabled the countries' health services to counter the pandemic. The strategies Vietnam adapted, which emphasized empowerment and early detection through Web-based tools, appear to be more successful in saving lives. Comparing the experiences of Vietnam and Sri Lanka may offer a clear strategy to other middle- to low-income countries facing the devastating COVID-19 pandemic and other pandemics that may occur in the future. AJPH

CORRESPONDENCE

Correspondence should be sent to Saroj Jayasinghe, Faculty of Medicine of the University of Colombo, Kynsey Rd, Colombo 00800, Sri Lanka (e-mail: saroj@clinmed.cmb.ac.lk). Reprints can be

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CONTRIBUTORS

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Brazil's Fight Against COVID-19

Mario R. Dal Poz, PhD, Eduardo Levcovitz, PhD, and Ligia Bahia, PhD

ABOUT THE AUTHORS

Mario R. Dal Poz and Eduardo Levcovitz are with the Institute of Social Medicine, University of the State of Rio de Janeiro, Rio de Janeiro, Brazil. Ligia Bahia is with the Institute of Studies in Collective Health, Federal University of Rio de Janeiro.

COVID-19 cases and deaths are clearly on the rise again in Brazil. It is thus important to look back in time and examine the achievements and challenges of the country's Unified Health System.

The pandemic struck Brazil just as the current government was introducing a reform agenda that can be described as a mixture of economic liberalism and conservatism. The ineffective and delayed response to COVID-19 was surprising given Brazil's history of responding capably and promptly with successful policies and services as well as its efficacy in controlling health risks and diseases such as smoking, HIV/AIDS, and, more recently, the Zika virus.[1] This commendable track record illustrates the positive health effects for affected populations when scientists from various relevant fields, communities, and families engage in concerted solutions to problems through the political determination of the federal, state, and local governments.

Unfortunately, the denialist stance by Brazil's federal government and pro-government protestors has generated a polarized political conflict with most state and local governments, as well as with the scientific and academic community.[2]

At the beginning of the pandemic, the Ministry of Health provided regular and consistent information and communication to the population and the press as a key strategy. A national center for public health emergency operations was established. The first and greatest challenge was to link and interact with various stakeholders in the system and in both the public and private sectors to structure the health care response by the Unified Health System. Daily briefings provided updated numbers of confirmed cases and deaths, and epidemiological bulletins were published that contained guidelines for surveillance activities in states and municipalities and reinforced the importance of measures to prevent coronavirus transmission.

However, as a result of the characteristics of the health care labor market and the shortage of personal protective equipment in Brazil, COVID-19 infection and mortality rates among health care workers have been higher than in other countries. The numbers of workers with two or more jobs, part-time and outsourced employment, and shifts of 12 to 24 hours have all significantly affected health care service efficiency.[3] Nurse technicians, physicians, and nurses, in that order, have been the health care workers most frequently identified among patients hospitalized with COVID-19.

Substantial underreporting has been observed, associated with such factors as variable laboratory capacity, unavailability of tests, and logistic challenges, resulting in delays in confirming cases and deaths and further exacerbating unreliable or even erroneous public policies to fight the pandemic. The Ministry of Health also began attempting to "disguise" or distort the data, and a "COVID-19 media consortium" was thus assembled to compile and publish the regular data generated by the state-level health services, replacing the discredited data reported by the Ministry of Health.

The scientific community expressed its concern when deaths reached extremely high levels (more than a thousand a day) and is continuing to do so now in light of the resumption of the spread of the virus, but sadly this has not been followed by appropriate interventions or acts by federal health authorities. The most widely accepted theory is that the current increase in the number of cases and deaths is attributable to the rapid and poorly controlled reopening of economic activities, lack of clear guidance from health authorities, and the population's reluctance to adhere to safety rules such as social distancing, mask wearing, and regular hand hygiene.

The federal government continues to play a limited role in organizing the public health response, criticizing nonpharmaceutical preventive measures and even recommending the use of scientifically disproven drugs.[4,5]

Decentralization of the Unified Health System, an ongoing process over the past 30 years, has left municipalities (local governments) in charge of

executing most health activities and services. This is obviously challenging most of Brazil's nearly 6000 municipalities. Within this framework, the Ministry of Health and state health departments should still be playing central coordinating and funding roles. During the pandemic, lack of leadership and coordination at all levels has contributed to the dissemination of inconsistent health recommendations to the population.

Despite the weak stance of federal authorities, several Brazilian states such as Bahia and São Paulo and cities such as Belo Horizonte and Niteroi have spearheaded a range of nonpharmacological measures to manage epidemics, including complete or partial lockdowns, social isolation, dissemination of consistent information, and control of safe distancing in public places, including a ban on gatherings and access to parks, pools, and beaches; closing of schools and universities; restrictions on services and businesses; reductions in public transportation; and adjustments to civil service office hours. These interventions have potentially saved thousands of lives from COVID-19.

Although many Brazilian states and municipalities have continued to take initiatives to increase the efficacy of public health measures and enhance the coordination of hospital services (including the private sector), there have been few reports of successes. At best, some measures may have avoided significant collapses in health services.

COVID-19 has highlighted the vulnerabilities of the Unified Health System, especially the uneven geographical distribution of both health care workers and the population's access to medium- and high-complexity health services. Surprisingly, however, the pandemic has triggered or exposed deficiencies in areas that had been perceived historically as the foundations of the Unified Health System and public health, such as epidemiological surveillance and the network of family health units and community health workers.

This situation does not appear likely to improve in the short term given that the lack of federal leadership and coordination and the disconnected response to the pandemic are related to the financial crisis exacerbated by the pandemic, posing significant challenges for the future of the Unified Health System. There are already signs of a worsening health care crisis, including aggravation of noncommunicable diseases and other health problems in the population and substantial reductions in vaccine coverage and other basic health care provisions.

Although Brazil's political and institutional environment is daunting, we can hope that with the results of the recent municipal elections, more municipalities will be able to support public health, develop evidence-based local health policies, improve primary health care, and restore a culture of understanding and dialogue with health professionals and social movements to protect the population's health.[6] AJPH

CORRESPONDENCE

Correspondence should be sent to Mario R. Dal Poz, PhD, Institute of Social Medicine, University of the State of Rio de Janeiro, Rua São Francisco Xavier 524, Maracanã, Bloco E, 7° andar—UERJ, Rio de Janeiro, RJ, 20550-013 Brazil (e-mail: dalpozm@ims.uerj.br). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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Precision Public Health Matters: An International Assessment of Communication, Preparedness, and Coordination for Successful COVID-19 Responses

Chloe Sales, BS, Yeuen Kim, MD, MAS, Gloria Kim, MD, Bryant Lin, MD, MEng, and Latha Palaniappan, MD, MS

ABOUT THE AUTHORS

Chloe Sales is with the Center for Asian Health Research and Education, Stanford University School of Medicine, Stanford, CA. Yeuen Kim, Bryant Lin, and Latha Palaniappan are with the Department of Medicine, Division of Primary Care and Population Health, Stanford University School of Medicine. Gloria Kim is with the Department of Cardiovascular Medicine, Division of Primary Care and Population Health, Stanford University School of Medicine.

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The most powerful country on the planet was not expected to fall so easily to a virus. Yet 13 months after the outbreak of COVID-19, the United States continues to display some of the worst outcomes in the world: more than 23 million cases and 390 000 deaths.[1] Despite having more time to prepare—thanks to lessons learned from our European and Asian counterparts—we have struggled with poor communication, mismanaged information, and inconsistent response coordination. In some regions of the United States, pandemic mortality varies widely within a 15-minute driving distance, magnifying long-standing inequities in life expectancy and access to care. These disparities persist when stratified by neighborhood income, overcrowding, work environment, and other barriers. Meanwhile, in smaller, less powerful countries, including Taiwan and New Zealand, the virus is all but contained.[2]

So why the difference?

One answer lies in precision public health: the best response for a specific population at a given point in time.[3] Precision public health addresses disparities in morbidity and mortality and is particularly relevant, as COVID-19 exacerbates health inequities (Figure A, available as a supplement to the online version of this article at http://www.ajph.org) and unearths political and social divides.[3]

In May 2020, our team at the Stanford University School of Medicine convened more than 50 global researchers, physicians, and health advocates—across 18 countries and 14 time zones—to share their public health practices through an international COVID-19 conference. Our speakers identified three elements common to the most successful efforts in precision public health: (1) transparent and effective communication, (2) public health preparedness, and (3) centrally coordinated responses recognizing local and national needs.[2] Other countries' successes illustrate the importance of looking beyond US borders to improve communication, care, and coordination.

First, effective communication requires active information management and a solid foundation of trust built on transparent communication. In Taiwan, stepwise aims, control measures, and health literacy initiatives helped guide public behavior and reduce case fatality and risk.[2] A digital platform identifying pandemic misinformation reinforced tough penalties for the dissemination of fake news, and ads for nonproven remedies brought swift action against the advertisers.[2] In New Zealand, the government placed science, leadership, and careful language at the forefront of the COVID-19 response.[4] Rather than frame the pandemic as a "war" or "battle," the prime minister discouraged COVID-19 stigmatization and emphasized public unity through regular social media updates and traditional addresses.[4] In the United States, however, the pandemic has been politicized, and the highest levels of government have presented the public with conflicting or incorrect information. Indeed, the outgoing president has been the greatest

source of misinformation regarding the pandemic, fomenting distrust for scientific authorities and political leaders.[5] Identifying and preventing the spread of misinformation, emphasizing our common strengths and goals, and supporting accurate, accessible communication are critical to regaining trust and improving our response in the United States.

Second, lessons learned from previous pandemics helped catalyze COVID-19 preparedness in several countries.[2] Scientists in China identified and shared genetic sequencing of SARS-CoV-2 on January 10, allowing international jump starts in testing technology (South Korea) and vaccine development (e.g., United States, United Kingdom). As a result of the 2015 SARS (severe acute respiratory syndrome) epidemic, South Korea established the Infectious Disease Control Center, which later distributed COVID-19 testing guidelines before the first confirmed South Korean case.[2] Responses in Hong Kong, Taiwan, and South Korea used technology—including mobile phone data, credit card records, and closed-circuit TV recordings—to help identify, isolate, and contact trace COVID-19–positive individuals.[2] Despite encroachment on individual privacy and liberties, public recall of SARS and MERS (Middle East respiratory syndrome) facilitated adherence to these procedures.[2] Unlike the fragmented US health care system, universal health care access in all other developed nations facilitated support of pandemic responses. Preparedness through universal health care and frank discussions about civil liberties regarding technology may help us emulate smaller nations and their successes in controlling COVID-19.

Third, strong central coordination is essential to COVID-19 mitigation and precision public health. Taiwan allocated more than US $1.3 billion to hard-hit local businesses and US $653 million to health care workers and systems, delaying tax and rent payments and issuing state-guaranteed loans.[2] Funding mental health was a crucial component of this relief.[2] British Columbia, Canada, quickly recognized that telehealth could reduce inequities in access, especially for Indigenous or First Nations populations in rural areas.[2] In the absence of federal coordination, local responses have helped reduce morbidity in San Francisco, California.[6] Public health coordination of handwashing stations, universal testing, and access to supportive housing helped minimize the disruption of social networks among individuals experiencing homelessness, possibly conferring lower-than-predicted mortality rates among these populations.[6]

Yet we need to do more. The privatized nature of the US health system has exacerbated socioeconomic inequities and revealed where our societal priorities and values lie. Cities in the San Francisco Bay Area of California that have higher proportions of poverty and minorities, such as Richmond and San Pablo, display their county's highest COVID-19 infection rates yet offer the same number of testing sites as their affluent White counterpart Walnut Creek—a city with half the population and an infection rate five times lower.[7] Rather than practice equality, which would dictate an equal distribution of resources, we must promote equity: distributing resources according to need.

Every crisis offers an opportunity to see where we are, how we got here, and where we want to be. The health of the entire country depends on the health of its individual members; the African Ubuntu philosophy "I am because of who we all are" seems particularly apt at this challenging time. Effective communication and social and health programs that protect the lives of all members of society can restore trust and credibility. Operating as 50 separate countries (rather than 50 united states), competing for the same resources, and issuing conflicting guidelines have crippled our response. We must move forward to heal.

The United States must exercise precision public health: the best care for a specific population at a given point in time.[3] In the words of the director of the University of California, San Francisco Benioff Homelessness and Housing Initiative, Margot Kushel, "Our humanity has always been wrapped up in other people's humanity"[8]; we must collaborate beyond our borders and support the international community. The ability to reckon with the future will depend on how much and how well we learn from recognizing disparities and their root causes. Improving communication with, reinforcing the information infrastructure of, and cooperating as a leader among other nations will position us to face the "new normals" of momentous change. It is time for the United States to rejoin those at the lead and help all of us emerge stronger from this crisis and ready for the next. AJPH

CORRESPONDENCE

Correspondence should be sent to Chloe Sales, Program Coordinator, The Center for Asian Health Research and Education, Stanford University School of Medicine, 1265 Welch Rd, Palo Alto, CA 94305 (e-mail: csales@stanford.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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C. Sales organized the Stanford International COVID-19 Conference, wrote and revised the editorial, and created Figure A. Y. Kim shared content and supervised. Y. Kim and G. Kim edited and revised the editorial. B. Lin and L. Palaniappan invited speakers and convened the Stanford International COVID-19 Conference and edited the editorial.

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Equitable Enforcement of Pandemic-Related Public Health Laws: Strategies for Achieving Racial and Health Justice

Maya Hazarika Watts, JD, Katie Hannon Michel, JD, MELP, Jessica Breslin, JD, and Elizabeth Tobin-Tyler, JD, MA

ABOUT THE AUTHORS

Maya Hazarika Watts, Katie Hannon Michel, and Jessica Breslin are with ChangeLab Solutions, Oakland, CA. Elizabeth Tobin-Tyler is with the Alpert Medical School and School of Public Health, Brown University, Providence, RI.

As COVID-19 inflicts disproportionate harm on communities of color,[1] inequitable enforcement of pandemic response policies further widens health disparities. (Although "pandemic response policies" include many interventions, we use the term to reference public health policies adopted to limit viral spread.) These actions are extensions of persistent systemic failures in public health enforcement writ large that have deleterious health impacts (e.g., chronic failure to enforce health and safety regulations, such as housing safety codes,[2] and selective enforcement of certain public health laws, such as antismoking ordinances, that target and displace unhoused individuals).[3] Furthermore, using police to enforce public health laws—during the pandemic and beyond—is especially problematic from a health justice perspective in communities of color, given police violence against marginalized groups.[4]

Equitable enforcement should be used to promote racial justice and ensure that public health laws have their intended effect.[5] Inequitable enforcement harms public health through overenforcement, in which some communities are disproportionately affected by punitive enforcement approaches, and underenforcement, in which some communities experience inconsistent enforcement of public health laws. Equitable enforcement ensures compliance with the law while considering and minimizing harms to marginalized communities. An equitable enforcement approach considers racial and health justice at the levels of agency strategy and individual actions. It also considers equity at all enforcement stages—from determining when to enforce a law, and against whom, to deciding which enforcement tools to use.

We discuss the effects of inequitable enforcement of public health laws implemented during the COVID-19 pandemic and highlight alternative strategies to consider. Although policy selection and the underenforcement of public health laws are critical pieces of the puzzle, they are beyond the scope of this editorial. We offer considerations to improve the development and implementation of enforcement provisions and realize the health and racial justice benefits of public health laws during the pandemic and beyond.

EQUITABLE ENFORCEMENT AND RACIAL JUSTICE

Overreliance on the traditional criminal enforcement of pandemic response policies may prompt unnecessary interactions with law enforcement in underserved communities, which may already mistrust police[6] because of historical mistreatment and persistent disparities in the criminal justice system. Community Resource Hub found that the enforcement of pandemic response policies between March and August, 2020, disproportionately affected Black people, with arrests being the most common enforcement action.[7] The racial disparities in these early data highlight the need to address racially biased discretion in enforcement.

Overpolicing, particularly in communities where residents are disproportionately people of color, causes its own health problems. For example, New York's stop and frisk program was associated with poorer physical and psychological health in men and boys in areas where more police stops occurred.[8] Police killings of unarmed Black Americans also cause widespread harm, damaging the mental health of Black Americans who are not directly affected.[4]

In the wake of George Floyd's death, there has been growing attention to

delineating the appropriate role of law enforcement. Some criminal justice advocates argue that police, who typically lack adequate training in mental health, substance use disorders, and other noncriminal social problems, should be replaced by professionals with relevant expertise to respond more effectively and reduce opportunities for racial injustice and violence.[9] Similarly, enforcement of public health laws designed to protect the public from a highly transmittable and dangerous infectious disease is better addressed by those with expertise in public health. As communities develop enforcement strategies for pandemic response policies, it is important that they select enforcing officials and agencies that employ a racial and social justice lens that is informed by public health goals. This may include delegating the enforcement of public health laws to nonpolice agencies to reduce law enforcement involvement. Additional research and funding are required to facilitate this shift, given concerns about capacity, safety, and legal authority.

THE DISPARATE IMPACT OF PUNITIVE MEASURES

Physical-distancing and mask measures have been invaluable in slowing the spread of COVID-19. In many jurisdictions, however, violations of these public health orders are criminal offenses punishable by fines and, potentially, jail time.[10] Consequences like these disproportionately affect individuals with low income and people of color, exacerbating health inequities.[11] For example, a law that imposes a $250 fine for a violation can affect a person's ability to pay rent, feed family, or meet other essential needs—all consequences that harm health. Moreover, some populations may experience challenges to compliance; for example, immigrants may lack access to information in their preferred language.

Jurisdictions can consider several strategies to more equitably enforce pandemic response policies. These include using criminal penalties only after repeated violations by implementing graduated penalty schemes and sliding-scale fines that consider ability to pay. With graduated penalty schemes, individuals who violate a law are subject to less serious consequences—such as a warning, education, or a modest fine—before more severe consequences are imposed.

In San Francisco, California, for example, the police department has stated that stay-at-home orders will be enforced through multilingual education and voluntary compliance, with criminal penalties as a last resort.[10] Tying enforcement to public health education that acknowledges and addresses the challenges of physical distancing and the importance of mask wearing are less likely to exacerbate existing risk factors driven by poverty and lack of access to resources, such as overrepresentation in low-wage essential jobs and overcrowded housing.[12] To ensure that graduated enforcement schemes consider equity, jurisdictions should articulate options directly in emergency orders, where permissible, instead of relying on informal guidance from police departments or other enforcement officials. Although some level of discretion in enforcement is necessary and appropriate in an emergency, postcrisis evaluation of equity impacts can help jurisdictions craft a more equitable enforcement strategy in anticipation of future emergencies.

Jurisdictions should also adopt sliding-scale fines that reflect the violator's financial circumstances so that monetary penalties do not pose an unfair barrier to accessing necessities like food, housing, and medical care. These approaches can minimize unintended negative consequences of enforcement actions and account for differential impact based on varied circumstances. There is strong evidence that fines that pose a heavy financial burden, if unpaid, can escalate into severe consequences for individuals and families.[11] For example, failure to pay an initial fine may lead to a suspended driver's license, additional fines, wage garnishments, or jail time, which may create more harmful outcomes than the underlying offense. Continuing evaluation and iteration can help ensure that public health laws avoid harmful unintended consequences and achieve their intended goals.

ENGAGING COMMUNITIES IN ENFORCEMENT POLICIES

Two fundamental ethical principles of public health are community engagement and transparency in government decision making. Working *with* community members, rather than *on* the community, to enforce public health laws, such as stay-at-home orders, is likely to promote better compliance.[13] Communication and transparency about policy is even more critical in marginalized communities that are often left out of decision making.

In April 2020, Chicago, Illinois, created the Racial Equity Rapid Response Team[14] specifically to address the disparate effects of the pandemic on Black and Hispanic residents and to lay the groundwork to address longstanding systemic inequities—including overpolicing and high rates of incarceration, inadequate access to health care, and low-wage jobs that offer few workplace

protections. This task force created a public–private partnership with community groups already working to provide community organizing, health care supports, and mentoring services in neighborhoods hit hardest by COVID-19. Efforts included tailored education and outreach, prevention, testing and treatment, and supportive services such as food and housing assistance.

Educating and engaging communities in the purpose and rationale behind public health laws designed to reduce the spread of COVID-19 can support public trust. Furthermore, creating opportunities for community members to participate in the development and implementation of enforcement provisions is likely to increase compliance.[15] Because the impact of COVID-19 restrictions is so far-reaching—affecting family life, businesses, and access to a range of services, including medical care—policymakers should include a transdisciplinary range of stakeholders (e.g., individuals who are more likely to experience the medical and economic effects of the pandemic, community-based organizations, local businesses, housing advocates, public health organizations, and criminal justice advocates). Although including a wide range of stakeholders reduces the likelihood of community-wide consensus, failing to include different perspectives in decision making may backfire if community members' voices are unheard.

CONCLUSIONS

Early data show that the pandemic is exacerbating inequities that existed long before the pandemic began. People of color face greater social, health, and economic risks associated with COVID-19.[1] State and local officials are working to address challenges and craft innovative solutions in response to the evolving pandemic. Their actions include creative approaches to the enforcement of public health laws—for example, recommending nonpunitive consequences for violations of physical-distancing measures[10] and partnering with residents and community groups to combat preexisting racial and health disparities.[14] Strategies that jurisdictions pilot and implement now to respond to the emergency and reduce the negative consequences of inequitable enforcement should also inform long-term solutions to address preexisting inequities. Equitable enforcement can promote racial and health justice, increase community resilience, and improve outcomes during public health emergencies and beyond. AJPH

CORRESPONDENCE

Correspondence should be sent to Maya Hazarika Watts, ChangeLab Solutions, 2201 Broadway #502, Oakland, CA 94612 (e-mail: mwatts@changelabsolutions.org). Reprints can be ordered at http:// www.ajph.org by clicking the "Reprints" link.

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A Window of Opportunity Is Opening to Improve Immigrant Health: A Research and Practice Agenda

Maria-Elena De Trinidad Young, PhD, MPH, and Steven P. Wallace, PhD

ABOUT THE AUTHORS

Maria-Elena De Trinidad Young is with the Department of Public Health, School of Social Sciences, Humanities, and Arts, University of California, Merced. Steven P. Wallace is with the Department of Community Health Sciences, Fielding School of Public Health, University of California, Los Angeles.

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As a new presidential administration begins, the immigration policymaking that unfolds will affect the nation's immigration climate and immigrant health for years to come. In recent years, public health scholarship has documented that immigration policy is health policy.[1,2] Restrictive enforcement and deportation policies can harm health through increased stress and social exclusions based on race and citizenship status.[1,3] Inclusive policies granting legal status and rights can promote health by extending access to the safety net and opportunities and creating welcoming environments.[4,5] This work is a reminder of our field's role in contributing to the nation's social and political immigration climate as we work toward health equity.

While the new Biden administration may undo recent policies that have excluded and threatened many immigrants, political expedience may lead them and other policymakers to view policy compromises of past administrations as acceptable goals. Candidate Biden supported inclusive immigration policies but also condoned harmful policies of the Obama era. His platform acknowledged "the pain felt by every family . . . that has had a loved one removed from the country," but touted the Obama–Biden administration's "steps to prioritize enforcement resources on removing threats to national security and public safety, not families,"[6] which led to historically high levels of deportations.

President Biden can quickly cancel many of Trump's 400-plus immigration executive actions, but undoing policies enacted through regulatory mechanisms, such as the new public charge rules, will require time and may face pushback through the courts. Immigration legislation is difficult to pass even when the House, Senate, and presidency are controlled by the same party; the likelihood of a divided federal government in coming years makes immigration legislation even more challenging. Furthermore, ongoing divisions over immigrant rights in statehouses and among voters—including within immigrant communities—may discourage policymakers from bold, inclusive action.

Broad social and political pressure—and the research to support it—are needed to advance inclusive immigration policies. Public health researchers, practitioners, and advocates should be prepared to rise to the current moment and stand with immigrants to achieve health equity. The following identifies guiding principles and priorities for research, practice, and advocacy that are grounded in the research on structural racism. This vision centers immigrants' human rights over pragmatism or political expediency and focuses, not on short-term outcomes, but on our field's contribution to fundamental shifts toward a more inclusive future.

ACKNOWLEDGE STRUCTURAL RACISM

Immigration policies in the United States are used as intentional tools of racialized exclusion.[7] In recent years, we have seen explicit racism in policy—from the language of the "China virus" to the treatment of immigrants of color as suspect "illegal immigrants." Seemingly "race-blind" policies, such as the public charge rule that discriminates against low-income immigrants, also serve as mechanisms of racial exclusion.[8] As a result, immigration policies contribute to structural racism that produces mechanisms of social, economic, and political inequity, resulting in risks to physical and psychological well-being.[7] Public health must expose and dismantle mechanisms of racialization that are at the heart of immigration policy by supporting inclusive immigration policy and shifting power and priorities within our field and broader society.

DECRIMINALIZE IMMIGRANTS AND PEOPLE OF COLOR

The restrictive immigrant policies of the last few decades criminalize immigrants' day-to-day activities through surveillance and policing and by linking immigration enforcement with the criminal justice system.[9] By selectively targeting some immigrants who are labeled socially "undesirable" (e.g., Latinxs and Muslims), these policies stigmatize entire groups as "national security" or "public safety" risks[10] and create hostile environments. Documenting the pernicious consequences of these actions can support advocacy to dismantle policies that place immigrants into positions of second-class citizenship.

Abolish Immigration Enforcement

Support efforts to abolish the enforcement, detention, and deportation systems. A health equity lens is consistent with an abolitionist vision that goes beyond protecting privileged or "deserving" immigrants to fully eliminate enforcement, detention, and deportation—documented sources of public health harm. Practitioners can refuse to collaborate with these systems of exclusion. Public health scholars and advocates can use their research and voices to expose the false trade-off that policies can protect some, while others become the targets of immigration enforcement.

Create a Path to Citizenship for All

Support efforts that remove legal status as a criterion for public benefits eligibility and that create a path to citizenship for all. There was little distinction between lawful permanent residents and naturalized citizens before the 1996 welfare reform law.[11] That law, grounded in an unsupported "welfare magnet" theory (i.e., that individuals migrate to the United States for the express purpose of receiving public benefits), was a turning point in excluding many from public benefits and producing a chilling effect for many more. Policies to provide a path to citizenship and programs to extend the safety net to all undocumented immigrants, lawful permanent residents, and other noncitizens are critical for health equity. A continuing stream of evidence and advocacy can keep the issues alive in the policy arena.

DISMANTLE DESERVINGNESS IN PUBLIC HEALTH

Work to dismantle the categories of deservingness that are embedded in public health. Our field addresses the unique vulnerabilities of diverse immigrant nationalities, races/ethnicities, languages, and religions. In public health research, practice, and advocacy, the very distinctions used to identify vulnerability, unfortunately, are often rooted in the very deficit models that use social categorizations to justify exclusion.[2,12] Refugees and asylum seekers are sometimes portrayed as more deserving than economic migrants; woman and children are presumed to be the most vulnerable; and Latinx immigrants are assumed to be the only group affected by immigration policy, obscuring the experiences of Black and Asian immigrants. When not critiqued, these categories reinforce inequitable structures and assumptions about vulnerability. A health for all, or universal human rights, framework reframes discussions and should be used in research, practice, and advocacy.

STAND BEHIND THE POWER OF IMMIGRANT COMMUNITIES

Support movements led by immigrant organizations and communities to advance policies and demands. Recent decades have seen movements emerge from immigrant communities—from the civil disobedience of the DREAMers to mobilizations at airports against the Muslim ban. This organizing builds solidarity across groups, pushing policymakers to respond to community demands. Indeed, evidence shows that community organizing is not only good for health but also creates foundations for health equity initiatives.[13]

Supporting these movements means being willing to embrace the political implications of standing with immigrants and focusing on immigrant-led initiatives—but also offers an innovative lens to explore how being political and immigrant-centered can enhance public health research and interventions. This may include working directly with immigrant communities to identify salient research questions, rather than relying only on theory or academically generated questions; engaging in participatory research that empowers communities; or promoting community voices in policy and practice circles.

CONDUCT RESEARCH THAT ADVANCES INCLUSIVE POLICIES

Public health research on immigration policy and health will be particularly critical in the face of a likely divided government in which vote margins are tight. Public health researchers are

ideally situated to center immigrants' health and push beyond calls for "pragmatic" reform by pursuing research questions that build knowledge toward policies that create an equitable society, moving the nation away from immigration policies that imbed structural racism and criminalize immigrants. When there are no data or convincing analyses, the loudest voice is more likely to win. While facts are only one of many ingredients in moving a policy forward, the absence of research and data makes it easier for wild claims to go unchallenged.

Research Inequitable Structures

Realign research questions away from individual risks and toward the inequitable structures that harm health. Questions that apply color-blind analyses or focus exclusively on behavioral patterns, such as acculturation, run the risk of obscuring structural racism and other inequities and inadvertently placing blame on immigrants themselves.[14] Focus research on the systems and structures that create vulnerability, not solely the cultural or behavioral characteristics of immigrant populations.

Contribute Evidence for Immigrant Inclusion

Contribute evidence to support immigrant social movements. Research can evaluate the impact of immigrant-led organizing and advocacy—and include immigrants in the process. In the model of critical race theory and LatCrit, research must center immigrants and situate them in broader systems of inequality and power, both domestically and globally.[15] Contribute evidence to court cases and inclusive state policies. Courts and statehouses will continue to be sites of much immigrant policymaking. Inclusive policies may be challenged in a conservative court system, and implementation may be at the discretion of state and local governments. A growing evidence base is needed to inform court decisions about new policies or executive actions, as well as to help advocates push for inclusionary policies at the state and local levels.

CONCLUSIONS

The nation has been living through a period of antiimmigrant political and social climate rivalling that of the 1920s, to the detriment of the health of immigrants and their communities. Many powerful interests work to shape immigrant policy. But it is also shaped by the people who push for equity and inclusion. The public health field has a role—and responsibility—to push back on the antiimmigrant climate promoted by past administrations and support inclusive policies and social attitudes. The principles presented here build on work already accomplished in the field, but also ask researchers, practitioners, and advocates to refocus their approaches and rededicate their actions for equitable immigration policy and health. The public health field can boldly influence future policies that shape immigrant health through strategic research, advocacy, and speaking truth to power. AJPH

CORRESPONDENCE

Correspondence should be sent to Maria-Elena De Trinidad Young, University of California, Merced, 5200 N Lake Rd, Merced, CA 95343 (e-mail: mariaelena@ucmerced.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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The COVID-19 Pandemic in Historical Perspective: An *AJPH* Dossier

Theodore M. Brown, PhD

ABOUT THE AUTHOR

The author is a professor emeritus of history and public health sciences, University of Rochester, Rochester, NY. He is also an AJPH *associate editor.*

See also the COVID-19 & History section, pp. 402–445.

In times of crisis, many of us are strongly drawn to history. We turn to it for desperately needed perspective, ideally for useful lessons from the past and even at times for reassuring bases of optimism in what seem the darkest of times. In the time of COVID-19, many are turning to the authors of epidemic and pandemic history in the hope that they will do for us what medical historian Henry E. Sigerist did for his generation in the dark days of worldwide depression and World War II, that is, to give us perspective on the present by allowing us to see it through the lenses of time and social evolution.[1]

With this in mind, *AJPH* has encouraged historical essays to help place the COVID-19 pandemic in perspective. In this issue four such essays, along with five accompanying editorial comments, address the pre-vaccine challenges with which we have already been grappling: attempting to understand the complex epidemiology of the pandemic and hoping to learn important lessons from it, trying to collect data to solidly ground epidemiological analyses, pursuing social mitigation measures in the hope of buy-in and success, and facing head on the implications in terms of national reputation of our country's substantial failures thus far in dealing with COVID-19.

Siddarth Chandra et al. (p. 430) alert us to what may turn out to be the extraordinarily complex epidemiology of COVID-19 by looking carefully at waves of excess mortality during the "1918" influenza pandemic. They analyze monthly data on all-cause mortality in 83 Michigan counties and find evidence for up to four waves of excess mortality over a two-year period, including a severe spike in early 1920. They also find that some counties had two waves in late 1918, whereas others had only one, and that the 1920 wave was propagated differently than the two 1918 waves.

Most significantly, they find that the twin waves in 1918 were very likely related to the imposition and then the lifting of an order banning public gatherings and that what in some counties was a steep "echo" wave in early 1920 took its largest toll on isolated indigenous communities that had avoided infection in 1918 and 1919. By leaving open the question of whether the same pathogen was involved in all four waves, Chandra et al. demonstrate how challenging close historical epidemiological study can be.

In his related editorial comment, Svenn-Erik Mamelund (p. 405) homes in on some of the clear lessons that can be drawn from Chandra et al. for a better understanding of COVID-19: that more infections and deaths are likely as the northern hemisphere enters winter season and that there are likely to be later waves in 2021 and possibly also in 2022 that, without vaccine intervention, could be as bad as or worse than earlier ones.

Morabia (p. 438) focuses on the US Public Health Service's 1918–1919 house-to-house morbidity and mortality survey to understand how that survey was done and what data were collected for analysis. He finds that 146 203 individuals were surveyed in 18 localities across the United States in fall and winter 1918 and that the data collected indicated that, assuming the survey missed asymptomatic cases, perhaps 50% of the population was infected between August 1, 1918, and February 21, 1919, and the case fatality rate was perhaps 1%. Because the survey included questions about economic status, race, and crowding, findings indicated that incidence and mortality were higher among the poor and that in many areas Whites were apparently more infected but died less than people of color. Impressed with the design, logistics, and analytical sophistication evident in 1918, Morabia laments the current disinterest of the United States in mounting an updated version of that earlier survey.

In their editorial comment, Miguel Hernán and Raquel Yotti (p. 414) underscore both scientific and methodological progress that has been made over time and the current failings of the United States by describing the very sophisticated survey recently undertaken in Spain, the ENE-COVID survey led by the Instituto de Salud Carlos

III. They conclude that a close comparison between the American survey of 1918–1919 and the Spanish survey of 2020

> reflects as much the advancement of scientific knowledge as the social improvements of the last 100 years . . . [specifically the benefits from] 21st-century telecommunications and [Spain's] distributed health care system with universal coverage (p. 414).

J. Alexander Navarro and Howard Markel (p. 416) focus on social mitigation measures that were widely adopted in the United States during the 1918–1919 influenza pandemic and political pushback to those measures that was also widespread. Measures adopted by cities and states included closure of theaters, movie houses, and churches; mandatory face mask ordinances; shutting down of schools; and shuttering of saloons. However, citizens, business owners, clergy, and local political figures and legislative bodies expressed increasing impatience with public health edicts and agitated, petitioned, and voted to have them rescinded.

But the parallels between 1918 and 2020 end there because, as Navarro and Markel note, "In 1918, arguments over various closure orders overwhelmingly revolved around questions of efficacy, equity, and duration of the measures" (p. 420), and "given that public health was accepted as the domain of state and local jurisdictions, any opposition to these orders was concomitantly local" (p. 420–421). As Navarro and Markel point out, "By contrast, the response to the COVID-19 pandemic has become a national partisan battle" (p. 421), and "opposition to public health measures . . . [has] now become a symbol of political allegiance to the [former] president" (p. 421).

In their editorial comments, John Fabian Witt (p. 411) and Allan Brandt (p. 409) endorse Navarro and Markel's broad historical parallels and divergences but also note subtle discontinuities between 1918 and 2020. Witt, a professor of law and history, argues persuasively that we are now witnessing an "almost entirely unprecedented partisan pushback against public health measures by the courts" (p. 411). In 1918, the power to regulate public health emergencies was deeply embedded in American law and consistently upheld by the courts. But in 2020, Witt notes, Americans have filed hundreds of constitutional challenges to pandemic regulations. He adds:

> As of this writing, the most significant decision in the line of constitutional cases arising from the COVID pandemic comes from the US Supreme Court, which the day before Thanksgiving 2020 issued an unprecedented decision blocking New York State's emergency pandemic limits on the size of religious gatherings. . . . A century ago, analogous claims that California's influenza regulations infringed on religious freedoms made no headway at all (p. 412).

Brandt, a public health historian, also points out subtle but important discontinuities between 1918 and 2020. We now live in an age that, instead of respecting science, engages in widespread scientific denialism and is characterized by a new information ecosystem dominated by fractured sources of knowledge.

In the fourth historical essay of this set, historian of Chinese public health Ruth Rogaski (p. 423) draws an ironic analogy between China in the early 20th century and the United States in the early 21st. A century ago, China, after having long been a powerful empire, had come to be regarded as "the Sick Man of the Far East" because it was burdened by opium addiction, infectious disease, and an ineffective government. But in 1911 China began to redeem itself by tackling an epidemic of pneumonic plague, an airborne disease, with a dramatically restructured system of public health, and from that point forward, it closely linked the goals of national advancement with major public health improvements. By ironic contrast, the powerful United States finds itself in the early 21st century burdened by opioid addiction, COVID-19, and a national government that has been completely ineffective in dealing with the pandemic, all of which has led observers in China to call the United States "the Sick Man of the West."

As Liping Bu (p. 407) notes in her editorial commentary,

> Rogaski's study suggests that viral tragedies, such as the Manchurian plague and COVID-19, are also opportunities for national health transformation, as when China took a new approach to public health in the 20th century. COVID-19 has exposed the deficiencies of the US health system....[but] will this sad revelation spur health reform in the United States? (p. 408).

It is worth reflecting on Bu's question and generalizing its implications. History can provide perspective, suggest analogies, and even hint at optimal paths of action. But historical knowledge and insight cannot by themselves provide wisdom or dictate best choices. More historical essays are on the way, including expected papers on vaccine uptake and resistance, as we move to

the next phase in the world's grappling with the worst global pandemic in a century. Those living in the present must decide on a course of action. Our contemporary and future leaders will, it is hoped, make wiser choices in contending with COVID-19 once they have a clearer sense of its place in history. AJPH

CORRESPONDENCE

Correspondence should be sent to Theodore M. Brown, PhD, Department of History, University of Rochester, Rochester, NY 14627 (e-mail: theodore_brown@urmc.rochester.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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COVID-19: The Power of Historical Lessons

Svenn-Erik Mamelund, PhD

ABOUT THE AUTHOR

Svenn-Erik Mamelund is with The Work Research Institute, Oslo Metropolitan University, Oslo, Norway.

See also Chandra et al., p. 430, and the COVID-19 & History section, pp. 402–445.

Eighty-nine million cases and 1.9 million deaths from coronavirus disease 2019 (COVID-19) have been reported up to January 8, 2021 (but these estimates are unfortunately going to increase),[1] and several countries now seem to be entering a third wave of the pandemic after the holiday season. Although several countries have started to vaccinate against COVID-19, pressing questions persist, including whether we will have more peaks or waves of the pandemic, how severe they will be, and how and when the pandemic will end.

THE 1918 PANDEMIC AS A BENCHMARK FOR COVID-19

Projections about the future can only be as good as the assumptions put into models, and errors tend to increase the farther out one tries to project. Although history will likely not repeat itself exactly, clues to the questions raised earlier nevertheless might be found in research on previous pandemics. The 1918 influenza pandemic is often used as a benchmark of comparisons with other past pandemics; the current COVID-19 pandemic; and future pandemics that might be caused by influenza, coronavirus, or an unknown pathogen and could be even deadlier. The 1918 pandemic is different from the COVID-19 pandemic in many ways—for example, it happened in the context of World War I more than 100 years ago, was caused by influenza and not coronavirus, and killed young adults rather than the elderly. However, these pandemics also have several similarities, including the populations at risk medically (e.g., people with lung and heart diseases) and those who are vulnerable socially (e.g., poor, immigrant, and Indigenous people).[2,3] The role of nonpharmaceutical interventions, such as handwashing, social distancing, and travel restrictions, in infection mitigation is another lesson from historic pandemics that appears translatable to COVID-19.[4,5]

The earliest studies on the waves of the 1918 influenza pandemic have considered, for example, the number, severity, height, and length of waves, as well as possible cross-protection between them. This research has focused mainly on the second, most lethal fall wave and recently to some extent on the possible herald spring wave in 1918[6]; few studies have focused on the fourth and last wave in 1920. In this issue of *AJPH,* Chandra et al. (p. 430) present research in which they used monthly data on all-cause deaths for the 83 counties of Michigan to study the wavelike behavior of the 1918 to 1920 influenza pandemic. They found that Michigan had "up to four waves of excess mortality over a span of two years, including a severe one in early 1920. Some counties experienced two waves in late 1918, whereas others had only one." They also document that the two waves in late 1918 were likely related to the timing of the statewide imposition of a three-week social distancing order. Once this measure was lifted, infections and deaths started to increase again. Other research has shown similar effects in 1918,[5] and we also have seen this outcome during the COVID-19 pandemic.

This research on the epidemiology of the 1920 wave and the demonstration of the value of public health in controlling the 1918 influenza pandemic are novel and historically important. Future studies could analyze the wavelike behavior of the 1918 influenza pandemic among subgroups with particular medical (e.g., age, comorbidities) and social (e.g., gender, socioeconomic status, race/ethnicity) variables. However, these results are even more important when they are used to speculate about the future course of COVID-19. The early spread of the COVID-19 pandemic was not consistent across the United States or elsewhere. Some areas experienced only peaks and troughs in a single wave, others have already seen several waves, and more peaks and troughs or even new waves have started or will occur. Future spread likely will not manifest equally across time and space.

Research from the 1918 influenza pandemic, including that by Chandra et al., suggests that even with a vaccine and with different levels and types of nonpharmaceutical interventions, it would be wise to prepare for (1) more infections and deaths in the short run as the Northern Hemisphere now is in the

middle of the winter season and (2) later peaks and troughs or waves in 2021 and possibly in 2022. We also should be aware that these later waves could be as bad as or even worse than the earlier ones. Some of the hardest-hit areas in 1920 were isolated Indigenous communities that had avoided infection in 1918 and 1919. For example, urban and well-connected White majority populations in high-income Western countries in 1918 and 1919 had less than 1% mortality, whereas the Sami areas of Enare in northern Finland and Arjeplog in northern Sweden had 10% and 3% mortality, respectively, in their 1920 outbreaks.[3]

CONCLUSION

It has been said that those who forget their history are bound to repeat it. In 1918 and in 2020, quite a large proportion of both laypeople and those in charge of public health likely believed that (1) infectious diseases with the potential to cause severe pandemics belong to the past and that (2) medical problems during pandemics will be solved quickly by new technology and medical advancements. The 1918 influenza and COVID-19 pandemics have thus far shown us that these two beliefs were wrong. AJPH

CORRESPONDENCE

Correspondence should be sent to Svenn-Erik Mamelund, PhD, Research Professor, The Work Research Institute, Oslo Metropolitan University, PO Box 4, St. Olavs plass 0130 Oslo, Norway (e-mail: masv@oslomet.no). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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National Status in a Global Pandemic: Is (Mis)handling COVID-19 a Turning Point or a Revelation?

Liping Bu, PhD

ABOUT THE AUTHOR

Liping Bu is with the Department of History, Alma College, Alma, MI.

See also Rogaski, p. 423, and the COVID-19 & History section, pp. 402–445.

The whole world was stunned and frightened by the steep increase in COVID-19 cases and deaths in the United States. COVID-19 seemed unstoppable in this country that has the most advanced medical science and technology. In the meantime, East Asian countries effectively controlled the spread of SARS-CoV-2 (the virus that causes COVID-19) with strict preventive measures: wearing masks, washing hands, and disinfecting.

SARS-CoV-2 was first discovered in December 2019 in Wuhan, China, where it spread rapidly. China began lockdowns across the country on January 23. This was just days before the beginning of the Chinese New Year season (January 25–February 7), when tens of millions of Chinese had traveled or were preparing to travel back home to spend the most important holiday with their families. All travels within cities and across the country became limited, and there were strict health regulations. Public transportation was heavily disinfected—when in operation. Everyone wore a face mask. Those who tried to get home in their own cars were prevented by local authorities with the support of residents, who refused to let outsiders into their residential communities and villages without health passes. The Internet became the place to complain and share opinions about the strict preventive measures. After spending the entire Chinese New Year season indoors and strictly following the preventive measures, China emerged from the lockdowns in March and people returned to work and normal life gradually with few COVID-19 cases.

The Chinese community checkpoints for COVID-19 in 2020 are reminiscent of the road blocks to village entrances during the 1911 plague epidemic in northeast China, known as the Manchurian plague, which took more than 60 000 lives.[1] At that time, China was a weakened empire that had been labeled "the sick man of the Far East." National sovereignty hinged on China's ability to control the plague, as foreign powers were about to expand their spheres in China in the name of health protection. The Chinese rulers of the time, the Qing dynasty, relied on modern medical scientists, who introduced harsh Western preventive measures and brought the plague under control.[2] Their successful fight against the plague secured China's sovereignty.

In the following decades, Chinese modernizers included public health as a vital element of national development to fight off the "sick man" label and make China strong. They embraced science as the means to solve health and social problems and carried out many public health campaigns.[3] Chinese people developed a strong sense of the *chuanran* (contagion) inherent in epidemics and internalized such public health behaviors as wearing masks and washing hands as prevention. A health mentality that connected personal health behavior to the well-being of the public during an epidemic also evolved. When they saw Americans not wearing masks amid increasing COVID-19 cases, Chinese people were horrified: did they not fear death? The US failure to control the virus led some Chinese netizens to speculate that it was a sign of national decline: the situation of the United States was like that of the late Qing dynasty; it had become the sick man of the West.

The United States is certainly not late Qing China, as it remains the most powerful country in the world. In this issue of *AJPH* (p. 423), Ruth Rogaski, an award-winning scholar of health history, notes that there are striking similarities between China during the Manchurian plague and the United States during the COVID-19 pandemic; namely, widespread drug addiction (opium in China, opioids in the United States), a pandemic, and an ineffective government. Rogaski's comparison of the Manchurian plague and COVID-19 in light of the "sick man" trope highlights the direct link of national health, including epidemic control, with national status and world image.

When the United States shocked the world with its failure to control the spread of SARS-CoV-2, what did that shock reveal? Rogaski's study suggests that viral tragedies, such as the Manchurian plague and COVID-19, are also opportunities for national health transformation, as when China took a new approach to public health in the 20th century. COVID-19 has exposed the deficiencies of the US health system. For example, millions of Americans lost health care insurance when they needed it the most, because the pandemic caused widespread job loss and the insurance was tied to their employment. Will this sad revelation spur health reform in the United States?

The Manchurian plague and COVID-19 have many similarities: both were airborne diseases, both spread fast via public transportation, and mask wearing was met with resistance by Westerners during both. During the Manchurian plague, Chinese doctors believed that the disease was airborne, and they mandated that health personnel wear masks as prevention. But Western medical doctors in Manchuria regarded masks as useless until the deaths of their colleagues alarmed them and changed their minds (Rogaski, p. 425). Ever since Wu Lian-de advocated mask wearing during the 1911 Manchurian plague, wearing masks has been considered essential in preventing airborne contagion for Chinese citizens.[4] In the early months of COVID-19, authorities in the United States and Europe, along with the World Health Organization, dismissed the usefulness of wearing masks as an effective prevention against COVID-19.[5] They changed policies only after COVID-19 cases and death tolls rapidly increased because of not wearing masks, and after East Asian countries proved mask wearing effective in preventing COVID-19.

Western media have reported mask wearing as peculiar to the cultures of Asian countries. In fact, mask wearing as a public health behavior in Asia came with the experience of fighting the 1918 flu pandemic, which took 50 to 100 million lives worldwide. Americans wore masks during the 1918 flu pandemic as a preventive measure and as a patriotic act during World War I. That experience, somehow, was not turned into a habitual public health behavior in the United States, as it was in Asia, to fight airborne disease. The emphasis instead has been on the development of vaccines and therapeutic drugs, creating dependence on the commercial products of medical science. Some people have put personal freedom above public well-being during the current pandemic, seriously undermining the effort to control the spread of the virus. Because new viruses always come long before scientists can figure out how to concoct new vaccines to counter them, preventive actions must be taken. The successful control of COVID-19 in many countries demonstrates that the most effective approach is timely government action to stop the virus at its outbreak with universal testing and holistic preventive measures. AJPH

CORRESPONDENCE

Correspondence should be sent to Liping Bu, PhD, Department of History, Alma College, 614 W Superior St, Alma, MI 48801 (e-mail: bulipi@alma.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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Pandemics and Public Health History

Allan M. Brandt, PhD

ABOUT THE AUTHOR

Allan M. Brandt is with the Department of the History of Science and the Department of Global Health and Social Medicine, Harvard University, Cambridge and Boston, MA.

See also Navarro and Markel, p. 416, and the COVID-19 & History section, pp. 402–445.

Since the inception of the COVID-19 pandemic, historians have been frequent commentators, searching high and low through their research files, scholarly articles, and books to find the closest analogs in the history of past pandemics to the current crisis. Journalists and pundits have sought out these rarely consulted academics to offer insights for our understanding of the unfolding challenges of COVID-19 as it has circled the globe.[1]

The massive influenza epidemic that torched the world following World War I has occupied the most attention in these historical sweepstakes, although other pandemics—plague, cholera, yellow fever, and HIV/AIDS, among others—have been frequently cited for their contemporary relevance. The significance of *AJPH*'s longstanding section "History Essays" (formerly, "Public Health, Then and Now") has never been so clear as we face this current crisis. There is much to learn about how to think through an epidemic in the careful, analytic histories of disease so often revealed in these articles. Over recent decades, the field of public health history has been transformed as it has addressed the history of pandemics, centering attention on powerful social and structural forces that create unequal vulnerabilities to death and disease, as well as greater attention to the significant obstacles that stand in the way of effective responses.[2]

In the current issue, Navarro and Markel dive back into the 1918 pandemic in their article "Politics, Pushback, and Pandemics: Challenges to Public Health Orders in the 1918 Influenza Pandemic" (p. 416). They scrupulously use newspaper accounts of public opposition to public health measures, documenting a number of striking similarities to the current debates and divisions about public health strategies to reduce the transmission of COVID-19. Indeed, in reading their account, one might well conclude that we are back in 1918 fighting over the use of masks and the closing of businesses, bars and restaurants, theaters, and churches. Some 100 years later, they suggest, little has changed in the character of conflict about public health and individual liberty; inevitably, pandemics divide social interests and the economy, while often devastating both. The more things change, the more they stay the same.

But what is the conclusion we should draw from what appear to be such powerful historical parallels? And more broadly, what can history tell us about the present? No doubt there are important continuities in the opposition to public health mandates that Navarro and Markel describe so meticulously. The United States has a deep political and cultural tradition of suspicion of state authority, as well as strong cultural commitments to individualism and personal liberty. Public health efforts, which are especially centered on rules, regulations, and mandates, have, as we know, often been challenged by both protest and litigation.[3]

These legacies no doubt inform the trajectory and character of current debates, but it is important as we observe these similarities not to assume that they merely represent the return of well-known historical divisions.[4] Indeed, as we recognize the continuities that Navarro and Markel point to, so too should we investigate the particular characteristics and contexts that drive these debates about US responses to the current pandemic.

Even as historians search for analogs, we must be sensitive to the powerful and fundamental discontinuities, social and political change, and seismic scientific and technological shifts that inform our understanding of the current pandemic. We cannot assume that these "symptoms" of division emanate from the same root causes. History points us to fundamental questions of context and contingency. Rather than "naturalize" mask refusal or debates about closing theaters or churches, we need to further evaluate not just similarities but also essential contextual differences.

The information ecosystem and the structure of social division today is fundamentally different than it was in 1918, when most news and knowledge was passed by word of mouth or

covered in daily newspapers in expanding US cities. As we now recognize, divisions over the pandemic and sharply contentious perspectives on its risk, impact, and management are characteristic of the fractured sources of knowledge in a new media ecology, rising scientific denialism, and the intensive polarization of our polity. To track COVID-19 on CNN and Fox News is to see two wholly different phenomena, with radically distinct implications for public health and strategies for controlling the pandemic. And, of course, this is but a small element of the broader media labyrinth in which misinformation, disinformation, and conspiracy theories about the pandemic have been so widely broadcast.[5]

Given the salience of the specific contexts that have shaped responses to COVID-19, should we simply assume that every epidemic is but a reflection of its particular moment, that we must avoid all comparisons to earlier, specific pandemics? To do so, would be to misunderstand the importance and relevance of history for informing our current crisis. History offers a critical perspective on problems of disease and its amelioration. We know that disease will track social inequities and illuminate failing infrastructure. We know, from historical scholarship, that because there is a powerful functional relationship between diseases and their social determinants, in times of pandemics, these vulnerabilities will light up in sharp relief. For many historians, there have been few elements of COVID-19 that could not have been anticipated.

Nonetheless, SARS-CoV-2 is a novel virus that has traveled the world at a moment of intense division and political discord in the United States and in other nations. At a time of interdependent global trade and economy, the pandemic has sharply disrupted the national and international status quo. And at a time of attacks on democratic institutions and the fundamental values embedded in the history of public health efforts, it has been used to challenge such conventions. This perhaps explains in part the vitriol and denial that are now associated with masks and lockdowns. Even if we expect pandemics to be deeply embedded in politics, as public health has been through the centuries, the politicization of this pandemic has been the result of the specific contexts in which it has occurred and the contingent decisions and leadership that have shaped responses from nation to nation.

Is mask refusal and resistance to public health regulations the same in 1918 and 2020? We cannot assume that similar behaviors mean precisely the same thing in these distinctive, historically specific contexts. Looking at the dynamics of mask skepticism and hostility in the COVID-19 pandemic, we can see that it reflects situated forces that distinguish it from the noncompliance of 1918. This form of public health nihilism is perhaps most clearly seen in the support for pursuing herd immunity—the argument for letting the pandemic take its course, with the weak caveat of "protecting the most vulnerable." Masks are seen as an obstacle to this strategy.

Such nihilistic views of public health are familiar to historians who are well versed in the arguments and rationalizations that disease and disparities are but an aspect of natural selection and biological determinism.[6] The historian's responsibility is to draw attention to these specious and historically situated arguments and to demonstrate how they reflect the particular social, cultural, and political forces of their time. Such work has the potential to inform the present and deepen our understanding of the past. AJPH

CORRESPONDENCE

Correspondence should be sent to Allan M. Brandt, PhD, Department of the History of Science, One Oxford St, Cambridge, MA 02138 (e-mail: brandt@fas.harvard.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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The Partisan Transformation of American Public Health Law, 1918 to 2020

John Fabian Witt, JD, PhD

ABOUT THE AUTHOR

John Fabian Witt is with Yale Law School, Yale University, New Haven, CT.

See also Navarro and Markel, p. 416, and the COVID-19 & History section, pp. 402–445.

In "Politics, Pushback, and Pandemics: Challenges to Public Health Orders in the 1918 Influenza Pandemic" (p. 416), Navarro and Markel clear away an influential but incorrect impression about epidemic policy in US history. Figures like Associate Justice Samuel Alito of the US Supreme Court have asserted that the pandemic regulations of 2020 and 2021 are like nothing the country has seen before.[1] Navarro and Markel, however, identify powerful continuities between state governments' efforts to contain infection today and such efforts in 1918. The authors document, moreover, parallel cultures of protest a century ago and today against mask mandates, business closures, and school closures. The article particularly focuses on a distinctive new element in our 21st-century pandemic: the rise of novel partisan dimensions in the opposition to regulatory interventions.

Navarro and Markel, however, mostly omit a vital new part of the story that supports and extends their basic argument. In the 21st-century epidemic, the United States is witnessing almost entirely unprecedented partisan pushback against public health measures by the courts. The partisan transformation of the courts is indispensable for anyone aiming to understand the similarities and differences between 1918 and 2020. The influenza pandemic of 1918 produced an outpouring of regulations designed to slow the spread of infection—and protest followed. Crowds inveighed against business closures. Local politicians spluttered against costly closure orders. Lawsuits followed, as they have today.

But there is a crucial difference between the lawsuits of 1918 and those of 2020. A century ago, such challengers sued to force officials to carry out their authority appropriately. Today, legal challengers sue to assert that officials have no authority at all. Plaintiffs in the courts during the 1918 influenza contended that regulations were unfair, that they violated public health law, or that they otherwise exceeded the authority of the actor making the regulation. Sometimes they won. The Supreme Court of New Jersey set aside the conviction of a saloonkeeper in Paterson on the ground that the violation charged was not actually a violation of the relevant statute against public nuisances (*Board of Health v. Clayton*, 106 A. 813, N.J., 1919). Such victories sent public health officials back to the drawing board to come up with regulatory interventions anew. But mostly courts rebuffed such challenges (e.g., *Globe School Dist. No. 1 v. Board of Health*, 179, Ariz., 1919, p. 55). Courts were loath to override public health measures when their own expertise was lacking. As the Supreme Court of Kansas put it in 1919, it was "indispensable to preservation of the public health that some administrative officer or board should be clothed with authority to make adequate rules which have the force of law" (Ex Parte McGee, 185, Kan., 1919, p. 14).

In 1918, legal challenges almost never contended that state or federal constitutions prevented regulators altogether from intervening to slow the spread of the flu. The police power to regulate epidemics was too deeply embedded in US law to make such claims plausible. As the Massachusetts Supreme Judicial Court put it in 1868, state boards of health were

> clothed with extraordinary powers for the protection of the community from noxious influences affecting life and health, and it is important that their proceedings should be embarrassed and delayed as little as possible by the necessary observance of formalities. (*City of Salem v. E. R. Co.*, 98 Mass. 431, 443, 1868, p. 502)

Chief Justice John Marshall of the US Supreme Court agreed, acknowledging the power of states to enact "inspection laws, quarantine laws, [and] health laws of every description" (*Gibbons v. Ogden*, 22 US 1, 203, 1824). By the end of the 19th century, state supreme courts like Wisconsin's could say confidently that the police power to regulate for

epidemics was essentially a "law of overruling necessity," one that was "coextensive with self-protection" and a part of the "inherent and plenary power in the state which enables it to prohibit all things hurtful to the comfort and welfare of society" (*State v. Burdge*, 70 N.W. 347, 349, 1897). Even libertarian-leaning jurists of the era concurred.[2,3]

In 1905, little more than a decade before the 1918 influenza pandemic struck, the long history of the police power culminated in Associate Justice John Marshall Harlan's opinion in the Supreme Court in *Jacobson v. Massachusetts.* Upholding an order by the city of Cambridge, Massachusetts, requiring vaccination against smallpox, Justice Harlan wrote, "The rights of the individual in respect of his liberty may at times . . . be subjected to such restraint . . . as the safety of the general public may demand" (*Jacobson v. Massachusetts*, 197 US 11, 29, 1905).

By my count, the lawbooks from the 1918 influenza pandemic contain only one reported judicial opinion in which a plaintiff had the temerity to challenge the right of a state to restrict behavior during the pandemic. A federal court of appeals had no difficulty upholding the power of Alamance County, North Carolina, to prohibit a traveling amusement show from opening for business during the influenza pandemic (*Benson v. Walker*, 274 F. 622, 624, 4th Cir., 1921).

In 1918 and 1919, courts also made clear that broad delegations of authority to state boards of public health were an inevitable and salutary feature of the law of epidemics. As the Kansas high court put it, "Generally the public welfare is best promoted by delegating power to make administrative regulations to fulfill the expressed intention of the Legislature" (Ex Parte McGee, 185, 16, Kan., 1919, p. 14).

In 2020, by contrast, Americans have filed hundreds of constitutional challenges to pandemic regulations. A number have been successful. In Kansas, where courts sustained public health powers in 1919, a federal court issued a restraining order against limits on gatherings in churches (*First Baptist Church v. Kelly*, 455 F. Supp. 3d 1078, D. Kans., 2020). In Wisconsin, where courts had once been at the forefront of sustaining public health powers, the state high court struck down stay-at-home and business closure orders and warned that such orders were "something we normally associate with a prison, not a free society" (*Wisconsin Legislature v. Palm*, 942 N.W.2d 900, 939, Wis., 2020). In Michigan, the state supreme court majority struck down the state's emergency powers legislation on the theory that it unconstitutionally delegated the legislature's power—although the delegation at issue closely resembled broad delegations going back to 1918 and before (*Midwest Inst. of Health v. Governor of Michigan*, N.W.2d, 22020 WL 5877599, Oct. 2, 2020).

As of this writing, the most significant decision in the line of constitutional cases arising from the COVID-19 pandemic comes from the US Supreme Court, which the day before Thanksgiving 2020 issued an unprecedented decision blocking New York State's emergency pandemic limits on the size of religious gatherings (*Roman Catholic Diocese of Brooklyn v. Cuomo*, 592 US, 2020). A century ago, analogous claims that California's influenza regulations infringed on religious freedoms made no headway at all.[4,5] But now five justices on the US Supreme Court (and state judges around the country) insist that constitutional constraints preclude certain long-standing regulatory interventions.

What explains the new surge of judicial resistance to public health measures? Much of the answer lies in the "national partisan battle" Navarro and Markel cite. For the first time in a century and a half, the US Supreme Court is bitterly divided along party lines. (The court's Thanksgiving decision came only after the October confirmation of Justice Amy Coney Barrett, who swung the court in a new direction by replacing Democratic appointee Ruth Bader Ginsburg.) Many of the US state high courts are in similar positions. Republican judges, moreover, have put market regulation in the crosshairs as part of a broader critique of the New Deal consensus in constitutional law. In recent years, that effort has extended to bitter attacks on expertise and on the constitutionality of the administrative state.

In our pandemic emergency, legal partisanship has emerged as a new source of pushback. Judges have found themselves doing public health politics by constitutional law means. AJPH

CORRESPONDENCE

Correspondence should be sent to John Fabian Witt, Yale Law School, Box 208215, New Haven, CT 06520-8215 (e-mail: john.witt@yale.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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Two Pandemics, Two Surveys in the United States and in Spain

Miguel A. Hernán, MD, DrPH, and Raquel Yotti, MD, PhD

ABOUT THE AUTHORS

Miguel A. Hernán is with the departments of epidemiology and biostatistics of the Harvard T. H. Chan School of Public Health, Boston, MA. Raquel Yotti is with the Instituto de Salud Carlos III, Madrid, Spain.

See also Morabia, p. 438, and the COVID-19 & History section, pp. 402–445.

In every pandemic, two important public health questions are asked: how many people have been infected, and how many people have died from the infection? An accurate answer to these questions is surprisingly difficult to obtain for any country.

As described by Morabia in this issue (p. 438), in the fall of 1918, the US Public Health Service started a survey led by Wade Hampton Frost and Edgar Sydenstricker to answer these two questions about the influenza pandemic in the United States. In the spring of 2020, the Spanish Ministry of Health and the departments of health of the 17 Spanish regions started a survey (ENE-COVID), led by the Instituto de Salud Carlos III, to answer these questions about the SARS-CoV-2 pandemic in Spain.[1]

Both epidemiological surveys were carried out in the midst of a pandemic and faced similar logistical challenges. However, the proposed solutions to these challenges varied greatly because the surveys took place in different centuries and within different health systems. A methodological comparison of the national surveys in 1918 United States and 2020 Spain reflects as much the advancement of scientific knowledge as the social improvements of the last 100 years.

HOW TO SELECT A REPRESENTATIVE SAMPLE?

A first challenge for both surveys was how to select a nationally representative sample. The US survey attempted to obtain "a fair sample of the general population" (Morabia quoting Frost, p. 439) by targeting individuals from 18 localities in 82 sections of the country with population ranging from 25 000 to 600 000. A century later, the databases of the National Institute of Statistics were used to randomly select more than 35 000 Spanish households, stratified by province and town size. For ENE-COVID, the progress in data systems made it feasible to select a truly random sample of the population.

HOW TO OBTAIN THE DATA FROM THE SELECTED INDIVIDUALS?

A second challenge concerned the logistics of approaching the selected individuals and recording their information. For the US survey, areas were selected within each locality for house-to-house canvass. Over a four-month period, field personnel interviewed the housewife or other responsible members of each household and ended up collecting information for about 146 000 individuals. For ENE-COVID, the first wave of data collection was completed in two weeks by mobilizing and training 4400 health professionals in more than 1400 primary care centers, as well as creating an information system capable of hosting up to 2000 concurrent users. More than 66 000 individuals (about 75% of those who had previously received an invitation by phone) provided the information to the study personnel at their doctor's office or in their own homes. The interval between the identification of the survey as a national priority and the start of the field work was less than four weeks. ENE-COVID benefitted from 21st-century telecommunications and a distributed health care system with universal coverage, all of which resulted in a high response rate for a population-based survey.

HOW TO DETERMINE WHO WAS INFECTED?

A third challenge was how to define the spread of the virus in the population. The US survey was designed for "ascertaining as accurately as possible the proportion of the population affected" (Morabia quoting Frost, p. 439). By "affected," the 1918 investigators meant the proportion of individuals in the population who had symptomatic disease—that is, those who self-reported having had symptoms of influenza.

Thanks to a century of advances in immunology, ENE-COVID could determine

the proportion of individuals who had developed antibodies against the virus (via either a point-of-care test or a chemiluminescent microparticle immunoassay on serum), which is a proxy for the proportion of infected individuals. The data from this serosurvey were then used to estimate the proportion of both asymptomatic individuals (those who reported no symptoms but had antibodies against the virus) and symptomatic individuals (those with antibodies who self-reported symptoms). The preexistence of a health care system with clinical laboratories around the country, with coordination from the National Centre for Microbiology at the Instituto de Salud Carlos III, allowed rapid transport and analysis of more than 50 000 blood samples.

THE IMPORTANCE OF ASYMPTOMATIC INFECTIONS

The US survey was carried out at a time during which it was not possible to measure serum antibodies, and, thus, the survey data could not directly quantify the spread of the virus in the population. To do so, assumptions are needed about the number of asymptomatic individuals; for example, Morabia assumed that a third of influenza infections were asymptomatic (as estimated in ENE-COVID for SARS-CoV-2).

The impossibility of detecting asymptomatic individuals also has implications for the calculation of mortality. The 1918 US survey data could only be used to estimate the case fatality risk—that is, the proportion of individuals with influenza symptoms who died during the course of the disease.[2] By contrast, the 2020 Spanish serosurvey data could be used to also estimate the infection fatality risk—that is, the proportion of individuals infected with SARS-CoV-2 (regardless of symptoms) who died.[3] While knowing the case fatality risk is important for clinical purposes, knowing the infection fatality risk in different population groups assists pandemic management: we have no control over who becomes symptomatic after infection, but we can adopt measures to prevent infection.

In summary, Frost and Sydenstricker's retrospective survey was quite impressive given the options at their disposal in 1918. However, a longitudinal serosurvey like ENE-COVID required an additional century of scientific, technological, and social progress. Historical comparisons regarding other aspects of pandemic management—nutritional status of the population, development of diagnostics, therapeutics, and vaccines—lead to the same conclusion: despite the magnitude of human suffering caused by the SARS-CoV-2 pandemic, our generation has been way more fortunate than previous ones. AJPH

CORRESPONDENCE

Correspondence should be sent to Miguel A. Hernán, Professor, Department of Epidemiology, Harvard T. H. Chan School of Public Health, Boston, MA 02115 (e-mail: miguel_hernan@post.harvard.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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Politics, Pushback, and Pandemics: Challenges to Public Health Orders in the 1918 Influenza Pandemic

J. Alexander Navarro, PhD, and Howard Markel, MD, PhD

See also the COVID-19 & History section, pp. 402–445.

During the first wave of the COVID-19 pandemic in the United States, many state governors faced an increasing number of acts of defiance as well as political and legal challenges to their public health emergency orders. Less well studied are the similar acts of protest that occurred during the 1918–1919 influenza pandemic, when residents, business owners, clergy, and even local politicians grew increasingly restless by the ongoing public health measures, defied public health edicts, and agitated to have them rescinded. We explore several of the themes that emerged during the late fall of 1918 and conclude that, although the nation seems to be following the same path as it did in 1918, the motivations for pushback to the 2020 pandemic are decidedly more political than they were a century ago. (*Am J Public Health*. 2021;111: 416–422. https://doi.org/10.2105/AJPH.2020.305958)

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Beginning in May 2020, communities across the nation began removing the closure orders, gathering bans, and other public health edicts they had enacted to slow the spread of the COVID-19 pandemic. They often did so in response to growing opposition to the measures from a small but vocal group of protestors. In Michigan, for example, a barber who reopened his shop in defiance of state public health orders drew a large crowd of supporters from hundreds of miles away.[1] Other protestors swarmed the state capitol in Lansing, firearms and picket signs in hand, demanding an end to the pandemic control measures they considered too onerous.[2] In New Jersey, a throng gathered outside a gym to jeer at state troopers as they issued citations to the two owners for refusing to comply with the state's closure edicts.[3] In Arizona, several restaurants reopened their doors to crowds of hungry diners despite the ongoing stay-at-home orders and the threat of citations.[4] A coalition of Oregon churches has sued the governor for exceeding her legal authority to issue lengthy closure orders.[5] The Michigan legislature has sued the governor for enacting sequential public health emergency periods without legislative consent.[6] Meanwhile, the Wisconsin legislature won its legal battle with the governor when the state Supreme Court struck down the state's "Safer at Home" orders as unconstitutional.[7] The governors of Pennsylvania, California, Maryland, Ohio, Illinois, Texas, and Virginia have similarly faced various legal challenges from business owners, private citizens, and lawmakers.

The current battles are not a new phenomenon, and there is a long history of pushback—sometimes violent—to the implementation of public health measures, from vaccination campaigns to placarding to forced isolation of cases of communicable diseases.[8] Over a century ago, during the devastating fall wave of the influenza pandemic of 1918, communities across the nation implemented public gathering bans, closure orders, and a host of other measures in an attempt to slow the spread of the disease.[9] And then, as now, similar scenes of pushback, defiance, and political and legal challenges sometimes resulted.

THE 1918 EPIDEMIC AND THEATERS

The brunt of the closures in the fall of 1918 were borne by theaters and movie houses. With the understanding that a lingering epidemic was bad for box office receipts and having been promised by public health officers that the epidemic would be over quickly, owners in many cities initially offered their full cooperation. As the epidemic dragged on, however, that sense of cooperation and civic duty gave way to the financial strain business closures created. Theater owners in Birmingham, Alabama, for

example, estimated their losses at $90 000 during that city's three-week closure period. In Chicago, some 1150 theater employees lost their jobs because of the closure orders. One theater had already sold $80 000 in advance tickets for performances that were canceled. In Cleveland, Ohio, the month-long business closure had cost theater proprietors more than $1.25 million.[10]

As the continued closures took their financial toll, many owners took to city hall. In Atlanta, Georgia, the city's Theater Managers' Association complained that they were required to shut their doors while people could still congregate at the Southeastern Fair, where fairgoers were treated to free outdoor movies produced by the government as part of the Fourth Liberty Loan drive. The angry owners protested to the mayor, who demanded that the Board of Health remove the closure orders. When the board refused, the mayor convened a special session of the city council, which overruled the Board of Health and reopened Atlanta's places of public amusement after less than three weeks and before the city's epidemic had run its course.[11]

In Los Angeles, California, the powerful Theater Owners' Association, backed by producers from several of the largest film studios, demanded that officials close all nonessential businesses to bring the epidemic to a swifter conclusion. The City Council agreed and decided that theater owners were being singled out and treated unfairly. They called on the health officer to enact a complete closure of the city for five days. Retailers vehemently protested. The health officer, believing that such a sweeping order would be impossible to enforce, refused to comply and instead called on the City Council to order the stricter measures itself. Factions formed and the political battle continued until the brunt of the epidemic ended in early December.[12]

In Denver, Colorado, a massive resurgence in cases and deaths after city officials removed public health measures prematurely led the mayor and health officer to reimplement business closures once again. Theater and movie house owners quickly met, formed an "amusement council," and demanded that officials either close all nonessential businesses or issue a mandatory mask order. Faced with such strong opposition from a major sector of the local economy, city leaders capitulated and rescinded the closure order only a few hours after it went into effect, implementing a mandatory mask order in its place.[13]

MANDATORY MASK ORDERS

Denver was not alone in turning to face masks as a way to stem the epidemic. Across the nation, citizens were encouraged to wear masks while in public, and posters, newspaper announcements, and statements from public officials attempted to link the use of face masks to wartime patriotic duty. San Francisco, California Mayor James Rolph said that "conscience, patriotism and self-protection demand immediate and rigid compliance" with his city's mask ordinance.[14] In nearby Oakland, Mayor John Davie stated that "it is sensible and patriotic, no matter what our personal beliefs may be, to safeguard our fellow citizens" by wearing a mask.[15] The Red Cross took out full-page newspaper ads urging Americans to wear masks, bluntly calling the individual who refused to wear a mask "a dangerous slacker."[16]

Officials realized that mask recommendations could only go so far and that many citizens would avoid wearing the uncomfortable devices. As one Sacramento, California, official put it, people "must be forced to do the things that are for their best interests."[17] To that end, numerous communities, particularly in the American West, enacted mandatory mask ordinances. And almost everywhere these measures were met with widespread noncompliance and outright defiance. In Denver, for example, store owners openly told the city health department that they would not turn away unmasked customers. One department store employee refused to wear a mask because she believed "an authority higher than the Denver Department of Health was looking after her well-being."[18] Streetcar conductors, fearful of altercations with passengers, refused to enforce the order aboard their trolleys. Despite the presence of police officers stationed on busy street corners and the threat of hefty fines ranging from $10 to $200 for failure to comply, a majority of Denver residents still refused to don masks. Even the mayor recognized the folly of such an approach. "Why, it would take half the population to make the other half wear masks," he commented. "You can't arrest all the people, can you?"[19]

Denver was not alone. Seattle, Washington, streetcar conductors similarly refused to turn away unmasked passengers. In Oakland, officials had to deputize some 300 War Service civilian volunteers to assist police in securing the names and addresses of scofflaws.[20] Sacramento's police stations began flooding with arrested offenders within 20 minutes of that city's ordinance going into effect.[21] So many residents were caught without their masks in San Francisco that the police chief warned he was quickly running out of jail cells. As more arrests were made, police justices were forced to work well into the evenings and on weekends just to clear the

backlog of cases. Even the health officer and mayor were caught without their masks on while at a crowded boxing match. Both were fined.[22]

Many of those who were caught were simply unfortunate souls who believed they could make a quick public foray without being nabbed. A few, however, were more actively defiant. Some argued that mask orders were an unconstitutional infringement on their civil liberties and vociferously maintained that the government could not force individuals to wear a mask. Others questioned the efficacy of masks. Although in the minority, these groups were vocal and could be quite powerful. When San Francisco's epidemic spiked once again in January 1919, officials issued a second mask order. This time, protestors formed a 2000-strong "Anti-Mask League" and packed an auditorium to listen to speeches on how to fight the ordinance. Audience members included several prominent city physicians as well as a member of the San Francisco Board of Supervisors.[23] In Oakland, debate over a second mask order was tabled after Christian Scientists and several labor organizations (whose workers did not want to wear uncomfortable masks all day while toiling in factories) lodged protests against the proposal. The mayor also opposed a second ordinance, recounting his humiliation at having been arrested while in Sacramento for failing to wear a mask. A prominent local physician commented that "if a cave man should appear . . . he would think the masked citizens all lunatics."[24] In Portland, Oregon, repeated debates over a draft mask ordinance grew so heated that one city official stood up and declared the measure "autocratic and unconstitutional," adding that "under no circumstances will I be muzzled like a hydrophobic dog."[25]

SCHOOL CLOSURES

New York City, Chicago, Illinois, and a few Connecticut communities opted to keep schools in session so that children could be monitored by teachers and nurses, under the premise that many of their pupils were safer in classrooms than in their impoverished homes. In other cities, this discussion was quickly put to rest as the number of new influenza cases began accelerating. In Minneapolis, Minnesota, however, the issue quickly came to a head when Health Officer H. M. Guilford ordered all city schools closed. The state health officer strongly opposed the move and called it an unnecessary overreaction. "Do you think that any program of shutting up a few things is going to stop this epidemic?" he rhetorically asked Minneapolis officials.[26] Nine days later, the city Board of Education—unsupportive of the action to begin with and now backed by the opinion of the state health officer—voted to reopen Minneapolis's schools, arguing that Guilford did not have the legal authority to close them.[27]

Guilford responded by instructing the police to arrest members of the Board of Education. The board readied for battle. "We shall not close the schools if they arrest us and fine us," said the board's spokesperson. Hoping to avoid a confrontation, the police chief met with the school board in person. The result of the meeting was, as one board member put it, "a diplomatic invitation to the school board to surrender unconditionally." The board reversed its decision and closed schools once again.[28]

In the end, the forced closure of Minneapolis schools did not result in a court battle. In other communities, however, legal challenges were made, with mixed results. In Oregon, the state Supreme Court ruled that, under existing statutes, the state Board of Health had no authority to close public schools.[29] In Arizona, on the other hand, the state Supreme Court found that local boards of health had wide administrative power during public health emergencies and could order schools closed as public nuisances during times of epidemics.[30]

HOUSES OF WORSHIP

Many clergy and parishioners were initially eager to do their part to stem the rising tide of influenza, and houses of worship often shut their doors even when such closures were only recommended. In some cities, however, clergy defied mandated closures. In Los Angeles, for example, members of the Ninth Church of Christ, Scientist promptly found themselves escorted to central booking when they reopened their church. Their defiance was designed to spark a test case before the California Supreme Court. It did not go very far: the court refused to issue a writ of habeas corpus for the main defendant, stating that to do so would cast legal suspicion on the closure ordinance and thus make its enforcement difficult in the midst of an epidemic.[31] In Cleveland, two Jewish synagogues decided to ignore the state gathering ban and held indoor services away from their usual buildings. Police arrested nine of the men, who claimed that they were simply worshipping and not holding regular religious services.[32]

Many clergy grew angry that other gatherings were allowed while their churches were shuttered. In Charleston, South Carolina, for example, ministers protested that residents were still allowed to crowd in poorly ventilated office buildings and shops. "Business must not be hindered, it must go on,

come what may," one minister sarcastically wrote in a public letter. "But the King's business . . . must be side-tracked in the presence of a national calamity."[33] The bishop of Charleston protested the continued closure of churches while circus parades were still allowed, writing that US soldiers in Europe were being denied the prayers of loved ones back home by "a drastic law of dubious scientific value" at a time when people desperately needed spiritual comforting.[34]

Clergy were particularly upset at church closures in cities where saloons were allowed to remain open. It was the eve of Prohibition, and the adherents of temperance were vocal in their opposition to saloons. "Why are they not ordered closed?" wrote the vicar general of the Diocese of Fall River, Massachusetts, blasting city officials. "Are not the motley gatherings of the 'great unwashed' assembling in these unclean places . . . a thousand times greater a threat than the congregations of our churches? Is German brewery power supreme in city and State House?"[35] In Cleveland, a group of one hundred clergy joined together for a door-to-door canvass to gain support for Prohibition, denouncing the discrimination of allowing saloons to remain open during a pandemic while churches were closed. A group of Methodist ministers in Columbus, Ohio, likewise protested their mayor's provision allowing saloons to remain open. They called saloons "one of the principal sources for the spread of disease of all kinds for the reason that men congregate there in great numbers, drinking from glasses used by others which have not been properly sterilized."[36] The complaints fell on deaf ears.

SALOONS

Angry clergy were largely correct that saloons tended to be insalubrious dens of large-scale congregation. They were also much more than simple watering holes. Saloons of the early 20th century served as poor-men's social clubs, de facto immigrant community centers, places where workingmen could obtain cheap meals, and the foci of many urban Democratic political machines. They were important gathering places, and there were many of them. By 1918, an estimated 265 000 saloons operated in the United States. A typical US city had one for every 200 to 500 residents. Despite such market saturation, they were almost always very busy establishments, with the vast majority of any city's workingmen visiting a saloon on any given day, typically immediately after their factory shifts had ended.[37]

These factors complicated local public health responses during the epidemic. The sheer crowding of saloons led most states and cities to order them closed. In in a nod to the political, social, and economic importance of saloons, other communities allowed saloons to operate with restrictions on hours, capacity, or how liquor could be sold and consumed. With so many saloons in each city, however, enforcement of either closures or restrictions was often difficult, as saloons could and often did continue to operate clandestinely. In Indianapolis, Indiana, at least six saloon owners defied the closure order and were arrested. When other saloons continued to skirt the order, police were sent to disperse the crowds and close the offending establishments.[38] Saloons in Baltimore, Maryland, had their operating hours limited to the daytime, severely curtailing their ability to serve their usual customers. Many simply ignored the restrictions and remained open well into the night. Chicago saloonkeepers were instructed to maintain proper ventilation and to keep their premises uncrowded. Not all owners were scrupulous about the rules, however. When police raided one saloon, they found 20 men asleep on the benches, 10 of whom were hauled off to the drunk tank. A second saloon was found to have a throng of drunken men bellied up to the bar two-deep. Fifteen violators and the manager were taken to jail.[39] In Cincinnati, Ohio, saloons were allowed to remain open for carryout bottle service only. Police found so many serving drinks as usual that the health officer threatened to order all saloons completely shut if the violations continued.[40] In Paterson, New Jersey, rampant violations of the state closure order led the state Department of Health to dispatch an officer to assist local officials in enforcing the rule. Several saloonkeepers were arrested. Most pleaded guilty and paid their fines. One owner, however, challenged the city Board of Health's authority to close his saloon under state orders. In the end, the state Supreme Court ruled that the public health nuisance ordinance under which he had been charged pertained only to physical structures and not human conduct. "Certainly, the mere *inviting* of people to congregate in his saloon was not dangerous to life or health, even under the construction argued for by prosecutor," the Court found. The justices ruled that Paterson's sanitary ordinance did not apply.[41]

Far and away, however, it was in Newark, New Jersey, that the nation's most significant act of defiance occurred. As historian Stuart Galishoff has noted, Newark had a long and infamous history of probusiness and highly politicized public health.[42] This once again became apparent when Mayor Charles P. Gillen proclaimed that Newark saloons—an important component of his political power base—would be

permitted to sell bottled liquor on a physician's prescription via their side doors, in direct contravention of sweeping closure orders issued by state Director of Health J. G. Price.[43] The city's newspaper of record condemned the mayor's intransigence in a scathing piece criticizing Gillen and questioning his legal authority to skirt state orders. The feisty mayor immediately fired back. "If the *Newark Evening News* attempts to interfere with any orders which I have issued or may issue for the preservation of the health of the people of Newark," he barked, "I will close the paper immediately under the laws of the state, as a menace to the public health, just as I would close any place of assembly." Gillen added that it was not for the editors to question his authority, stating that he had first consulted with a physician at the state Department of Health and was given approval for his side-door plan. Conveniently, Gillen could not remember the name of the doctor with which he spoke.[44]

Many saloonkeepers took Gillen's intransigence as tacit approval to operate as usual. Indeed, Gillen seemed to ignore the mounting reports of violations. Hounded by the New Jersey Department of Health and by the *Evening News* for refusing to comply with the state directive, the mayor unilaterally ended the closure orders only 11 days after they went into effect. He defended his action by arguing that the state edict was only meant to apply while the epidemic existed in any given community. Having declared it over in Newark, the city was therefore free to return to business as usual.[45] When the editors of the *Evening News* again attacked Gillen's act of defiance, the mayor called the piece a "vile lie from beginning to end" and then banned reporters from his office "until such time as the *Newark Evening News* learns to print the truth about these affairs."[46] He also derided the closure orders, stating that it was unfair to close some businesses while allowing crowded factories to remain operational, and arguing that keeping the ban in place would have been "confiscation without proper warrant, reason or authority."[47]

The state was largely powerless to rein in Gillen. Under the intricacies of New Jersey home rule laws and Newark's city charter, official authority over public health in Newark was vested solely in the mayor, who also held the title of Director of the Department of Public Affairs. The City Commission could have removed Gillen but was hesitant to act, especially given that the Newark Theatrical Managers Association had announced its full backing of the mayor and its opposition to the state Department of Health.[48] Officially, Newark was once again open. In March 1919, Gillen won another victory when a series of bills designed to strengthen the state's public health laws ran into a wall of unanimous opposition from the Essex and Hudson County delegations, home of Newark and Jersey City (which had followed Newark in rescinding state closure orders), respectively. The amendments failed.[49]

PAST AS PROLOGUE?

To be sure, history is not a perfect template for the present, let alone the future. The historical context of the United States in 1918 was vastly different from what we are experiencing today. The nation was at war, and social cohesion and patriotism—stoked by a federal propaganda program—ran high. It was a period that historians have labeled the Progressive Era, when tremendous stock was put in scientific expertise. Media consumption patterns were very different than today; news was limited to print, but newspaper circulation and readership were high. The economy was dominated by the manufacturing sector, and the number of women in the workforce was much lower. Most important, the causative agents of the respective pandemics are different.

Despite these differences, the incidents of defiance and pushback seen today are strikingly reminiscent of those displayed a century ago. Business owners presented with mandatory shutdowns today, for example, face the same financial pressures that their forebears did in 1918. Indeed, the economic fallout from shutdowns has been far greater in 2020, given that the orders generally have been more sweeping and have most severely affected the service sector, now the dominant segment of the economy. Many clergy, then and now, believe that their moral obligation to minister is only heightened during a national crisis. Masks are just as uncomfortable to wear today as they were in the fall of 1918, and it is only natural that some citizens will refuse to don them.

What is different today, however, is the way in which public health has become heavily politicized.[50] In 1918, arguments over various closure orders overwhelmingly revolved around questions of the efficacy, equity, and duration of the measures. Even in Newark, Mayor Gillen's defiance was based on economic and political power, not partisanship. Opposition to mask ordinances was mostly driven by nonpartisan complaints that masks were too uncomfortable to wear or orders too difficult to enforce. Those who decried such measures as an unconstitutional infringement of civil liberties may have been motivated by an ideology of personal freedom, but not by naked political partisanship. Furthermore, given that public health was accepted as the

domain of state and local jurisdictions, any opposition to these orders was concomitantly local.

By contrast, the response to the COVID-19 pandemic has become a national partisan battle, led by President Donald Trump. Those on the political left argue that citizens have a civic and social obligation to the collective and a duty to follow the best guidance of public health officials. Those on the political right believe that pandemic control measures restrict private conduct, infringe on individual freedoms, and suppress the economy.[51] Furthermore, trust in science is now heavily influenced by political beliefs.[52] This has colored nearly every aspect of the response to the pandemic, from mask orders to business closures and even to the question of whether and how to reopen schools. Rampant disinformation spread by social media, right-wing outlets, and conservative political figures only serves to heighten the partisan divide. Opposition to public health measures and the rejection of scientific evidence by some elected officials, conservative media, and many voters have now become a symbol of political allegiance to the president. Woodrow Wilson may have remained silent on the 1918 influenza pandemic, but the Trump administration has actively undermined the nation's public health response.

This politicization of public health threatens to contribute further to the public's "epidemic fatigue." In 1918, city after city saw huge crowds of entertainment-starved residents flock to amusement venues when control measures were lifted. Cases and deaths spiked anew, in some communities worse than the initial wave. Yet citizens and officials alike often resigned themselves to the cases and deaths still to come rather than live under another period of economically and socially difficult closure orders and gathering bans. Today, such creeping complacency is further bolstered by scientifically invalid and politically motivated misinformation, which, together, threaten to derail a cohesive, effective, evidence-based public health response precisely when broad consensus and compliance is most critical. Given how the social response to the COVID-19 pandemic in the United States has thus far unfolded, Shakespeare may again be proven right when he wrote the line, "What's past is prologue." Unfortunately, that public health prologue has now become highly partisan. AJPH

ABOUT THE AUTHORS

J. Alexander Navarro and Howard Markel are with the Center for the History of Medicine, University of Michigan, Ann Arbor.

CORRESPONDENCE

Correspondence should be sent to J. Alexander Navarro, Center for the History of Medicine, University of Michigan, 102 Observatory, Rm 212, Ann Arbor, MI 48109. Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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CONFLICTS OF INTEREST

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The Manchurian Plague and COVID-19: China, the United States, and the "Sick Man," Then and Now

Ruth Rogaski, PhD

See also the COVID-19 & History section, pp. 402–445.

In this article, I explore the historical resonances between China's 1911 pneumonic plague and our current situation with COVID-19. At the turn of the 20th century, China was labeled "the Sick Man of the Far East": a once-powerful country that had become burdened by opium addiction, infectious disease, and an ineffective government. In 1911, this weakened China faced an outbreak of pneumonic plague in Manchuria that killed more than 60 000 people. After the 1911 plague, a revolutionized China radically restructured its approach to public health to eliminate the stigma of being "the Sick Man." Ironically, given the US mishandling of the COVID pandemic, observers in today's China are now calling the United States "the Sick Man of the West": a country burdened by opioid addiction, infectious disease, and an ineffective government. The historical significance of the phrase "Sick Man"—and its potential to now be associated with the United States—highlights the continued links between epidemic control and international status in a changing world. This historical comparison also reveals that plagues bring not only tragedy but also the opportunity for change. (*Am J Public Health*. 2021;111:423–429. https://doi.org/10.2105/AJPH.2020.305960)

On February 3, 2020, the *Wall Street Journal* published a fierce op-ed piece criticizing China for its handling of the coronavirus outbreak in Wuhan. The essay, by Bard College political scientist Walter Russell Mead, slammed the government of the People's Republic of China (PRC) for its "self-serving" and "ineffective" response to the virus and predicted a future meltdown of China's "brittle economy" as a result. The virus, according to Mead, had "shaken confidence in the Chinese Communist Party at home and abroad." As a result, Beijing's geopolitical footprint would shrink, and the virus would usher in the return of the United States as the world's sole superpower.[1]

Mead's article caused a huge stir in China not because of its inaccurate predictions but because of its title: "China is the Real Sick Man of Asia." By using the phrase "Sick Man of Asia" in the headline, the *Wall Street Journal* employed a trope that has a long history as a negative stereotype of China and the Chinese. Reaction in China was swift: the PRC government denounced the article and expelled three *Wall Street Journal* journalists. US observers castigated China for suppressing freedom of the press, but the PRC Foreign Ministry instead pinned the blame on the wording of the article: "[t]he editors used a racially discriminatory title, triggering indignation and condemnation among the Chinese people and the international community."[2]

What did "the Sick Man" mean for China when the term first emerged more than 100 years ago, and why is the Sick Man trope still so significant today? Here I consider the context of disease and public health in China at the turn of the 20th century, a moment when China under the Qing dynasty (1644–1911) was labeled "the Sick Man of Asia": a once-powerful empire that had become burdened by disease, opium addiction, and an ineffective government. In 1911, this weakened China faced a deadly epidemic of an airborne plague, a disease that caused tens of thousands of deaths and had a profound impact on China's emerging modernity. A consideration of the 1911 pneumonic plague offers compelling resonances with our current airborne crisis of COVID-19. This historical comparison not only reveals insights into the current PRC response to the COVID-19 pandemic but also raises the question of who might inherit the mantle of the "Sick Man" in the 21st century.

THE SICK MAN AT THE TURN OF THE CENTURY

In the 19th century, Western observers used the phrase "Sick Man" to castigate any government that was failing as a result of corruption and indifference, but it was most frequently used to criticize non-Western countries.[3] Originally used to critique the Ottoman Empire, by the late 19th century the "Sick Man" phrasing was frequently applied to China, a previously successful empire that had been defeated in war, had been rocked by famine, and was experiencing erosion of its sovereignty at the hands of Western and Japanese imperial powers.[4]

In 1896, the British-owned *North China Herald* called China the "Sick Man of the Far East," a country that could be cured only if it transformed its approach to education, overhauled its justice system, and got rid of incompetent government officials.[5] In 1905, the *New York Times* also called China "The Sick Man of the Far East," a once-great empire that was now an object of derision around the world.[6] In these uses of the phrase, the "Sick Man" referred to the Qing dynasty, the last imperial government of China and a political system that seemed incapable of responding to the crises it faced.

Surprisingly, many Chinese intellectuals at the turn of the century did not dismiss foreign criticism but instead used the "Sick Man" trope to express their own dismay at China's situation. Some, including the famous reformer Liang Qichao (1873–1929), used the phrase to link the health of the nation to the health of its individual citizens. Citing China's opium addiction, malnutrition, and lack of hygienic awareness, Liang declared that the entire population of 400 million were "sick men," and therefore China was a "sick country."[7] Under the pen of disappointed Chinese reformers, the language of the "Sick Man" trope could become highly medicalized, full of disease, pathogens, and bodily rot.[8]

There were many reasons why Chinese intellectuals in the late Qing linked the political health of the nation to the physical health of individual bodies. In the Chinese language, "to cure" and "to rule" can be expressed with the same word, *zhi* (治), and for centuries traditional medical discourse included political metaphors for governance.[9] Chinese modernizers were also deeply influenced by their understanding of social Darwinism, which linked a biological "survival of the fittest" to the fate of nations. It is important to note that, relative to its long history, China did experience a dramatic increase in epidemics in the 19th century as a result of increased population density and the impact of imperialism.[10] The political, social, and medical crises of the late Qing brought an increasing consciousness that health itself could be a central element of governance, reform, and even revolution.[11]

In 1911, a major epidemiological crisis in China's northeastern region helped to cement the conceptual link between the health of individual bodies and the political health of the country. That winter, a deadly airborne disease—the pneumonic plague—emerged from China's Manchurian borderlands. Examining China's experience in the 1911 Manchurian plague shows how epidemic control became a crucial element in the country's maintenance of national sovereignty and a key strategy in its fight against the "Sick Man of Asia" label. Contemplating this airborne epidemic also reveals numerous thought-provoking resonances with our COVID crisis today.

COMPARING AIRBORNE CRISES

The first resonance between COVID-19 and pneumonic plague resides in the zoonotic origin of both diseases. The virus that causes COVID-19, SARS-CoV-2, emerged in bats in China's remote southwestern borderlands with Burma and Laos. How it moved from bats to humans in the fall of 2019 has not yet been determined, but scientists suspect an intermediary animal that humans handled as part of market-driven consumption of wild meat products.[12] Similarly, in the fall of 1910, humans encountered the bacillus that causes plague, *Yersinia pestis,* when markets spurred exploitation of animals on another Asian borderland, a part of northeastern China on the border with Russia and Mongolia known as Manchuria. This region is home to a burrowing groundhog-like animal—the marmot—that became an attractive source for furs at the turn of the century. The trapping and skinning of millions of marmots resulted in the transfer of *Yersinia pestis* directly into the lungs of humans and gave rise to the pneumonic plague.[13]

The involvement of the lungs in both COVID-19 and the pneumonic plague has important implications for their modes of transmission. In pneumonic plague, *Yersinia pestis* infects the alveoli, causing a high fever and a painful, bloody cough and ultimately leading to failure of lung function. The sputum expelled in coughs can travel through the air and can be inhaled directly into a new host's lungs. It is through this mode of transmission that the plague takes its most contagious and deadly form. With no treatment available in the early 20th century, in 1911 the disease had a 100% mortality rate.[14] Although COVID-19 is

far less deadly than pneumonic plague, its primary manifestation as a lung infection has similar implications for both its mode of transmission and strategies for its control. As pneumonic infections transmitted from human to human through the air, both diseases require interventions in the most difficult to control of all human activities: moving, gathering, and even breathing.

Although separated by more than 100 years, similar timing and similar technologies facilitated the rapid spread of both pneumonic plague and COVID-19. The 1911 plague exploded in Manchuria around the Chinese New Year, a time when millions of Chinese traditionally travel home to be with their families. COVID-19 also emerged in the lead-up to the Chinese New Year in December 2019 and January 2020. In both cases, modern transportation afforded rapid spread of the disease. In 2020, the SARS-CoV-2 virus traveled from Wuhan to domestic locations via high-speed train and internationally via direct flights around the world.[15] In 1911, *Yersinia pestis* traveled along the recently developed China Eastern Railway (part of the Trans-Siberian Railway that now links Vladivostok to Moscow), a modern transportation vector that quickly spread the disease to major urban centers in China's northeastern heartland. It was in these cities that the largest number of people died in the winter of 1910–1911 and the most dramatic struggles took place to understand and contain the disease.

The nature of the pneumonic plague was once as mysterious as COVID-19 is today. In 1911, scientists working in Asia had only recently identified the microorganism that caused plague (*Yersinia pestis*, then known as *Bacillus pestis*), and many unanswered questions remained about the plague's ecology, epidemiology, and infectivity—the same questions scientists today are asking about SARS-CoV-2.[16] How long could the pathogen last outside the body of the host? How far could it travel? How could it be killed? What were the seats of the disease, the nature of the lesions? Which vector or mode of transmission was responsible for infection?

Teams of researchers from different nations came to Manchuria to study these questions through work in laboratories, clinics, and the field, as well as through investigations into what anthropologist Christos Lynteris has called "ethnographic plague" data: studies of how the habits of different ethnic groups made them more or less vulnerable to the disease.[17] The overwhelming uncertainty about plague generated a wide and sometimes bizarre array of experiments. Researchers chased down wild marmots on the prairie to take rectal temperature readings, extracted urine from the corpses of victims to determine whether it contained the plague bacillus, and placed gerbils in buckets next to dying plague patients to gauge the potential for human to animal transmission.[18]

At the onset of the epidemic, scientists could not even agree on the most basic nature of the Manchurian plague. This uncertainty led to a debate about a central issue found in COVID-19 control today: the use of masks. In 1911, researchers from Russia and Japan assumed that plague was transmitted by rats and fleas, but Chinese researchers discovered that this version was centered in the lungs and passed from human to human through the air.[19] Believing the epidemic to be airborne, Chinese clinicians mandated mask wearing for their personnel, whereas European and Japanese medical workers eschewed masks as worthless—until alarming deaths among foreign doctors indicated that the plague was indeed airborne and masks were thus a useful preventive measure.[20]

The presence of foreign researchers in Manchuria in 1911 highlights the most significant difference between then and now: the status of China in the geopolitics of the early 20th century. Today, China's well-established public health infrastructure and highly centralized government assumed responsibility for the response to COVID-19, but in 1911 China's political situation was radically different. Since the mid-19th century, foreign powers had been chipping away at Qing territory, and this "semi-colonial" condition was clearly manifested in Manchuria. Japan controlled the railway that ran toward the southerly parts of Manchuria, and Russia controlled the railway's east–west portion. Cities along the railway were divided into Chinese-run and foreign-run zones.

Fearing that Russia and Japan might use epidemic control as an excuse for further territorial expansion, the Qing government established its first-ever central public health organization—the North Manchuria Plague Prevention Service—and hired the Cambridge-educated Chinese-Malayan physician Wu Lien-teh (Wu Liande) as director.[21] Determined to protect its sovereignty through mastery of Western medicine, under Wu's leadership China adopted the same draconian plague control methods of its foreign occupiers.

Epidemic control measures in 1911 possessed some approaches familiar to us from our current COVID-19 experience, but the violence with which measures such as quarantines were enacted is shocking to current sensibilities.[22] In Manchuria's densely populated cities, thousands of soldiers enforced cordon sanitaire, with shoot-on-sight orders for

those attempting to escape. Police went door to door searching for plague victims. If a corpse was found, family members and neighbors were pulled from their homes and placed into quarantine. Those who showed signs of plague were forcibly removed and sent to "plague hospitals," makeshift warehouses for the dying with few provisions for treatment or comfort. The homes and possessions of the dead were burned with the goal of preventing infection, and even the bodies of the dead were burned in mass pits, a grave affront to Chinese custom that was nevertheless carried out by the Qing government on its own citizens.[23]

As we find today in US public opinion about government responses to COVID-19, in 1911 there were strong differences of opinion in China about the policies used to control the plague. Some Chinese observers reacted with shock at the violence of "Western medicine" and saw its methods as nothing more than a foreign assault on the bodies of Chinese people. Some claimed that thousands died not from the plague but as a result of the plague control measures themselves.[24] By stark contrast, other Chinese observers embraced plague control policies as the new scientific standard for modern government and praised the Qing court for aggressively adopting even the most horrifying of foreign techniques. For these modernizers, if China was to overcome its status as the "Sick Man of Asia," it needed to manage what they perceived as the country's unruly and unhygienic population, and thus extreme and sometimes violent methods were justified.[25]

By the spring of 1911, authorities in Manchuria had credited these draconian policies for stopping the epidemic. The pneumonic plague had not traveled to other countries, and in Manchuria itself deaths had been "minimized" to an estimated total of 60 000.[26]

Although it was a humanitarian disaster, the plague also created an opportunity for China to radically rethink the relationship of health and governance. As Sean Hsiang-lin Lei has shown, the 1911 plague convinced some Chinese elites that Western medicine was politically superior to China's own medical traditions. With its holistic approach to the body, Chinese medicine could not diagnose the plague as a discrete, "notifiable" disease, and with its focus on individual cure, Chinese medicine had no capacity for mass population management techniques such as quarantine, disease mapping, and disinfection.[27] For modernizers, Western-style public health could help China escape its "Sick Man" fate by allowing the country to control epidemics, preserve its sovereignty, and prove its fitness to exist in the modern world. This commitment to a new kind of public health—inspired by the experience of the 1911 plague—would become central to China's social and political transformations in the 20th century.

OVERTHROWING THE SICK MAN

Only a few months after the pneumonic plague subsided, republican revolutionaries overthrew the Qing dynasty and put an end to 2,000 years of imperial rule in China. The new republic took to heart the important lesson about health and sovereignty learned during the Manchurian plague. If China was no longer going to be the Sick Man of Asia, its leaders argued, it would require a powerful central government that could discipline its citizens and create a strong nation. Sun Yat-sen, the leader of the 1911 revolution (and, interestingly, a physician of Western medicine), placed strong government authority at the center of his program for creating a modern China. In Sun's formulation, the goal of China's revolution was not to achieve individual freedom but to achieve the freedom of the nation from foreign domination. This strong, autonomous nation would require healthy, disciplined bodies to support it.[28]

This vision proved difficult to achieve in the first half of the 20th century as China struggled with invasion, civil war, and violent mass political upheavals. Medical historians such as Mary Brazelton, Wayne Soon, and Nicole Barnes have shown how even in the midst of the catastrophic 1937 to 1945 invasion by Japan, Chinese health reformers were able to initiate small but meaningful public health interventions such as vaccination programs, blood banks, and nursing corps.[29] Even in their darkest hour, China's elites still remained deeply committed to chipping away at the "Sick Man" label.

The realization of a public health predicated on the creation of a powerful centralized state and a disciplined citizenry finally emerged after the establishment of the People's Republic in 1949. The link between health and the nation was clearly illustrated in the "Patriotic Hygiene Campaigns" initiated by the PRC in the 1950s. During the Korean War, China accused the United States of using germ warfare against its population, and in response the government launched a nationwide propaganda blitz encouraging citizens to clean streets, destroy pests, receive vaccinations, and otherwise "do hygiene" to protect the motherland. Long after the war's end, these hygiene campaigns remain a regular fixture of life in the PRC and have even been part of China's

COVID-19 response.[30] Seven decades of consistent messaging on the part of the PRC government has helped to create an expectation in today's China that individual health behaviors are directly linked to the status of the nation.

There are of course limits to the "then and now" links that can be drawn between the legacy of 1911 and the crisis of 2020. Nevertheless, one point is clear: those seeking an understanding of China's current response to COVID-19 need not turn to ancient Confucian culture to explain everything from universal mask wearing to compliance with draconian restrictions on personal freedoms.[31] China's moves to control COVID-19 today are based on a century-long experience of placing hygienic modernity at the center of national identity. Both the PRC's initial lack of transparency about the disease—a deep-seated fear of the truth about health failures being exposed—and its aggressive measures to control the epidemic can be attributed in part to China's long struggle with the Sick Man of Asia image.

THE TABLES TURNED?

It should now be clear why the *Wall Street Journal*'s "Sick Man" op-ed struck a deep-rooted nerve for PRC officials. But the article's true significance resides elsewhere: it may have opened the door for a historic reversal of the "Sick Man" label. Reading the essay today reveals a deep, sad irony: in February 2020, the *Wall Street Journal* and most observers in the West were highly critical of China's handling of the virus but absolutely failed to consider that the United States would fare much worse. The numbers of confirmed COVID-19 cases and deaths (as contentious as those numbers might be for some) show how different our reality is today: as of the writing of this article, the PRC (with a population of 1.4 billion) has reported 90 509 cases and 4739 deaths, whereas the United States (with a population of 330 million) has reported 7 156 562 cases and 205 268 deaths.[32]

Given China's apparent success in controlling the spread of the virus, it is not surprising that some Chinese observers suggest that the global tables are turning. China was known as the "Sick Man of Asia" in the 19th and early 20th centuries, but elements in China today are now portraying the United States as the "Sick Man of the West." In April, an essay in the PRC state-backed *Global Times* attacked the hypocrisy of using the "Sick Man" label to describe China's response to the coronavirus, stating that instead "incompetence will be the one word other countries pin on the US, the Trump administration in particular."[33] PRC Web sites proclaim that "America is the real sick man of the western world" and warn that the world "should be wary of the American virus."[34] Bloggers single out Trump as "the genuine Sick Man of America."[35] Chinese social media even boasts a hashtag, "#Meiguo bingfu" (American Sick Man), that has received millions of views.[36]

Given the active involvement of the state in the PRC Internet, Chinese social media should not be seen as a pure reflection of public opinion. Still, it does not take much government spin to convince the Chinese public that its country's response has been superior when epidemiological numbers alone will suffice: Chinese state television runs the number of positive COVID cases and fatalities in the United States as a perpetual scrolling ticker at the bottom of its news broadcasts. Even those Chinese citizens who are wary of the PRC media and consume news directly from the United States—cosmopolitan college students, scholars, and businessmen who have a foot in both countries—are horrified at the inattention to science, obsession with personal freedom, and lack of solidarity they have witnessed in the US COVID-19 response.[37] It is not only Chinese nationalists who suspect that the Sick Man tables have turned as a result of the COVID-19 pandemic. As medical historian Marta Hanson recently observed, perhaps it is time to acknowledge that the mantle has passed from the "Sick Man of Asia" to "Sick Uncle Sam."[38]

At the turn of the 20th century, China was labeled the Sick Man of Asia, a country grappling with political malaise, opium addiction, and disease. In 1911, an epidemic of a puzzling deadly lung infection highlighted China's underlying problems and cost tens of thousands of lives, but it also jolted the government into altering its approach to medicine and health. Like China at the beginning of the 20th century, the United States at the beginning of the 21st century is a nation mired in political turmoil, suffering through an opioid crisis, and dealing with a deadly epidemic of a mysterious airborne infection. Its failure to control the spread of SARS-CoV-2 has caused observers to label the United States the new "Sick Man" of the world.

Given these compelling comparisons, what, if anything, might the United States learn from China's historical experiences? Lessons are not likely to be learned from the PRC government's specific COVID-19 control policies. China's style of responding to the virus—the complete lockdown of entire cities, mandatory enforced quarantines (which in Wuhan included house to house searches and the separation of infected family members), the total shutdown of

all transportation (including private car traffic), mask wearing sometimes enforced by drone[39]—reflects not only its particular approach to governance but also its own particular public health legacies.

Instead, it is possible that insight and inspiration might be found elsewhere in this history, including in the very phrase "Sick Man." At the beginning of the 20th century, China's elites paid close attention to critiques from foreign sources. They took the "Sick Man" label seriously and dedicated themselves to overcoming it. In the United States today, most discussions about COVID-19 are wrapped up in domestic political squabbles, and little heed is given to how the rest of the world views our situation: if anything, US leadership has willfully ignored, discounted, and misrepresented the experience of other nations.[40] When the current administration does mention China, it simply blames China for "unleashing" the virus and represents the United States as a hapless victim.[41] The United States needs to take seriously the perspective of those outside of it, particularly the views of a nation it once held in hygienic contempt.[42]

Finally, it is important to remember that the 1911 Manchurian plague inspired China's government to adopt an entirely new system of medicine. It used the "Sick Man" label as a defiant rallying point, a spur for building national solidarity around the well-being of all citizens. The portability of the phrase "Sick Man"—and its potential to now be associated with the United States—highlights how epidemics are profoundly intertwined with issues of international status. An examination of this history also reminds us that epidemics can serve as inflection points: opportunities to rethink, retool, and even revolutionize approaches to health. AJPH

ABOUT THE AUTHOR

The author is with the Departments of History and Asian Studies, Vanderbilt University, Nashville, TN.

CORRESPONDENCE

Correspondence should be sent to Ruth Rogaski, PhD, 2301 Vanderbilt Place, PMB 351802, Nashville, TN 37235 (e-mail: ruth.rogaski@vanderbilt.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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CONFLICTS OF INTEREST

The author reports no conflicts of interest.

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Pandemic Reemergence and Four Waves of Excess Mortality Coinciding With the 1918 Influenza Pandemic in Michigan: Insights for COVID-19

Siddharth Chandra, PhD, Julia Christensen, BA, Madhur Chandra, MPA, PhD, and Nigel Paneth, MD, MPH

See also the COVID-19 & History section, pp. 402–445.

The global influenza pandemic that emerged in 1918 has become the event of reference for a broad spectrum of policymakers seeking to learn from the past. This article sheds light on multiple waves of excess mortality that occurred in the US state of Michigan at the time with insights into how epidemics might evolve and propagate across space and time. We analyzed original monthly data on all-cause deaths by county for the 83 counties of Michigan and interpreted the results in the context of what is known about the pandemic. Counties in Michigan experienced up to four waves of excess mortality over a span of two years, including a severe one in early 1920. Some counties experienced two waves in late 1918 while others had only one. The 1920 wave propagated across the state in a different manner than the fall and winter 1918 waves. The twin waves in late 1918 were likely related to the timing of the statewide imposition of a three-week social distancing order. Michigan's experience holds sobering lessons for those who wish to understand how immunologically naïve populations encounter novel viral pathogens. (*Am J Public Health*. 2021;111:430–437. https://doi.org/10.2105/AJPH.2020.305969)

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The 1918 influenza pandemic, one of the most devastating pandemics to affect humankind,[1,2] affected nearly every inhabited part of the globe, killing an estimated 50 million people.[3–5] The lack of attention paid to this pandemic over the subsequent century is surprising and earned it the title "the Forgotten Pandemic."[6] Yet the global and relatively recent nature of the pandemic make it a rich source for enhancing our understanding of pandemics, and knowledge about the 1918 pandemic has formed the basis of modern pandemic preparedness planning.[7] The emergence of the COVID-19 pandemic has underscored the value of such knowledge.

A question of central importance to the COVID-19 pandemic is whether it will manifest as a single wave or multiple waves, and how severe and long these waves will be. As the unfolding experience is demonstrating, much will depend on human behavior and how effectively measures such as social distancing are implemented. The 1918 pandemic can provide insights into how respiratory viral pandemics evolve and propagate. The objective of this article is to analyze the dynamics of that pandemic in Michigan, a geographically diverse state in the Midwestern region of the United States.

In this article, we used monthly county-level data on deaths in Michigan to estimate excess deaths during the period 1918 to 1920. We identified the number and timing of waves of mortality and their geographic spread and examined the waves sequentially for evidence of patterns that may further elucidate the dynamics of these epidemics or, if they were part of the same pandemic, the pandemic in its entirety. This exercise produced three phenomena of note, including (1) a widespread and steep fourth wave of excess deaths in early 1920 (also seen in the US state of Arizona and other countries[8–14]), which, in some counties, was more severe than the better-known waves in late 1918 and early 1919; (2) variations in the timing and number of peaks in different counties in late 1918; and (3) notable differences in the way the 1920 wave and the late 1918 waves propagated across the

state. Collectively these findings mean that Michigan experienced four waves of excess mortality over a span of two years, and not the two or three that earlier studies have identified.

METHODS

The data set contains monthly counts of all-cause deaths for the 83 counties of Michigan for the period 1914 to 1921 (n = 7968).[15] We selected all-cause deaths because cause-specific data were not reported uniformly across all relevant years and the challenge of determining which reported causes of death should count as "influenza-attributable" for those waves that may have been caused by the pandemic influenza virus. For example, a contemporary report from Massachusetts identified 85 different conditions as possible causes of pandemic-related mortality.[16] Furthermore, using seasonally unadjusted influenza, pneumonia, and broncho-pneumonia deaths produced a spatio-temporal picture that very closely mirrors the phenomena described here. It should be noted that, while all-cause mortality data may accurately identify the timing of mortality peaks, they are less accurate when used for the computation of actual mortality.[17]

We estimated excess deaths by seasonally adjusting county-level data using the additive mode of the PROC X12 module in SAS (SAS Institute Inc, Cary, NC) as follows[18]:

1. a trend moving average was computed from the original data on deaths,
2. the original time series was detrended using the moving average mentioned in step 1,
3. outliers (including a winter epidemic in 1915 to 1916 and the pandemic peak[s] of 1918 to 1920) were identified and replaced with non-extremal estimates,
4. a month-wise average was computed from the series in step 3 to produce initial estimates of regular monthly (seasonal) components,
5. the monthly components were subtracted from the series in step 3 to obtain a preliminary seasonally adjusted series,
6. the trend was re-estimated using the series obtained in step 5, and
7. steps 1 to 6 were repeated twice more, but using the series generated in step 5 from the previous iteration.[15,19]

The outputs of this process consisted of three components: a trend or long-term component, a cyclical or seasonal component, and an irregular or residual component. These components can be added to reproduce the original time series. We examined the irregular component, which identifies excess deaths not explained by normal seasonal variations or long-term trends. We defined an episode of excess deaths as a "wave" if, for at least one month during the episode, the excess was large enough to be designated an outlier by the X12 algorithm and the episode occurred between January 1918 and July 1920. We interpolated the resulting monthly county-level time series to produce weekly estimates of excess deaths.

RESULTS

Figure 1 shows aggregate excess deaths in Michigan. The four prominent peaks occurred during

1. March to May 1918,
2. September to November 1918,
3. November 1918 to January 1919, and
4. January to March 1920.

Notably, the fourth peak, which was as severe as the fall 1918 peak, does not form part of the Centers for Disease Control and Prevention's (CDC's) characterization of the pandemic (Figure 2). In addition, the early wave in 1918, also seen in Figure 2, emerged in the vast majority of counties across the various regions of the state.

Figure 3a compares the timing of the fall and winter 1918 peaks in four geographically dispersed counties, Washtenaw and Wayne in the east, Ingham in south–central Michigan, and Kent in the west.[20] These counties were selected for their large populations and, thus, lower likelihood that outliers would affect the overall mortality patterns. Overlaid on this graph are two vertical lines marking the dates on which Michigan Governor Albert Sleeper issued (October 19) and subsequently lifted (November 7) a statewide order banning public gatherings.[21,22]

The two counties in eastern Michigan experienced peaks in October 1918 with virtually no subsequent excess mortality in 1918 to 1919. By contrast, Ingham County in south–central Michigan experienced two peaks of similar size, one each in October and December 1918. Kent County in the west experienced its only peak in December 1918. If in fact the deaths were caused by the same pathogen, the epidemic appears to have spread westward across the state, with a single early peak in the east, a single late peak in the west, and both an early and a late peak in the center. The pattern in the center of the state (Ingham County) conforms best to the CDC's characterization of two separate waves in late 1918, but was not observed in all parts

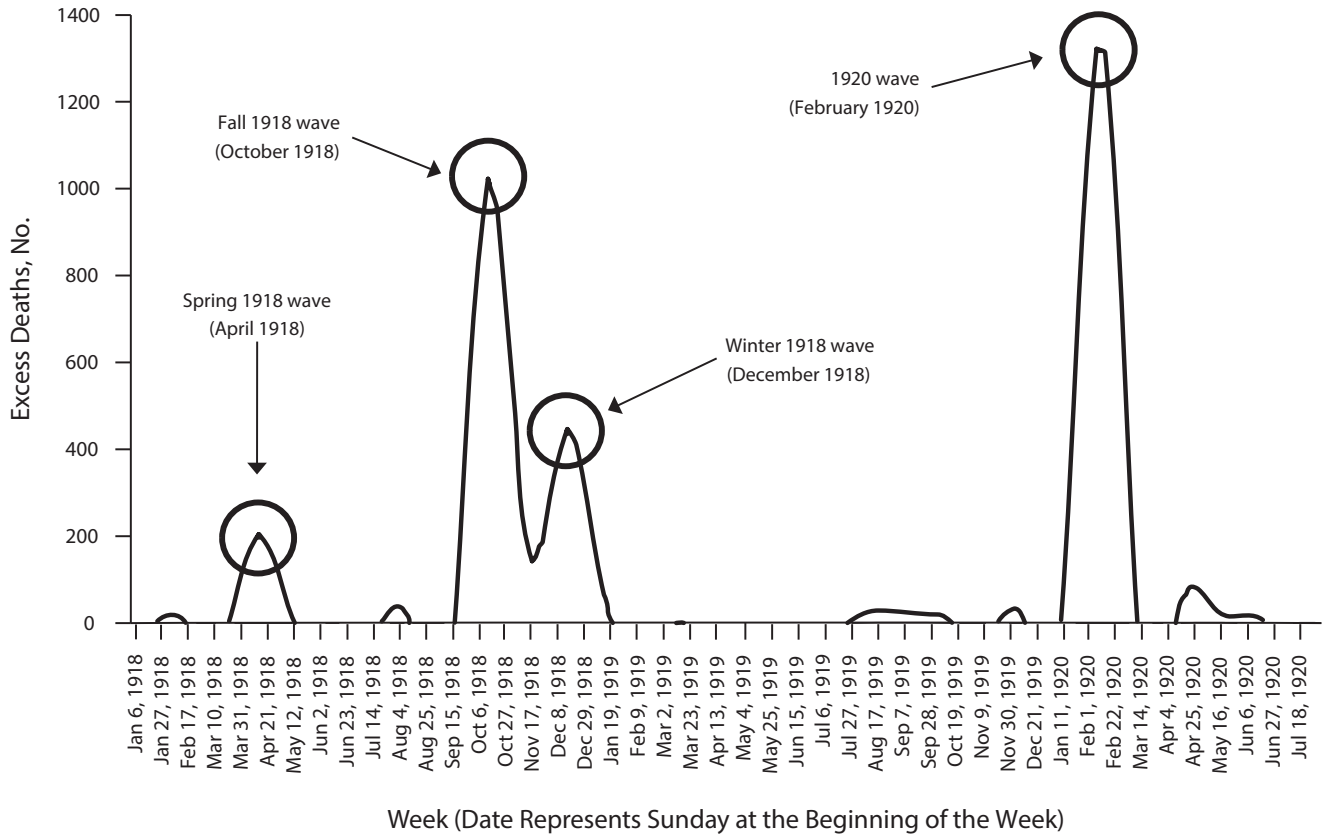


FIGURE 1— The Four Waves of Excess Deaths in Michigan: 1918–1920

of Michigan. Indeed, an approximately even fraction of counties in Michigan experienced each of the two waves of late 1918, suggesting that the bimodal pattern of October and December 1918 for the entire state, seen in Figure 1, is as much the result of aggregation across counties as it is a reflection of the experiences of individual counties. The same observation likely applies to the pattern observed for the entire United States and other countries.

The fourth wave, by contrast, consisted of a single peak, occurring simultaneously across almost all the counties of Michigan during the weeks of February 8 and 15, 1920 (Figures 1 and 3b). For the rest of this article, therefore, we will refer to the two late-1918 peaks as two separate waves: the "Fall 1918" or "second" wave and the "Winter 1918" or "third" wave, respectively. The 1920 wave will be referred to as the "1920" or "fourth" wave.

In terms of duration, the Fall 1918, Winter 1918, and 1920 waves each spanned eight to nine weeks (Figures 1, 3a, and 3b). The 1920 wave shows a particularly marked concentration in the four weeks of February 1920, with excess death totals of 1322 and 1314 in the first two weeks alone. The highest excess deaths in any of the three earlier waves, in the second week of October 1918, totaled 1023.

Figures 4a and 4b show weekly spatial snapshots of excess deaths across the counties of Michigan during the weeks in the Fall and Winter 1918 waves when the largest numbers of counties were peaking. Figure 4c is a snapshot of the same phenomenon during the 1920 wave. The shades of gray represent the status of the epidemic during the week in question in each county, with dark gray signifying the peak week for the county, the next darkest gray signifying the week with the second-highest number of excess deaths, and lighter shades of gray signifying the third- and fourth-highest weeks, respectively.

The Fall 1918 wave (Figure 4a) was more pronounced than the Winter 1918 wave (Figure 4b) in two regions of Michigan. The first region consisted of the counties in the main population centers of southern Michigan along the Detroit, Michigan, to Chicago, Illinois, transportation routes. These included the population centers of Detroit, Ann Arbor, and Jackson, Michigan. The second region consisted of the counties straddling two major shipping routes

FIRST WAVE SPRING 1918

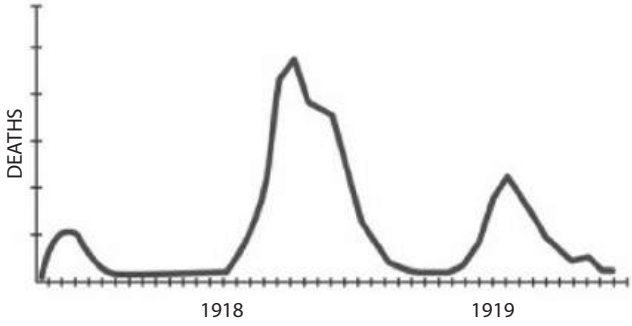
The first outbreak of flu-like illnesses was detected in the US in March. with more than 100 cases reported at Camp Funston in Fort Riley, Kansas.

During 1918, the US was engaged in WWI. Hundreds and thousands of US soldiers traveled across the Atlantic to deploy for war. The mass troop movement contributed to the global spread of flu.

More people died during the 1918 pandemic than the total number of military and civilian deaths that resulted from WWI.

SECOND WAVE FALL 1918

In 1918, many health professionals served in the US military during WWI, resulting in shortages of medical personnel around the US. The economy suffered as businesses and factories were forced to close because of sickness amongst workers.



There were three different waves of illness during the pandemic, starting in March 1918 and subsiding by summer of 1919. The pandemic peaked in the US during the second wave, in the fall of 1918. This highly fatal second wave was responsible for most of the US deaths attributed to the pandemic.

THIRD WAVE WINTER 1918

The Motor Corps of St. Louis chapter of the American Red Cross on ambulance duty during the influenza epidemic, October 1918.

A third wave of illness occurred during the winter and spring of 1919, adding to the pandemic death toll. The third wave of the pandemic subsided during the summer of 1919.

An estimated one third of the world's population was infected with the 1918 flu virus—resulting in at least 50 million deaths worldwide.

FIGURE 2— A Screenshot From the Centers for Disease Control and Prevention's Web Site Commemorating the Pandemic and Showing the Spring (Herald), Fall, and Winter 1918 "Waves"

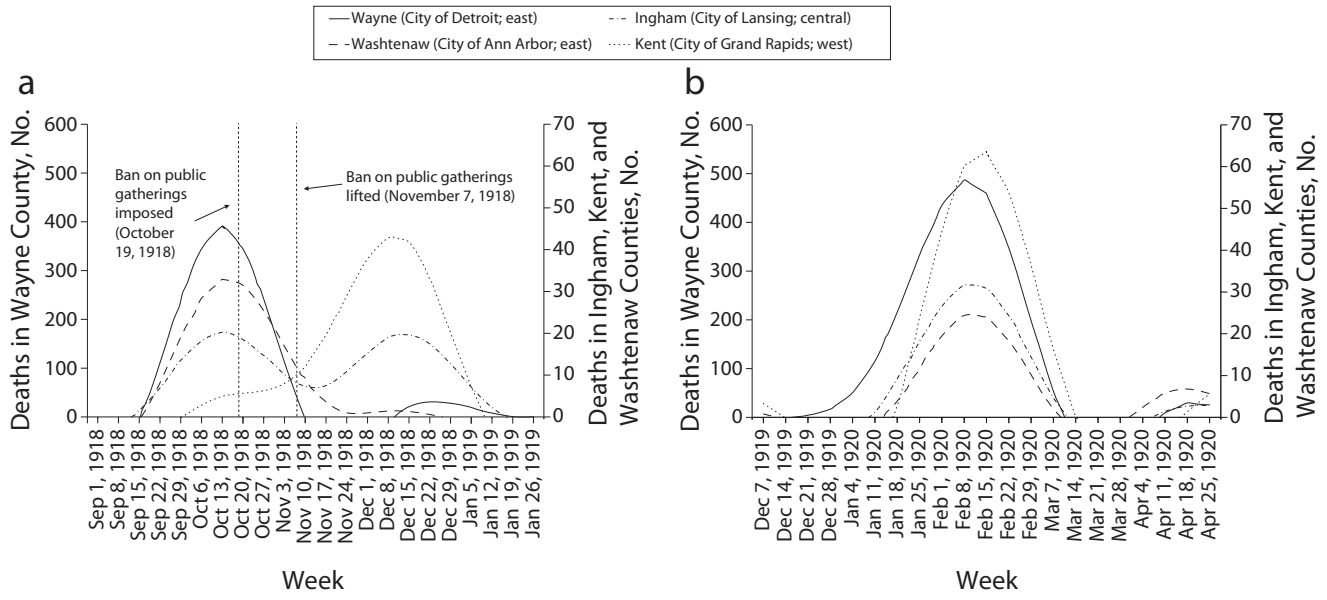


FIGURE 3— Excess Deaths During (a) the Second (Fall 1918) and Third (Winter 1918) Waves and (b) the Fourth (Spring 1920) Wave: Highly Populated Counties in Michigan

connecting the Great Lakes, the Straits of Mackinac between Lake Michigan with Lake Huron, and the St Mary's River connecting Lake Superior with Lake Huron. The Winter 1918 wave was more pronounced than the Fall 1918 wave in the central part of the Lower Peninsula of Michigan and in the central and western parts of the Upper Peninsula.

The 1920 wave (Figure 4c) matched the combined Fall 1918 and Winter 1918 waves in terms of severity (Figure 1). Thirty-nine out of 83 counties (46%) experienced their absolute peak week (i.e., maximum excess deaths across all four waves) during the 1920 wave. The February 1920 volume of the *Michigan Bulletin of Vital Statistics* describes "a most notable increase" in the number of deaths from influenza compared with January of the same year, adding "In fact, there were 312 more deaths from pneumonia during the month than there were in the month of October 1918, the month of greatest mortality during the previous epidemic,"[23(p17)] pneumonia being a common and often fatal complication of influenza.[4]

DISCUSSION

The data show a robust wave of excess mortality in early 1920 in Michigan. It was as severe as the lethal Fall 1918 or Winter 1918 waves and, in its peak week, considerably more severe than either earlier wave. In addition, the 1920 wave was an isolated wave that propagated rapidly across the state and peaked simultaneously across the vast majority of counties in all regions of the state (Figure 4c). The Fall 1918 and Winter 1918 waves, by contrast, were consecutive waves that appeared with differing degrees of severity, singly or in a pair, across the different counties of Michigan, and the preceding Spring 1918 wave was the least pronounced of the four.

The question of whether these four waves were part of a single pandemic unfolding serially or separate epidemics caused by different pathogens remains an open one. Reasons to be cautious in interpreting the four waves as part of a single pandemic include (1) the absence of genetic evidence from Michigan that any of the four waves was caused by the same pathogen that caused any of the other waves, (2) the possibility of immunization effects across different influenza viruses that may have caused different waves,[24] (3) the absence of cross-protection from infection across waves,[25] and (4) the absence of proof that the unusual pattern of age-specific mortality during the late 1918 and early 1920 waves of excess mortality (Figures A and B, available as supplements to the online version of this article at http://www.ajph.org)[4,10] were directly caused by a virus.[26] On the other hand, findings consistent with different combinations of waves being part of a single pandemic include (1) the same unusual pattern of age-specific mortality across the late 1918 and 1920 waves (Figures A and B); (2) research from other locations showing cross-protection between the Spring 1918 and Fall 1918 waves, a

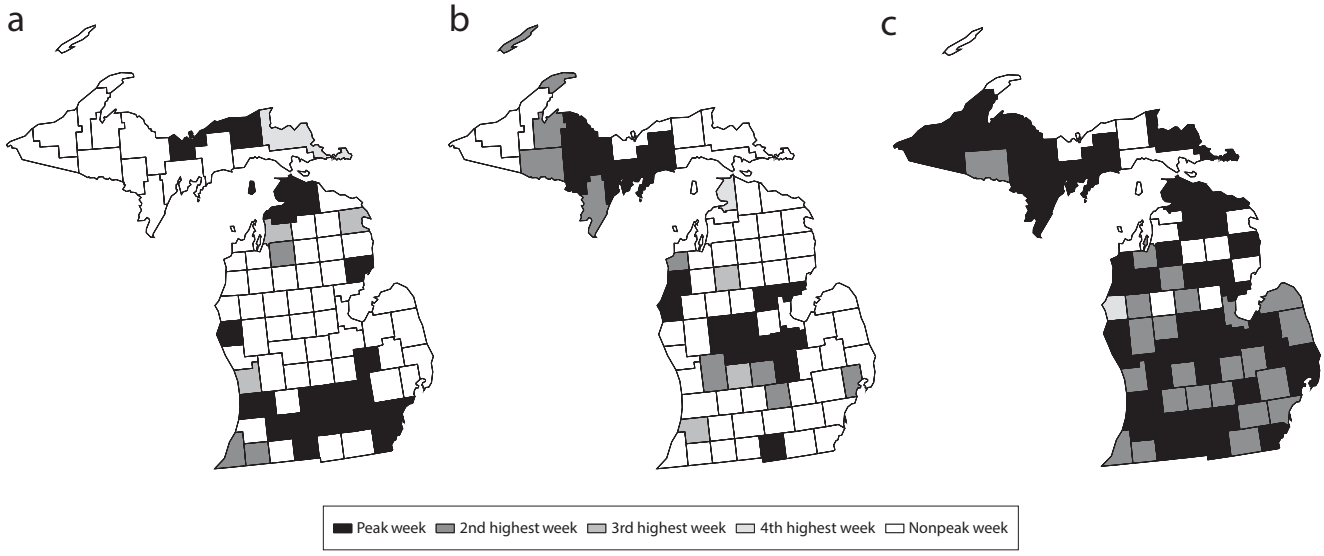


FIGURE 4— Peak Influenza Pandemic Weeks in Michigan Counties on the Weeks of (a) October 13, 1918, (b) December 15, 1918, and (c) February 15, 1920

Notes. Part a shows counties in which the Fall 1918 wave was higher than the Winter 1918 wave with their status the week of October 13, 1918. Part b shows counties in which the Winter 1918 wave was higher than the Fall 1918 wave with their status the week of December 15, 1918. Part c shows the status of the 1920 wave in Michigan counties the week of February 15, 1920. Note the simultaneous statewide peak in 1920 in contrast to the spatially distributed peaks in 1918 (a and b).

possible indicator that the waves were caused by the same pathogen[27]; and (3) the classification of the waves in Michigan in both years as being caused by "influenza" (rather than some other disease). In sum, given the contradictory nature of the literature comparing the different waves of excess mortality, the possibility that the early 1918, late 1918, and 1920 waves were caused by a different pathogen or that different waves were caused by different mutations of the same virus cannot be ruled out.

A number of factors may have played a role in producing the four-wave pattern of excess deaths observed in Michigan. These include

1. Public health responses: Shortly after Governor Sleeper's ban on public gatherings was imposed (October 19, 1918),[18,19] excess deaths declined (Figure 3a). This nonpharmaceutical intervention could also account for the consecutive nature of the Fall and Winter 1918 waves, as was observed in several major US cities[28]—soon after the ban was lifted, cases began to increase again in some counties. Similar phenomena are now being observed in the context of the ongoing COVID-19 pandemic in Michigan and other US states.
2. Weather conditions: Influenza transmission is most efficient at approximately 40 degrees and low relative humidity.[29,30] Weather conditions during the Fall 1918, Winter 1918, and 1920 waves were likely ideal for transmission of an influenza virus, whether or not it was the same one across the three waves. The lack of daily humidity data by county impedes detailed analysis of the connection between weather conditions and transmission. However, the Weather Bureau reported in January 1920 that "unusually cold weather of December continued with increasing severity during most of January,"[31(p3)] and the following month, February 1920, "was not nearly so cold" with temperatures returning to or slightly above the average.[32(p15)] It appears that favorable conditions for the rapid and efficient spread of influenza viruses, not present in January 1920, developed in February, perhaps contributing to the abruptness and severity of the 1920 wave if it was an influenza wave.
3. Short-term demographic changes: Some 8000 young men from the Michigan Guard who were in wartime Europe in 1918 had returned by February 1920. [33] This change in the composition of the population and its increased mobility could have facilitated the more rapid spread of the pathogen that caused the severe excess mortality in 1920.
4. Other behavioral and economic factors: more people spending time

indoors in close proximity during the uncommonly cold winter of 1919 to 1920[31] and Michigan's extensive shipping and rail systems at the time may also have facilitated the spread of the pathogen.[34–37]

The findings presented in the article suggest several opportunities for further research to better understand the sequence of four waves of excess deaths in Michigan and elsewhere in 1918 to 1920. These include

1. factors accounting for the difference in propagation between the Spring 1918, Fall 1918, Winter 1918, and 1920 waves;
2. possible cross-protection effects (or the absence thereof) between the various waves, which could illuminate whether they were caused by the same or a similar pathogen[9,38,39];
3. the roles of transportation networks, climate and weather, nonpharmaceutical interventions, and demographic changes (troops returning from World War I during the summer of 1919) in accounting for the differences in propagation between the various waves;
4. analysis of county-level data from other states for the purposes of comparison and validation of our findings; and
5. genetic analysis of tissue samples taken from victims from the four different waves to identify the pathogen(s) underlying each one.

CONCLUSIONS

A central finding of this article is the emergence of four waves of infection and mortality in 1918 to 1920 in Michigan. In addition to the relatively mild wave in the spring of 1918, counties in Michigan experienced one or two waves of excess mortality in late 1918, depending on their locations and, very likely, on the timing of the governor's statewide ban on public gatherings. A year later, the counties of the state were struck by another almost uniformly devastating wave of infections and mortality.

Michigan's experience holds sobering lessons for those who wish to understand how immunologically naïve populations encounter novel viral pathogens. First, the timing of nonpharmaceutical interventions of the kind being applied to the COVID-19 pandemic today may play a role in the emergence and severity of "trailer" waves of infection and death.[27,40] Second, the second and third waves identified by the CDC in Figure 2 may reflect the combination of three phenomena: (1) a delayed wave, with the early wave dominating in some parts of the United States and the late wave dominating in others; (2) the gradual movement of the same pathogen from its place of introduction to other areas; and (3) the effects of the timing of the adoption and subsequent relaxation of social distancing measures, giving rise to one or two waves depending on the timing of the measures. And third, if the 1920 wave was caused by the same virus that caused one or more of the three 1918 waves, the findings in this article raise the sobering possibility that, even after one or more severe rounds of infection and death have subsided, the pandemic may re-emerge with a vengeance months or years later when conditions—including weather, mobility of people, and the availability of susceptible hosts—are favorable for a resurgence. AJPH

ABOUT THE AUTHORS

Siddharth Chandra is with the Asian Studies Center, James Madison College, and Department of Epidemiology and Biostatistics (by courtesy), Michigan State University, East Lansing, MI. Julia Christensen is with James Madison College, Michigan State University. Madhur Chandra is with the Ingham County Health Department, Lansing, MI, and Department of Epidemiology and Biostatistics, Michigan State University. Nigel Paneth is with the Department of Epidemiology and Biostatistics and Pediatrics, Michigan State University.

CORRESPONDENCE

Correspondence should be sent to Siddharth Chandra, 427 N Shaw Lane, Room 301, Michigan State University, East Lansing, MI 48824 (e-mail: chandr45@msu.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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CONTRIBUTORS

S. Chandra conceptualized and designed the project, collected and analyzed the data, interpreted the results, and co-wrote all sections of the article. J. Christensen assisted in conceptualization and design of the project, collection and analysis of the data, and interpretation of the results, and co-wrote all sections of the article. M. Chandra and N. Paneth interpreted the results, co-wrote the associated sections of the article, and provided input into all other sections of the article.

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CONFLICTS OF INTEREST

None of the authors has any conflicts of interest to report.

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The US Public Health Service House-to-House Canvass Survey of the Morbidity and Mortality of the 1918 Influenza Pandemic

Alfredo Morabia, MD, PhD

See also the COVID-19 & History section, pp. 402–445.

Between November 20, 1918, and March 12, 1919, the US Public Health Service carried out a vast population-based survey to assess the incidence rate and mortality of the influenza pandemic among 146 203 persons in 18 localities across the United States. The survey attempted to retrospectively assess all self-reported or diagnosed cases of influenza since August 1, 1918. It indicated that the cumulative incidence of symptomatic influenza over 6 months had been 29.4% (range = 15% in Louisville, KY, to 53.3% in San Antonio, TX). The overall case fatality rate (CFR) was 1.70%, and it ranged from 0.78% in San Antonio to 3.14% in New London, Connecticut. Localities with high cumulative incidence were not necessarily those with high CFR. Overall, assuming the survey missed asymptomatic cases, between August 1, 1918, and February 21, 1919, maybe more than 50% of the population was infected, and about 1% of the infected died. Eight months into the COVID-19 pandemic, the United States has not yet launched a survey that would provide population-based estimates of incidence and CFRs analogous to those generated by the 1918 US Public Health Service house-to-house canvass survey of influenza. (*Am J Public Health*. 2021;111: 438-445 https://doi.org/10.2105/AJPH.2020.306025)

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The influenza pandemic of 1918 is often used as comparison with that of COVID-19 because it indeed appears to have behaved very similarly, catching the whole world off guard almost simultaneously and killing so many people that it became a milestone in family histories. It is common to read estimates of its quantitative impact, such as "From 25 to 40% of people in affected communities were sick"[1(p2193)] or "case fatality rate was >2.5%,"[2(p15)] but the original sources of this information have rarely, if ever, been provided in publications after 1935.

This article critically reviews the source of the estimate of incidence, mortality, and case fatality for the 1918 influenza pandemic in the United States and discusses the relevance of this information for the 2020 response to the COVID-19 pandemic. This survey by the US Public Health Service (PHS) began in the fall of 1918, was mostly carried out in the fall of 1918, and ended in March 1919 (Figure 1). It involved a canvassing of randomly selected houses, in which 146 203 persons resided. Its unique population-based information provided nationally representative numbers of infections and deaths, and cumulative incidence and case fatality rates (CFRs)—a type of information we are still lacking today for COVID-19 in the United States in October 2020.

As shown in Figure 1, which is a redrawing of the US data shown by Frost[3] in Chart 3 and provided as an Appendix (available as a supplement to the online version of this article at http://www.ajph.org), in the United States, a generalized epidemic of influenza occurred mostly in a single wave, during September, October, and November 1918. There were local epidemics in March and April 1918, which did not have an impact on the overall mortality, but which, in hindsight, were interpreted as a possible first phase. The same is true for a possible third phase lasting from December 1918 to January 1919. The main contextual element was the entry of the United States in the First World War in 1917. The war ended November 11, 1918. The movement of US troops from the United States to

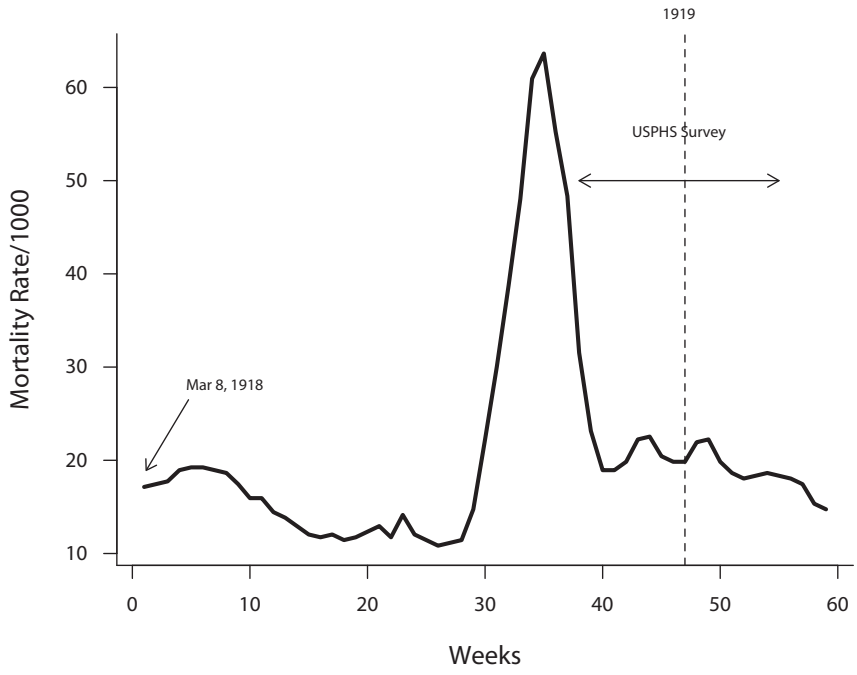

FIGURE 1— Annual Death Rates From All Causes in 45 American Cities, March 2, 1918, to April 5, 1919

Source. Redrawn from Frost.[3]
Note. The segment indicates that the US Public Health Service Survey was conducted between November 20, 1918, and March 12, 1919.

Europe and back seems to have played a major role in the dissemination of the pandemic.[4]

The severity of the pandemic wave that began in August 1918 made the PHS realize the "utter inadequacy and lack of uniformity of morbidity reporting in the United States" and their incompleteness.[5(p2306)] Excess mortality rates from all causes afforded the closest figure of severity of the 1918 influenza compared with previous epidemics.[6,7] The PHS did not routinely collect incidence data. Death certificates were not specific enough to separate influenza deaths from those of other respiratory diseases, such as pneumonia. In April 1918, US Surgeon General Rupert Blue established an Influenza Task Force of the PHS. He named Wade Hampton Frost (1880–1938) head of the task force. Frost was a health officer of the PHS. Eighteen months later, Frost would become the founding chair of the Department of Epidemiology of the newly opened The Johns Hopkins University School of Hygiene and Public Health. The task force also comprised Edgar Sydenstricker (1881–1936), principal statistician at the PHS, who had been previously working with Joseph Goldberger on the South Carolina 1916 pellagra cohort study[8] and who, in 1921, would help launch the Hagerstown, Maryland, survey[9] and the National Health Survey of 1935–1936.[10]

THE HOUSE-TO-HOUSE CANVASS

The surveys and most of the analyses, made under the direction of Frost and Sydenstricker, are described by them in several papers[11–13] but most thoroughly 14 years later by Britten.[14] The surveys were conducted between November 20, 1918 (Baltimore, MD) and March 12, 1919 (Charles County, MD).[14(p305)] The "purpose" was "ascertaining as accurately as possible the proportion of the population affected."[11(p491)]

Data were collected in 18 localities: the first report provided detailed results for Baltimore and 7 smaller towns and districts of Maryland.[11] Further reports provided the results for 10 additional localities in widely separated sections of the United States with populations ranging from 25 000 to 600 000[14]: New London, Connecticut; Spartanburg, South Carolina; Louisville, Kentucky; Little Rock, Arkansas; San Antonio, Texas; San Francisco, California; Des Moines, Iowa; and Macon and Augusta, Georgia. The 18th locality, Charles County, was added in March 1919: its survey was commissioned by the PHS but incorporated into the Census data collection procedures.

This was a multistage survey. In most of the localities, the PHS had previously established organizations prepared to collect data reliably and efficiently.[13(p585–586)] With the exception of the far West (San Francisco was the only city west of San Antonio and Des Moines), the communities represented the different geographical sections of the United States. Areas were selected for the house-to-house canvass in each locality to be situated within a town or city and to have similar population sizes. In each locality, the house-to-house canvass was performed in 10 or more enumeration districts, selected as to give, presumably, "a fair sample of the general population."[13(p585–586)] For the purpose of statistical power, 5000 persons or more were canvassed in each city. In cities of more than 100 000 population, at least 5% of the total population was canvassed.

As shown in Figure 1, soon "after the epidemic appeared to have definitely subsided,"[13(p586)] the survey technicians, referred to as the "enumerators,"

interviewed the housewife or other responsible member of every household of the selected areas. The sociodemographic information comprised name, "color," sex, and age at last birthday of each household member; for the household, the number of rooms occupied and the enumerator's impressions of the economic status of the family, whether well-to-do, moderate, poor, or very poor. The influenza-specific data comprised the date of onset and duration of each case of influenza, "flu" or "grippe," or pneumonia since August 1, 1918, and the date of each death from influenza or pneumonia. These included cases lasting at least three days, with one full day of bed confinement. Persons who had only been "feeling badly," or who had a "cold," were categorized as "doubtful" cases. The total morbidity from influenza during the epidemic period included cases classified as "influenza," "grippe," "pneumonia," and "doubtful." Other causes of illness besides influenza, pneumonia, or colds were not recorded. There was no further validation of the families' statements as to diagnosis, but some of them had been made by an attending physician.

As for the quality of the data, it was noted that "for a small proportion" of cases of influenza, ascertained retrospectively by canvass, the dates of onset may not have been accurately recalled. However, these errors were expected to occur randomly and, therefore, "it was believed that a sufficiently large mass of data would reduce the errors arising from faulty memory on the part of some informants, and the inquiries were sufficiently simple to permit even untrained persons to obtain the data with detailed written instructions and under careful supervision."[11(p492)]

Overall, the investigators "believed that such inquiries, made quite simply and covering a very definite epidemic period, afford a fairly accurate idea of the incidence of the disease among representative groups of persons."[11(p492)]

MEASURES OF DISEASE OCCURRENCE

Frost and Sydenstricker used the following measures of disease occurrence:

1. Total number of persons included in canvas (N)
2. Number of cases of influenza (I)
3. Number of deaths from influenza and pneumonia (all forms; D)
4. Case incidence rate (CIR) per 1000: CIR = (I/N)*1000
5. Death rate (DR) per 1000: DR = (D/N)*1000
6. CFR per 100: CFR = (D/I)*100

They also computed the following ratios (i and j refer to any two groups compared):

1. CIR ratio: $(CIR_i)/CIR_j)*100$
2. DR ratio: $(DR_i)/DR_j)*100$
3. CFR ratio: $(CFR_i)/CFR_j)*100$

Table 1 shows how these measures were used for the preliminary report focusing on the Baltimore survey, in which 46 535 persons were canvassed, of whom 33 776 were in the 32 districts or areas selected in Baltimore City.[11(p493)] Expressed in percentage, the CIR ranged from 23.3% to 59.4%, while the CFRs ranged from 1.1% to 2.5%.

RESULTS OF THE NATIONAL HOUSE-TO-HOUSE SURVEYS

The house-to-house canvassing began in November 20 (Baltimore). Besides San Francisco (February 21, 1919) and Charles County (March 12, 1919), the survey was completed by January 31, 1919. In 1920, Frost reported a total of 130 033 persons, 36 365 cases, and 583 deaths.[13] But, in his apparently more thorough analysis, Britten reported 146 203 persons, 42 920 cases, and 730 deaths.[14]

The full survey results are shown in Table 2: the crude case cumulative incidence was overall 29.4% and varied from 15% in Louisville to 53.3% in San Antonio. The overall CFR was 1.70%, and it varied from 0.78% in San Antonio to 3.14% in New London.

Additional age-specific analyses showed that the incidence was highest among those aged 5 to 9 years, fell off progressively for those aged from 10 to 24 years, rose to a minor second mode among those aged 25 to 29 years, and then declined progressively in successive age groups.[14(p311–312)] There was no marked difference between genders.

The CFR rose to nearly 3% in the group aged 25 to 29 years and fell to less than 1.5% among those aged 45 to 49 years, but in people aged 70 years and older it rose again, reaching 5.1%.[14(Table 28, p332)] The nominal CFR was higher among men than among women, mostly among those aged 20 to 40 years. No statistical tests were performed.

Economic Status and Crowding

The data for the economic status and crowding of the households have been reported for Whites only in New London, Baltimore, Augusta, Macon, Des Moines, Louisville, Little Rock, San Antonio, and San Francisco.[15]

The age-adjusted incidence rates of influenza by economic status were 25.2%, 27.2%, 32.6%, and 36.4%,

TABLE 1— Absolute Incidence, Case Fatality, and Mortality and Respective Ratios in the Maryland Influenza Survey Conducted by the US Public Health Service Influenza Task Force, November 10 to December 11, 1918

					Case Incidence Rate[a]		Death Rate[b]		Case Fatality Rate[c]	
	Total Population	Persons in Canvass	Cases Influenza	Deaths (I+P)	Rate/1000	RR	Rate/1000	RR	Rate/100	RR
All	733 490	46535	13 037	243	280.2	...	5.2	...	1.9	...
Baltimore	680 000	33 776	7868	156	232.9	100[d]	4.6	100	2.0	100[d]
Salisbury	9000	1735	796	9	458.8	197	5.2	113	1.1	57
Frederick	11 340	2420	777	9	321.1	138	3.7	81	1.2	58
Cumberland	27 300	5234	2147	38	410.2	176	7.3	158	1.8	88
Lonaconing	2000	1840	1093	22	594.0	255	12.0	260	2.0	101
3 rural districts[e]	3850	1530	356	9	232.7	100	5.9	128	2.5	126
Men, 20–44 y		7644	2192	78	286.8	100	10.2	100	3.6	100
Women, 20–44 y		9936	3030	51	305.0	106	5.1	50	1.7	47

Note. I = influenza; P = pneumonia; RR = rate ratio.

Source. Frost and Sydenstricker[11]; Britten.[14]

[a] Cases of influenza/persons in canvass.
[b] Deaths from influenza and pneumonia/persons in canvass.
[c] Deaths from influenza and pneumonia/cases of influenza.
[d] Baltimore is the reference.
[e] Rural district (canvassed/total population): Quantico (114/2000), Linganore (688/1000), Downsville (718/850).

respectively, for well-to-do, moderate, poor, and very poor. "The ratio of the rate for the 'very poor' to that for the 'well-to-do' [was] 1.3 to 1.0 for the nine localities as a group."[15(p159)] The differences were consistent across ages. The age-adjusted CFRs were, respectively, 1.5%, 1.5%, 1.7%, and 2.8%—that is, "nearly twice as great among the 'very poor' as among the 'well-to-do.'"[15(p160)] The mortality rates per 1000—adjusted for age using the 1910 Census as standard—were, respectively, 3.8, 3.8, 5.2, and 10.0.[15(p159)]

For crowding, the age-adjusted incidence rates of influenza were 26.5%, 32.8%, and 40.5%, respectively, for "1 or less," "more than 1 but not over 2," and "more than 2" persons per room, respectively.[15(p164)] Sydenstricker noted "a quite definite association of household congestion and influenza," which "might be nothing more than a reflection of economic status."[15(p164)]

"Colored"–White Differences

The observed differences between Whites and the "colored" population comprised in the canvass were difficult to interpret. Numbers were available for Louisville, Baltimore, Augusta, Macon, Spartanburg, Maryland minor towns, Little Rock, and Charles County, for a total of 79 712 Whites and 21 312 "colored" persons, among whom 23 322 and 6000 cases occurred, respectively.[14] In Charles County, in which "colored" represented about 50% of the population, incidence rate was 14% greater among the "colored," but the CFR was not reported. However, in the seven other localities, the incidence rates among the "colored" were uniformly lower than among the White population, on average by 33%, the differences persisting after adjustment for sex and age.[14(p318)] Also, excluding Charles County, the CFR of influenza was 1.7% in Whites and 1.9% in the "colored" population, but the pneumonia CFRs in the White and "colored" populations were 28.8% and 39.8%, respectively. Britten concluded that "we are probably warranted in concluding that the case fatality was really higher in the colored populations of the surveyed communities."[14(p336)]

CONCLUSIONS

In 1918, when the PHS was given the leadership to conduct the response to the terrible pandemic, there was a

TABLE 2— Absolute and Adjusted Incidence, Mortality, and Case Fatality of the National Influenza Survey Conducted by the US Public Health Service Influenza Task Force, November 20, 1918, to March 12, 1919, Ordered by Case Incidence Rates

			Influenza Cases			Deaths		
	Total Population	Persons in Canvass	No.	Rate/100 (Crude)[a]	Rate/100 (Adjusted)[b]	No. (I+P)	Rate/1000[c]	CFR[d]
All	1 954 496	146 203	42 920	29.4	30.0	730	[4.3][e]	1.70
San Antonio, TX	150 000	12 534	6701	53.5	52.2	52	4.2	0.78
Maryland minor towns	51 170	12 482	5060	40.5	41.7	84	6.4	1.66
Charles County, MD[f]	18 326	16 147	6546	40.5	40.5	147	9.1	2.25
Little Rock, AR	65 000	9920	3565	35.9	35.4	39	3.9	1.09
Augusta, GA	55 000	4123	1405	34.1	35.9	18	4.4	1.28
Baltimore, MD	680 000	33 361	8199	24.6	25.8	172	5.2	2.10
Des Moines, IA	115 000	5857	1353	23.1	23.3	22	3.8	1.63
San Francisco, CA	475 000	18 682	4021	21.5	21.2	90	4.8	2.24
Spartanburg, SC	25 000	5257	1126	21.4	21.8	10	1.9	0.89
Macon, GA	50 000	7905	1681	21.3	21.2	25	3.2	1.49
New London, CT	25 000	7933	1466	18.5	18.8	46	5.8	3.14
Louisville, KY[g]	245 000	12 002	1797	15.0	16.5	25	2.1	1.39

Note. CFR = case fatality rate; I = influenza; P = pneumonia.

Source. Britten.[14]

[a] Cases of influenza/persons in canvass.
[b] Age–sex standardized. The standard population used is the total population of the continental United States, males and females, by five-year age periods, as per census enumeration of 1910.
[c] Deaths from influenza and pneumonia/persons in canvass.
[d] Deaths from influenza and pneumonia/cases of influenza.
[e] Median computed by A. M.
[f] Universal survey incorporated to the 1919 Census data collection.
[g] Canvass concluded before epidemic had run its full course.

concern about obtaining representative population data. The PHS launched a considerable house-to-house survey collecting information on more than 146 000 persons. The PHS survey was the largest, but similar population-based designs had been used in Oswego, New York (n = 12 952); Watertown, New York (n = 20 473); Millville, New Jersey (n = 11 686); Gloucester, New Jersey (n = 11 969); Bridgeton, New Jersey (n = 13 319); New Britain, Connecticut (n = 2757)[14]; and Boston, Massachusetts (n = 10 000). Also, immediately after the 1928–1929 influenza epidemic, the PHS made surveys in 10 cities in the United States similar to surveys made in 1918 to 1919, including house-to-house canvassing.[16(p124)]

The trait of the PHS survey that stands out is the swift attempt to obtain representative data for the US population using state-of-the-art survey methods. The main national wave of the pandemic began in August 1918. Three months later—as soon as possible "after the epidemic appeared to have definitely subsided,"[13(p586)]—the PHS survey was fielded. More than 140 000 people in 16 localities were surveyed in two months (November 20, 1918, to January 31, 1919).

Whether the samples were representative of the localities surveyed has not been shown. It would be possible to compare the age–sex–"color" distributions in the survey data with those of the 1919 Census, but the First World War had depleted the young male population in many areas, making these assessments speculative.

Limitations

The PHS survey had several limitations. The absence of biological tests precluded the identification of asymptomatic, incubating, and subsymptomatic cases resulting in an underestimated cumulative incidence.

The lack of specific diagnosis may also have been a source of misclassification.

TABLE 3— Data and Statistics Reported on Centers for Disease Control and Prevention Web Sites Providing Insights Into the Incidence, Mortality and Overall Death Impact of the COVID-19 Pandemic, as of October 2020

Survey	Location	Population Base	Reports	Limitations
COVID-19–Associated Hospitalization Surveillance Network (COVID-NET) is a population-based surveillance system that collects data on laboratory-confirmed COVID-19–associated hospitalizations among children and adults through a network of more than 250 acute care hospitals in 14 states: https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covid-net/purpose-methods.html	70 counties in 14 states: CA, CO, CT, GA, IA, MD, MI, MN, NM, NY, OH, OR, TN, UT	29 million persons	Laboratory-confirmed hospitalized case rates. By age groups and sites. Denominator: entire number of people residing in that area. Updated weekly.	No information on asymptomatic or nonhospitalized cases
Commercial Laboratory Seroprevalence Survey: https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/commercial-lab-surveys.html	Commercial laboratories in 10 sites: CT; LA; MN; MO; New York City; Philadelphia, PA; San Francisco, CA; southern FL; UT; western WA		People who had blood specimens tested for reasons unrelated to COVID-19. Aim: about 1800 samples collected from each of these 10 areas, approximately every 3–4 wk. Percentage of people tested already have antibodies against SARS-CoV-2, and how that percentage changes over time in each area. https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/commercial-labs-interactive-serology-dashboard.html.	No denominator; still preliminary.
Mortality: https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/us-cases-deaths.html https://www.cdc.gov/nchs/nvss/vsrr/COVID19/index.htm	US	US	Number of deaths and infection fatality ratio for each of the communities under serosurveillance and the United States: https://www.cdc.gov/coronavirus/2019-ncov/hcp/planning-scenarios.html.	No denominator
Provisional death counts for COVID-19; excess deaths associated with COVID-19: https://www.cdc.gov/nchs/nvss/vsrr/COVID19/index.htm https://www.cdc.gov/nchs/nvss/vsrr/covid19/excess_deaths.htm#dashboard	US	US	Excess deaths (difference between the observed numbers of deaths in specific time periods and expected numbers of deaths in the same time periods). By race/ethnicity. By cause of death.	Reporting lags and underreporting

The PHS survey relied on self-report of physician diagnosis of influenza. However, data from the 1918–1920 pandemic in Bergen, Norway, indicate that medical visits were more systematic in severe waves than in milder waves[17] suggesting that the fall 1918 PHS survey may have ascertained most severe cases. Collins also noted that "the number of doubtful cases reported was so small that it appears that only the more severe colds were remembered by the informants."[16(p124)]

It is also unclear if the large differences in morbidity and mortality from place to place (see Table 2) are real or reflect the differences in timing of the survey resulting in localities being at different stages of the epidemic curve. In other parts of the world, such as in Bergen,[17] there was a summer wave and a winter wave, preceding and following the fall wave. If this were the case in the United States, the PHS captured part of these waves as it ascertained events from August 1, 1918, to March 12, 1919, but it captured them differentially across localities and may have failed to capture the full magnitude of the pandemic overall.

Herd Immunity and Fatality

The final analyses of the PHS survey indicate that the cumulative incidence rate for all localities was 29.4% over the 6-month period. In other words, one out of every three or four persons in the canvassed populations reported that they had some symptoms compatible with influenza during the autumn wave of the epidemic and the recurrence. The highest rate was in San Antonio, where one out of every two persons reported having the disease. Influenza killed 1.8% of the cases.

As already mentioned, the cumulative incidence was also underestimated because the assessment excluded asymptomatic cases, incubating cases, and subsymptomatic cases. A Spanish SARS-CoV-2 seroprevalence survey in 2020 found that about one third of seropositive individuals are asymptomatic.[18] Extrapolating this asymptomatic proportion to the estimated 1918 CIR, the average increases to about 40%, and varies between about 20% in Louisville and 70% in San Antonio. For the same reason, the CFR was overestimated by the house-to-house canvass, and must have been closer to 1.1% in average, varying from 0.6% in San Antonio to 2.4% in New London.

The case of Charles County is special. Because the influenza survey was coupled with the 1919 Census, the whole resident population was counted. The CIR was 40% (53% after correction for the asymptomatic cases), and the CFR was 2.3% (1.7% after correction for the asymptomatic cases). These figures were higher than the average.

Overall, we can conclude that the brunt of 1918 influenza in the United States lasted 6 months, from September 1918 to March 1919, but that a substantial proportion, maybe more than 50%, of the population was infected, and that about 1% of the infected died.

Social Determinants of Health

The 1918 canvas included questions about economic status, crowding, and "color." These were, of course, confounded markers but, as expected, they showed that incidence and mortality was higher among the poor. In many areas, Whites had greater rates of infection but died less than the people of color. This question has been extensively explored and discussed.[19] However, in Charles County, where enumeration was exhaustive for both Whites and people of color as part of the 1919 Census, both incidence and mortality were greater among the "colored" population. Therefore, selection and ascertainment biases, including access to medical diagnosis, must have been at work in the localities in which "colored" people had an apparent lower morbidity.

1918 VERSUS 2020

The pandemical context of the 1918 PHS survey is very different than that of the COVID-19 pandemic in 2020. Throughout the whole 1918–1919 pandemic, the nature of the micro-organism causing the influenza syndrome had not been identified.[20] The PHS knew it was an infectious agent, but it had not been demonstrated yet that it was a virus and the extent of the syndrome it could cause.[3(p158)] Attempts were made to develop killed whole cell bacterial vaccines, which would not have prevented influenza. Influenza viruses would not be isolated and identified until the 1930s, and the first commercial influenza vaccines were not licensed in the United States until the 1940s.[21] Nonpharmaceutical interventions were used in most US cities. They included social distancing measures (e.g., closure of schools, theaters, and churches; the banning of mass gatherings), mandated mask wearing, case isolation, making influenza a notifiable disease, and public disinfection and hygiene measures.[22] But the efficacy of preventive measures had not been proved.[3(p158)]

Today we know that COVID-19 is a respiratory virus, transmission of which can be slowed down by personal protection and social distancing. But current systems for surveillance are not where they should be. We are more than 8 months into the COVID-19 pandemic and nothing analogous to the 1918 PHS survey is available in the United States. The Centers for Disease Control and Prevention has done an impressive job at drawing all possible advantages from routinely collected data in private and public institutions of the United States. These resources are tabulated in Table 3. They allow for a quick representation of the state of the routinely collected data in the United States, with nimble graphical visualization. However, despite good intentions and expertise, we still are missing what was the core of the 1918 survey (i.e., data to assess population-based incidence and CFRs, and to compare them across time, people, and places). A modern surveillance system, using real-time collection, analysis, and visualization of population-based estimates of infection, hospitalization, and fatality, is warranted, but survey data, such as those collected by the 1918 PHS survey, remain indispensable to estimate reliable population-based morbidity and

fatality rates. Surely, we can do better throughout this COVID-19 response than was done knocking on doors in 1918. AJPH

ABOUT THE AUTHOR

Alfredo Morabia is the Editor-in-Chief of *AJPH*. He is with the Barry Commoner Center for Health and the Environment, Queens College, City University of New York, Flushing, NY, and the Department of Epidemiology, Mailman School of Public Health, Columbia University, New York, NY.

CORRESPONDENCE

Correspondence should be sent to Alfredo Morabia, MD, PhD, Barry Commoner Center, Queens College, City University of NY, Remsen Hall, Room 311, 65-30, Kissena Blvd, Flushing, NY 11365 (e-mail: amorabia@qc.cuny.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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CONFLICTS OF INTEREST

I have no conflict of interest with the contents of this article.

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Intercategorical and Intracategorical Experiences of Discrimination and HIV Prevalence Among Transgender Women in San Francisco, CA: A Quantitative Intersectionality Analysis

Paul Wesson, PhD, Eric Vittinghoff, PhD, Caitlin Turner, MPH, Sean Arayasirikul, PhD, Willi McFarland, MD, PhD, MPH, and Erin Wilson, DrPH

See also Biello and Hughto, p. 344.

Objectives. To examine differences in HIV prevalence and experiences of discrimination within the trans women community in California's San Francisco Bay Area.

Methods. Intersectional positions were constructed on the basis of race/ethnicity (non-Hispanic White, non-Hispanic Black, Latina) and gender identity (female identifying, transgender identifying). We used baseline data from the Trans*National study (2016–2017) to construct regression models that estimated racial/ethnic differences in the attribution of discrimination experienced and, along with surrogate measures for intersectionality, estimated risk among those who were dually marginalized (racial/ethnic minority and transgender identifying). Margins plots were used to visually compare absolute risk across all intersectional positions.

Results. Black and Latina trans women were more likely to be HIV positive than non-Hispanic White trans women. In several of the study domains, we estimated a lower risk of reporting discrimination among dually marginalized trans women than among White female-identifying trans women.

Conclusions. Quantitative intersectionality methods highlight the diversity of experiences within the trans women community and reveal potential measurement challenges. Despite facing multiple forms of systemic marginalization, racial/ethnic minority trans women report less discrimination than White trans women. Subjective reporting of discrimination likely undercounts risks among racial/ethnic minorities. (*Am J Public Health*. 2021;111:446–456. https://doi.org/10.2105/AJPH.2020.306055)

Trans women are a stigmatized group because of their gender identity, and they frequently experience disproportionately poor outcomes with respect to economic security and physical and mental health.[1] Trans women are individuals who were assigned male sex at birth and currently identify as women, trans women, or another gender not typically associated with someone who was assigned male sex at birth. Recent studies show a higher likelihood of unmet basic needs (e.g., stable housing) among trans women.[2] Trans women are also targets of transphobic discrimination, which has been linked to structural barriers that result in economic insecurity, limited access to health care, psychological distress, and violence.[2] Trans women experience a number of health disparities and are disproportionately affected by HIV infection worldwide.[3]

In San Francisco, California, trans women are burdened with a higher prevalence of HIV infection than any other population.[4,5] Trans women in San Francisco have a high mean population viral load, suggesting that, in addition to

acquiring HIV at higher rates, they are not receiving optimal medical care.[5]

Despite the general health and economic vulnerability of this population, trans women are not a monolith, and it is a disservice to examine their health burdens without also considering their diversity. Whereas trans women in San Francisco have a high prevalence of HIV overall, Black women and Latinas have the highest HIV prevalence among trans women,[4] respectively accounting for 25% and 27% of the prevalence in this population.[6] Moreover, a recent longitudinal study revealed higher rates of HIV acquisition among racial/ethnic minority trans women.[7] In addition, although trans women do not identify with the male sex they were assigned at birth, there is wide diversity in their gender identities.[6] Gender identity may also be linked to health and economic outcomes. For example, trans women in San Francisco who identify as female are less likely to be HIV positive than those who identify as transgender female.[8]

Stratified analyses by race/ethnicity or gender identity reveal some disparities but assume homogeneity within these broad categories. Important differences may emerge from the intersection of these demographic categories. Intersectionality provides a framework to examine such differences. Intersectionality examines how interlocking axes of power and privilege on the macro societal level (e.g., racism, sexism, classism) manifest as unique differences in experience for people occupying those intersectional positions on the micro level (e.g., Black trans women, low-income White women).[9–12] The experience of people at different intersectional positions is not simply the sum of the risk from their composite identities (i.e., the risk along the racial axis combined with the risk along the gender identity axis); rather, it reflects how these axes of identity and marginalization interact to produce unique outcomes.

This is analogous to statistical interaction, in which the risk among the dually exposed group is greater than (synergistic) or less than (antagonistic) what one would expect from summing the risk from each individual exposure. In contrast with intersectional additivity (in which the risk in the dually exposed group is equivalent to the expectation from simply summing the risk from each individual exposure), this is referred to as intersectional multiplicativity.

Few studies of trans women have examined their health burden through an intersectional lens. Several studies involving intersectional framing have explored how intersectional discrimination (feeling discriminated against because of both one's racial and gender identities) is associated with experiencing housing discrimination, posttraumatic stress disorder, suicidal ideation, depression, and unequal access to education and employment.[2,13] These health and financial outcomes may in turn increase one's propensity for engaging in sex work, which increases one's risk for HIV infection.[13] These studies have not, however, investigated disparities associated with specific intersectional positions within the trans women community. Highlighting disparities among specific intersectional positions clarifies who are the vulnerable among the vulnerable and informs where targeted strategies are needed to improve health outcomes.

In this study, we applied multiple quantitative intersectionality methods to identify and quantify disparities arising from intersectional positions within the San Francisco trans women community. Analyses incorporating HIV surveillance data indicate that trans women who identify as transgender are at significantly higher risk for HIV than those who identify as female.[8] We hypothesized that trans women who are dually marginalized—that is, those who are members of racial/ethnic minority groups and who identify as transgender (rather than female)—would have worse outcomes than those in other intersectional positions (known as the double/multiple jeopardy hypothesis[14]). In addition, we hypothesized that the prevalence of outcomes among the dually marginalized would demonstrate intersectional multiplicativity. There is currently no consensus on how best to study intersectionality quantitatively.[15,16] We therefore employed multiple methods put forward in the literature to showcase their similarities and differences.

METHODS

We used data from the Trans*National Study baseline visit,[8] in which HIV prevalence was measured along with sociodemographic correlates of infection. Respondent-driven sampling, a peer-referral sampling strategy, was used to recruit 629 participants in the San Francisco Bay Area.[17] Participants were eligible for the study if they were assigned male sex at birth and identified as a gender other than male, were at least 18 years of age, and resided in the San Francisco Bay Area. Data collection for the baseline assessment took place in 2016 and 2017.

Measures

Gender identity was assessed via self-report. Participants were asked "What is your gender identity?" Their response was categorized as one of the following: "male," "female," "transgender female or

transwoman," "androgynous/ambigender," "genderqueer/genderfluid," "questioning," or "additional sex or gender." We restricted our analysis to participants who indicated that their gender was either female (47.2% of the sample) or transgender female or transwoman (49.3% of the sample). Racial/ethnic identity was also assessed via self-report. Participants could indicate more than one race/ethnicity. We restricted this analysis to participants who indicated their race/ethnicity as non-Hispanic White (29% of the sample), non-Hispanic Black/African American (17% of the sample), or Latino/a (32.5% of the sample). The restrictions on gender identity and race/ethnicity yielded an analytic sample of 456 participants.

We used a modified version of the Experiences of Discrimination (EOD) instrument to assess discriminatory experiences in 10 domains (see the Appendix, available as a supplement to the online version of this article at http://www.ajph.org).[18,19] Participants were asked "Have you ever experienced discrimination, been prevented from doing something, or been hassled or made to feel inferior because of your gender identity or presentation, or race, ethnicity or color?" Participants were asked similar questions regarding verbal and physical abuse. Each of the EOD domain outcomes were dichotomized. Participants who responded "yes" to experiencing discrimination were then asked whether they believed that discrimination was related to (1) their gender identity or presentation; (2) their race, ethnicity, or color; or (3) both their gender identity and their race/ethnicity. Because it was a primary outcome in the Trans*National Study, we also included laboratory-confirmed HIV status as an outcome in our analysis.

Statistical Analysis

We constructed the following intersectional positions based on self-reported race/ethnicity and gender identity: non-Hispanic White female identifying, non-Hispanic White transgender identifying, non-Hispanic Black female identifying, non-Hispanic Black transgender identifying, Latina female identifying, and Latina transgender identifying. We conducted χ^2 analyses to assess differences between the intersectional positions and demographic variables. Multinomial logistic regression models analyzed racial/ethnic differences in the attributions of discrimination reported in the EOD domains. These models included the following 4 outcome levels: (1) no experience of discrimination reported; (2) discrimination attributed to gender identity or presentation; (3) discrimination attributed to race, ethnicity, or color; and (4) discrimination attributed to both gender identity and race/ethnicity.

We used several statistical methods to quantify differences in HIV prevalence and discrimination by intersectional position. Multivariable log-binomial regression models, followed by Stata's *lincom* command, estimated the risk difference (RD) between the dually marginalized group (racial/ethnic minority and transgender identifying) and the White female-identifying referent group. We chose White female-identifying participants as the referent group so that our statistical parameters directly quantified risk in the hypothesized dually marginalized intersectional position. If the log-binomial model did not converge, a logistic model was used instead.

We estimated risk differences to calculate interaction on the additive scale. Statistical interaction on the additive scale (not to be confused with intersectional additivity) is consistent with the intersectionality framework because measures on the additive scale directly translate to excess cases of an outcome (that are either caused or prevented) as a result of an exposure or a combination of exposures.[16,20] With respect to intersectionality, additive measures translate to excess cases attributed to the synergistic combination of marginalized identities that otherwise would not occur if only one of these exposures were present. Measures on the multiplicative scale do not have this interpretation and can misidentify groups with the greatest health burden because multiplicative measures are dependent on the baseline risk of the outcome in different subgroups.[20] All models included age, educational attainment, employment status, and history of incarceration as potential confounders.

In addition, we estimated 4 surrogate measures for intersectionality (Table B, available as a supplement to the online version of this article at http://www.ajph.org). Surrogate measures translate regression parameters on the multiplicative scale to intersectionality quantities.[16,21,22] The Synergy Index is the excess risk in the dually marginalized group when there is interaction between exposures relative to the excess risk from either exposure when there is no interaction. The ratio of observed versus expected joint effects on the relative scale (RJE) compares the observed outcome in the dually marginalized group with the counterfactual outcome if there was no interaction effect between exposures. The attributable proportion estimates the proportion of the outcome in the dually marginalized group that is attributed to the intersection or interaction of the exposures. The relative excess risk due

to the interaction (RERI) is the excess risk due to the interaction relative to the risk in the referent group (i.e., the risk in each single exposed group).

For each outcome in which either the risk difference or the surrogate measures for the dually marginalized group were statistically significant, we used Stata's *margins* function to estimate and plot the predicted probability (or prevalence) of the outcome for each intersectional position. We used Stata 16 in conducting all of our analyses.[23] The delta method was used to estimate 95% confidence intervals (CIs) for the surrogate measures.

RESULTS

The mean age of participants was 41 years (range = 18–75 years). The highest educational attainment among a plurality of participants was high school or the equivalent (49.7%). All participants reported annual incomes at or below the poverty line ($28 500; Table 1). The majority of participants (61.4%) reported a history of incarceration (Table 1). There were significant differences across all intersectional positions with respect to education, housing status, history of incarceration, and health insurance (Table 1). Nearly one third of participants were HIV positive, with the highest proportion among Black participants.

Results from the multinomial logistic regression analysis indicated that, in nearly all discrimination domains, Black and Latina participants were significantly more likely than White participants to attribute their experiences of discrimination to their intersectional identity (Table 2). White participants were more likely to attribute their experiences of discrimination to their gender identity than either Black or Latina participants (Table 2).

Results were less consistent in comparisons of Black and Latina participants. Relative to Black participants, Latina participants were more likely to attribute discrimination to their gender identity in the domains of school, work, street or public settings, being served at a store or restaurant, and experiencing physical abuse. Latinas were less likely (relative to Black participants) to attribute discrimination experienced while staying in a shelter, single-room occupancy, or residential treatment facility to their gender identity. In addition, Latinas were more likely to attribute discrimination experienced at school, at work, and on the street or in public settings, as well as discrimination when experiencing physical abuse, to their intersectional identity.

Multivariable regression analyses indicated several outcomes in which dually marginalized intersectional positions were significantly different from the White female-identifying reference group. Non-Hispanic Black transgender-identifying participants had a 52% increased risk of testing HIV positive (RD = 0.52; 95% CI = 0.37, 0.67) relative to White female-identifying participants (Table 3). However, in comparison with the reference group, non-Hispanic Black transgender-identifying participants had an 81% decreased risk of reporting feeling discriminated against when receiving medical care (RD = −0.19; 95% CI = −0.32, −0.06), an 82% decreased risk of reporting verbal abuse (RD = −0.18; 95% CI = −0.32, −0.04), and an 83% decreased risk of reporting physical abuse (RD = −0.17; 95% CI = −0.34, −0.01; Table 3). Relative to White female-identifying participants, Latina trans gender-identifying participants had a 24% increased risk of testing HIV positive (RD = 0.24; 95% CI = 0.14, 0.34) (Table 3).

Surrogate measures provided evidence for intersectional multiplicativity in several domains (Table 3). Black transgender-identifying participants exhibited synergistic interaction when reporting discrimination at work (AP = 0.95; 95% CI = 0.23, 1.68; RERI = 0.86; 95% CI = 0.19, 1.53). We observed antagonistic interaction among Black transgender-identifying participants for reports of discrimination when receiving medical care (RJE = 0.39; 95% CI = 0.04, 0.74), discrimination on the street and in public settings (RJE = 0.35; 95% CI = −0.19, 0.88), and reports of verbal abuse (RJE = 0.11; 95% CI = −0.08, 0.29). Among Latina transgender-identifying participants, we observed antagonistic interaction for reports of verbal abuse (RJE = 0.17; 95% CI = −0.12, 0.46). Synergy Index estimates were inconsistent with the remaining 3 surrogate measures (suggesting interaction in the opposite direction) because one or both "exposures" were statistically preventative in bivariate analyses.[20] Therefore, these estimates are not reported here.

Figure 1 provides a visualization (for each intersectional position) of the absolute risk of testing HIV positive or reporting discriminatory experiences in 6 domains. These margins plots indicate that the risk of reporting any verbal abuse or physical abuse is largely ubiquitous across intersectional positions. The plots also highlight that Black participants overall (not only those who are dually marginalized) are at elevated risk for testing HIV positive.

DISCUSSION

We investigated disparities in health and social outcomes among trans women in San Francisco through the lens of intersectionality. Our findings showed

TABLE 1— χ^2 Analysis of the Distribution of Sociodemographic Variables by Intersectional Position: Trans*National Study; San Francisco Bay Area, CA; 2016–2017 (n = 456)

		Intersectional Position, No. (%)						
Variable	Full Sample, No. (%)	Non-Hispanic White Female (n = 111)	Non-Hispanic White Transgender Female (n = 54)	Non-Hispanic Black Female (n = 34)	Non-Hispanic Black Transgender Female (n = 70)	Latina Female (n = 78)	Latina Transgender Female (n = 109)	χ^2 (*P*)
HIV status								103.99 (< .005)
Negative	309 (67.9)	103 (33.3)	46 (14.9)	12 (3.9)	21 (6.8)	58 (18.8)	69 (22.3)	
Positive	146 (32.1)	< 10 (< 6.8)	< 10 (< 6.8)	22 (15.1)	49 (33.6)	20 (13.7)	39 (26.7)	
Age, y								5.25 (.39)
18–24	46 (10.1)	10 (21.7)	< 10 (< 21.7)	< 10 (< 21.7)	< 10 (< 21.7)	10 (21.7)	11 (23.9)	
≥ 25	410 (89.9)	101 (24.6)	48 (11.7)	34 (8.3)	61 (14.9)	68 (16.6)	98 (23.9)	
Education								80.74 (< .005)
High school/equivalent or less	246 (49.7)	39 (16.6)	13 (5.5)	16 (6.8)	50 (21.3)	44 (18.7)	73 (31.1)	
Some college/technical degree	161 (32.5)	35 (24.1)	22 (15.2)	17 (11.7)	19 (13.1)	25 (17.2)	27 (18.6)	
College or higher	88 (17.8)	37 (48.7)	19 (25.0)	< 10 (< 11.4)	< 10 (< 11.4)	< 10 (< 11.4)	< 10 (< 11.4)	
Income status								...[a]
At or below poverty level	451 (100.0)	110 (24.4)	54 (12.0)	34 (7.5)	68 (15.1)	77 (17.1)	108 (24.0)	
Currently employed	185 (37.7)	45 (27.1)	20 (12.1)	10 (6.0)	17 (10.2)	30 (18.1)	44 (26.5)	7.23 (.20)
Housing status								28.47 (.002)
Rent/own	235 (52.0)	57 (26.6)	34 (15.9)	16 (7.5)	25 (11.7)	39 (18.2)	43 (20.1)	
Transitional housing	131 (29.0)	30 (24.2)	< 10 (< 7.6)	< 10 (< 7.6)	17 (13.7)	25 (20.2)	36 (29.0)	
Homeless/shelter	86 (19.0)	14 (17.3)	< 10 (< 11.6)	< 10 (< 11.6)	25 (30.9)	< 10 (< 11.6)	19 (23.5)	
Ever incarcerated	304 (61.4)	43 (15.0)	32 (11.2)	30 (10.5)	62 (21.6)	46 (16.0)	74 (25.8)	58.90 (< .005)
Type of health insurance								30.04 (.012)
None	25 (5.3)	< 10 (< 40.0)	< 10 (< 40.0)	< 10 (< 40.0)	< 10 (< 40.0)	< 10 (< 40.0)	< 10 (< 40.0)	
Public	355 (75.4)	69 (20.9)	33 (10.0)	29 (8.8)	54 (16.4)	57 (17.3)	88 (26.7)	
Private	83 (17.6)	30 (40.5)	11 (14.9)	< 10 (< 12.0)	< 10 (< 12.0)	< 10 (< 12.0)	13 (17.6)	
Public and private	8 (1.7)	< 10 (< 2.2)	< 10 (< 2.2)	< 10 (< 2.2)	< 10 (< 2.2)	< 10 (< 2.2)	< 10 (< 2.2)	

Note. Female = female identifying; transgender female = transgender identifying. In cells with fewer than 10 observations, true numbers have been masked to protect anonymity.

[a]The χ^2 statistic was not applicable because all of the participants were at or below the poverty level.

that there is variability in the perception of discrimination throughout the trans women community. Trans women of color were more likely than White trans women to perceive dual marginalization, attributing their discriminatory experiences to both their gender and racial/ethnic identities. A comparison of Latina trans women and Black trans women showed that Latinas were often more likely to attribute discriminatory experiences to their gender identity and their intersectional identity.

These results necessitate further investigation into how systematic marginalization operates in different domains and is differentially experienced among trans women of color. Cumulative experiences of intersectional discrimination are associated with an increased risk of housing instability.[2] Considering the variability in attributions of discrimination, it is worth investigating whether (among those reporting discrimination) attribution of discrimination also moderates the association with housing instability and other health outcomes.

Our results did not support the double jeopardy hypothesis. Dually

TABLE 2— Adjusted Multinomial Logistic Regression Analysis of Racial/Ethnic Attribution of Discrimination: Trans*National Study; San Francisco Bay Area, CA; 2016–2017

	Attribution of Discrimination			
Experience of Discrimination Domain	**Gender RRR (95% CI)**	**Race/Ethnicity RRR (95% CI)**	**Intersectional Identity RRR (95% CI)**	**Likelihood Ratio Test[a] χ^2 (*P*)**
School				
Black (Ref = White)	0.19 (0.09, 0.40)	4.84 (0.51, 53.34)	3.89 (1.57, 9.66)	47.70 (<.005)
Latina (Ref = White)	0.62 (0.37, 1.04)	5.63 (1.05, 30.29)	4.74 (2.33, 9.65)	40.86 (<.005)
Latina (Ref = Black)	3.46 (1.66, 7.21)	1.20 (0.29, 4.96)	2.01 (1.17, 3.74)	13.90 (.003)
Getting a job				
Black (Ref = White)	0.39 (0.20, 0.77)	4.39 (0.34, 56.97)	4.52 (1.58, 12.95)	24.89 (<.005)
Latina (Ref = White)	0.65 (0.39, 1.07)	4.39 (0.44, 44.17)	5.49 (2.47, 12.22)	35.04 (<.005)
Latina (Ref = Black)	2.09 (1.09, 4.02)	1.19 (0.22, 6.37)	1.98 (1.06, 3.72)	7.22 (.07)
At work				
Black (Ref = White)	0.48 (0.25, 0.91)	...	2.20 (0.75, 6.41)	15.48 (.001)
Latina (Ref = White)	0.71 (0.44, 1.15)	...	6.08 (2.53, 14.58)	33.87 (<.005)
Latina (Ref = Black)	2.12 (1.15, 3.92)	0.34 (0.07, 1.79)	2.62 (1.31, 5.23)	14.06 (.003)
Getting housing				
Black (Ref = White)	0.43 (0.21, 0.89)	...	2.73 (1.10, 6.74)	18.99 (<.005)
Latina (Ref = White)	0.87 (0.51, 1.46)	...	3.63 (1.66, 7.96)	21.41 (<.005)
Latina (Ref = Black)	2.10 (1.05, 4.20)	0.71 (0.13, 3.72)	1.19 (0.63, 2.26)	5.03 (.17)
While staying in a shelter, single-room occupancy, or residential treatment facility				
Black (Ref = White)	0.95 (0.49, 1.83)	...	3.05 (1.08, 8.60)	6.60 (.09)
Latina (Ref = White)	0.50 (0.28, 0.93)	...	3.37 (1.41, 8.02)	20.59 (<.005)
Latina (Ref = Black)	0.47 (0.24, 0.89)	0.99 (0.08, 11.99)	1.39 (0.69, 2.79)	8.52 (.036)
Receiving medical care				
Black (Ref = White)	0.38 (0.18, 0.81)	...	1.55 (0.41, 5.84)	7.59 (.023)
Latina (Ref = White)	0.58 (0.35, 0.96)	...	4.36 (1.39, 13.69)	17.92 (<.005)
Latina (Ref = Black)	1.62 (0.78, 3.38)	...	1.89 (0.76, 4.67)	7.13 (.07)
Getting service in a store or a restaurant				
Black (Ref = White)	0.20 (0.09, 0.42)	...	7.23 (2.57, 20.35)	60.61 (<.005)
Latina (Ref = White)	0.54 (0.33, 0.87)	...	5.88 (2.41, 14.37)	41.95 (<.005)
Latina (Ref = Black)	2.82 (1.37, 5.77)	0.67 (0.09, 5.18)	0.82 (0.46, 1.46)	12.23 (.007)
Getting credit, bank loans, or a mortgage				
Black (Ref = White)	...	...	7.96 (0.79, 79.88)	...
Latina (Ref = White)	0.20 (0.05, 0.88)	...	14.97 (1.83, 122.14)	22.65 (<.005)
Latina (Ref = Black)	...	0.33 (0.04, 2.43)	1.20 (0.49, 2.90)	3.95 (.27)
On the street or in a public setting				
Black (Ref = White)	0.10 (0.04, 0.22)	...	1.20 (0.52, 2.75)	60.62 (<.005)
Latina (Ref = White)	0.30 (0.16, 0.56)	...	1.55 (0.73, 3.31)	44.16 (<.005)
Latina (Ref = Black)	3.94 (1.97, 7.90)	2.48 (0.39, 15.92)	1.84 (1.00, 3.39)	16.00 (.001)
From the police or in court				
Black (Ref = White)	0.40 (0.20, 0.79)	...	6.57 (2.44, 17.67)	37.94 (<.005)
Latina (Ref = White)	0.64 (0.39, 1.06)	...	5.54 (2.24, 13.69)	35.49 (<.005)
Latina (Ref = Black)	1.86 (0.96, 3.59)	4.85 (0.50, 46.91)	1.08 (0.59, 1.97)	5.73 (.13)

Continued

TABLE 2— Continued

Experience of Discrimination Domain	Attribution of Discrimination: Gender RRR (95% CI)	Race/Ethnicity RRR (95% CI)	Intersectional Identity RRR (95% CI)	Likelihood Ratio Test[a] χ^2 (*P*)
Experiencing verbal abuse				
Black (Ref = White)	0.16 (0.07, 0.38)	...	0.95 (0.36, 2.48)	37.458 (<.005)
Latina (Ref = White)	0.28 (0.13, 0.57)	...	1.75 (0.76, 4.04)	52.29 (<.005)
Latina (Ref = Black)	2.23 (1.09, 4.57)	2.77 (0.40, 19.11)	2.36 (1.16, 4.80)	6.31 (.10)
Experiencing physical abuse				
Black (Ref = White)	0.36 (0.19, 0.69)	...	1.29 (0.57, 2.94)	13.73 (.001)
Latina (Ref = White)	0.71 (0.43, 1.16)	...	2.90 (1.46, 5.77)	25.99 (<.005)
Latina (Ref = Black)	2.10 (1.16, 3.81)	...	1.94 (1.02, 3.68)	12.55 (.006)

Note. CI = confidence interval; RRR = relative risk ratio. The base category was no experience of discrimination. Models adjusted for age, educational attainment, employment status, and history of incarceration. Ellipses indicate that relative risk ratios could not be calculated because there were no White transwomen (the denominator) in corresponding cell.

[a]The likelihood ratio test compared the full model with the model excluding race/ethnicity. A significant *P* value indicates that the model including the race/ethnicity variable was a better fitting model.

marginalized trans women did not have a greater risk of reporting discrimination than White female-identifying trans women. Perhaps counterintuitively, dually marginalized trans women were significantly less likely to report discrimination than White female-identifying trans women in the domains of receiving medical care, experiencing verbal abuse, and experiencing physical abuse. Although both Black and Latina transgender-identifying participants were more likely to test HIV positive than White female-identifying participants, the margins plot reveals that HIV-positive status is correlated with race and is not unique to this intersectional position. In addition, surrogate measures did not provide evidence that this increased risk of HIV-positive status among those who were dually marginalized was attributable to the interacting effects of race/ethnicity and gender identity.

There were several instances in which we found support for intersectional multiplicativity with surrogate measures. Relative to the counterfactual in which there is no interacting effect of race/ethnicity and gender identity, non-Hispanic Black transgender-identifying participants were 61% less likely to report experiencing discrimination when receiving medical care, 65% less likely to report being discriminated against on the street or in public settings, and 89% less likely to report ever having been verbally abused. Similarly, Latina transgender-identifying participants were 83% less likely to report being verbally abused. In one domain, discrimination at work, non-Hispanic Black transgender-identifying participants were more likely to report discrimination relative to the counterfactual.

Collectively, our results are surprising in light of the multiple forms of systemic marginalization and disproportionate violence faced by racial/ethnic minorities[24] and, specifically, trans women of color.[6,25–28] Notably, the discrimination questions were a measure of participants reporting discrimination they had experienced; these questions were not an objective measurement of discrimination experienced.

In the discrimination research literature, it is not uncommon for White participants to report more discrimination than racial/ethnic minority participants.[29,30] In a recent analysis of trans women in San Francisco involving data from 2013, Arayasirikul et al. found that White trans women reported greater transphobic discrimination than trans women of color.[31] Also, using data from a nationally representative study of adults receiving HIV care, Baugher et al. found a higher prevalence of self-reported discrimination in health care settings among White participants than among Latino and Black participants.[32] As with our analysis, neither of these studies claimed that White participants experience more discrimination than racial/ethnic minority participants; rather, White participants are more likely to report experiencing discrimination.

"Ceiling effects" are one potential explanation proposed in the intersectionality literature for why non-Hispanic White participants may report more negative experiences (with added marginalized social identities) than members of racial/

TABLE 3— Intersectionality Analysis Quantifying Risk Among Dually Marginalized Participants: Trans*National Study; San Francisco Bay Area, CA; 2016–2017

		Surrogate Measure		
Outcome	**Race × Gender RD**	**RJE**	**AP**	**RERI**
Black transgender identifying				
HIV status	0.52 (0.37, 0.67)[a]	1.20 (0.03, 2.38)	0.17 (−0.65, 0.98)	3.54 (−14.90, 21.99)
EOD				
At school	−0.00 (−0.17, 0.17)	0.77 (−0.00, 1.53)	−0.31 (−1.61, 1.00)	−0.30 (−1.56, 0.96)
Getting a job	−0.02 (−0.19, 0.15)	0.92 (0.41, 1.42)	−0.09 (−0.70, 0.51)	−0.09 (−0.67, 0.49)
At work	−0.02 (−0.19, 0.15)	22.22 (−333.32, 3777.75)	0.95 (0.23, 1.68)	0.86 (0.19, 1.53)
Getting housing	0.04 (−0.12, 0.21)	0.82 (0.03, 1.60)	−0.22 (−1.39, 0.95)	−0.26 (−1.59, 1.08)
While staying in a shelter, single-room occupancy, or residential treatment facility	0.01 (−0.17, 0.19)	0.96 (0.46, 1.45)	−0.05 (−0.59, 0.50)	−0.05 (−0.68, 0.58)
Receiving medical care	−0.19 (−0.32, −0.06)	0.39 (0.04, 0.74)	−1.57 (−3.86, 0.73)	−0.60 (−1.34, 0.13)
Store/restaurant	0.04 (−0.13, 0.20)	1.71 (0.48, 2.94)	0.42 (−0.00, 0.83)	0.42 (−0.02, 0.87)
Getting credit, bank loans, mortgage	0.04 (−0.12, 0.20)[a]	0.55 (−0.04, 1.14)	−0.82 (−2.76, 1.12)	−1.04 (−3.35, 1.26)
Street/public settings	−0.14 (−0.30, 0.01)[a]	0.35 (−0.19, 0.88)	−1.88 (−6.34, 2.57)	−0.85 (−2.97, 1.28)
Police/court	−0.01 (−0.18, 0.16)	0.90 (0.50, 1.31)	−0.11 (−0.61, 0.39)	−0.10 (−0.59, 0.38)
Verbally abused	−0.18 (−0.32, −0.04)[a]	0.11 (−0.08, 0.29)	−8.19 (−23.82, 7.45)	−2.40 (−7.55, 2.76)
Physically abused	−0.17 (−0.34, −0.01)	0.72 (0.38, 1.05)	−0.39 (−1.04, 0.26)	−0.28 (−0.73, 0.17)
Latina transgender identifying				
HIV status	0.24 (0.14, 0.34)[a]	1.23 (0.33, 2.14)	0.19 (−0.40, 0.78)	1.11 (−2.60, 4.82)
EOD				
At school	0.13 (−0.01, 0.27)	0.78 (0.22, 1.33)	−0.29 (−1.21, 0.63)	−0.49 (−1.99, 1.02)
Getting a job	0.08 (−0.06, 0.22)	1.18 (0.70, 1.65)	0.15 (−0.19, 0.49)	0.17 (−0.22, 0.57)
At work	0.05 (−0.08, 0.19)	2.21 (−0.53, 4.95)	0.55 (−0.01, 1.11)	0.73 (−0.08, 1.53)
Getting housing	0.12 (−0.03, 0.26)	0.99 (0.53, 1.47)	−0.00 (−0.48, 0.47)	−0.00 (−0.62, 0.61)
While staying in a shelter, single-room occupancy, or residential treatment facility	−0.07 (−0.22, 0.09)	0.90 (0.39, 1.41)	−0.11 (−0.73, 0.52)	−0.09 (−0.64, 0.45)
Getting medical care	−0.05 (−0.18, 0.09)	0.89 (0.33, 1.44)	−0.13 (−0.84, 0.58)	−0.11 (−0.70, 0.49)
Store/restaurant	0.06 (−0.08, 0.20)	1.50 (0.73, 2.28)	0.33 (−0.01, 0.68)	0.36 (−0.01, 0.73)
Getting credit, bank loans, mortgage	0.10 (−0.03, 0.23)[a]	0.95 (0.03, 1.87)	−0.05 (−1.08, 0.97)	−0.10 (−2.02, 1.81)
Street/public settings	−0.05 (−0.17, 0.06)[a]	0.48 (−0.18, 1.14)	−1.08 (−3.93, 1.77)	−0.76 (−2.79, 1.28)
Police/court	0.02 (−0.12, 0.16)	1.00 (0.62, 1.40)	0.01 (−0.38, 0.40)	0.01 (−0.41, 0.43)
Verbally abused	−0.09 (−0.19, 0.00)	0.17 (−0.12, 0.46)	−4.97 (−15.29, 5.34)	−2.10 (−6.65, 2.45)
Physically abused	0.02 (−0.12, 0.15)	0.96 (0.64, 1.29)	−0.04 (−0.39, 0.32)	−0.04 (−0.40, 0.32)

Note. AP = attributable proportion; EOD = experience of discrimination; RD = risk difference; RERI = relative excess risk due to interaction; RJE = ratio of observed to expected joint effects. Models controlled for age, educational attainment, employment status, and history of incarceration. The null value for the RJE is 1, and the null value for the AP and RERI is 0. The reference for group is non-Hispanic White female identifying.

[a]The log-binomial model did not converge, so logistic models (odds ratios) were used instead.

ethnic minority groups.[33] According to this explanation, racial/ethnic minorities endure a higher baseline level of victimization such that the perception of further victimization from additional marginalized identities is minimal. Relatedly, other scholars noting this phenomenon have hypothesized that discrimination may be so prevalent among certain groups that it is expected and therefore underreported as noteworthy[24,29] or that it may be acknowledged on the group level but minimized on the personal level.[34] Our results may highlight the need for a more objective measure of discrimination that is sensitive enough to register experiences of discrimination among populations with (potentially) different reference points.

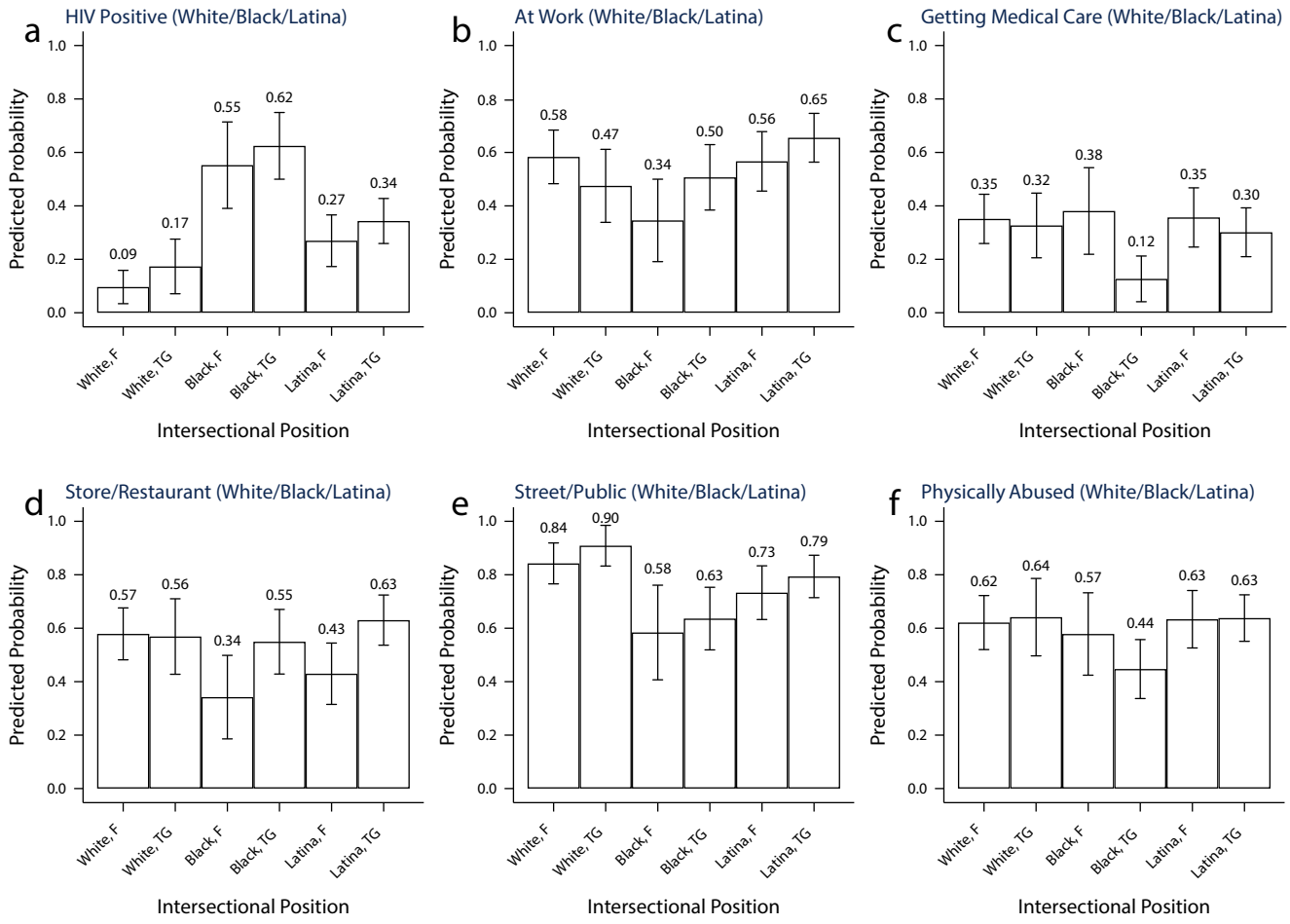

FIGURE 1— Predicted Probabilities of HIV-Positive Status or Reports of Discrimination, by Intersectional Position, in the Domains (a) HIV Positive, (b) at Work, (c) Receiving Medical Care, (d) at a Store or Restaurant, (e) on the Street or in Public, and (f) Experiencing Physical Abuse: Trans*National Study; San Francisco Bay Area, CA; 2016–2017

Note. F = female identifying; TG = transgender identifying.

Limitations

Our results should be interpreted in the context of several limitations. First, the relatively small sample sizes for each intersectional position resulted in wide confidence intervals, and there may not have been sufficient power to observe statistically significant differences. Sample size considerations also prevented us from analyzing interactions with other racial minority groups such as Asians and Native Americans. Second, individuals could have been misclassified by race/ethnicity. Anyone who indicated Latino/a ethnicity was coded as "Latina," including Black Latinas. Our results remained largely unchanged when we reclassified our 25 Black Latinas as Black; however, several estimates shifted in statistical significance (Table A, available as a supplement to the online version of this article at http://www.ajph.org).

Third, discrimination outcomes were self-reported and subjective. There may be differences between racial/ethnic groups regarding the level of victimization that meets the threshold of being considered discriminatory. Fourth, we restricted our intersectional analysis to race/ethnicity and gender identity because these were the identities that were the subject of the discrimination questions. Other social identities and characteristics relating to societal power could have been included as well to construct intersectional positions (e.g., language, immigration status, housing status, and "passing" as cisgender female). However, constructing additional intersectional positions would have magnified our concerns about sample size and statistical power.

Finally, all of the participants reported an annual income at or below the poverty line. Alongside other sociodemographic indicators, this may signal

that socioeconomic disadvantage was prevalent in our sample, potentially obscuring differences according to intersectional position. The prevalence of socioeconomic disadvantage may also indicate that our sample is not generalizable to the broader community of trans women in San Francisco. Although respondent-driven sampling is a common probability-based sampling strategy used with marginalized populations (such as trans women), the sampling process tends to reach the more socioeconomically disadvantaged segments of the population (relative to alternative approaches such as time location sampling).[35] This potential sampling bias likely limits the generalizability of our findings.

Conclusions

Our analysis provides insight into the diversity of experiences within the transgender community. We have demonstrated the use of multiple quantitative methods, individually and in combination, to study potential differences by intersectional position. Calculating the risk difference for the dually marginalized group with respect to White female-identifying participants allowed us, in part, to test the double jeopardy hypothesis but limited us to making comparisons with a single referent category. Estimating surrogate measures quantifies how much of the risk in the dually marginalized group is beyond what we would expect from the counterfactual scenario in which there are no interaction effects. These measures provide an indication of intersectional multiplicativity but fall short of contextualizing how risk in the dually marginalized group compares with risk in other intersectional positions.

Margins plots provide an assessment of absolute risk across all intersectional positions, with statistically significant differences noted via error bars. These plots are easily interpretable and illustrate where disparities exist without making any group the reference or centering it as the standard for comparison. Such an approach, as Bauer noted of intersectionality broadly, is useful for providing a "precise identification of inequalities."[16(p11)]

Experiences of discrimination are prevalent among trans women in San Francisco. Racism and transphobic discrimination have been linked to risk factors for HIV infection on both the individual level and the structural level. Intervening on systemic discrimination is a potential population-based course of action to interrupt HIV transmission and offset other adverse health outcomes for trans women. We used quantitative intersectionality methods to identify high-risk outcomes ubiquitous to the entire population (e.g., verbal abuse), higher-risk outcomes along a single axis of identity (e.g., HIV prevalence among Black participants), and outcomes specific to an intersectional position (e.g., reduced risk of reporting discrimination when receiving medical care among Black transgender-identifying participants). With sufficient sample sizes and objective measures, these methods can be useful in determining when interventions should be applied to a broad population or when they should be targeted to a specific intersectional group. AJPH

ABOUT THE AUTHORS

Paul Wesson, Eric Vittinghoff, and Caitlin Turner are with the Department of Epidemiology and Biostatistics, University of California, San Francisco. Sean Arayasirikul, Willi McFarland, and Erin Wilson are with the Center for Public Health Research, San Francisco Department of Public Health.

CORRESPONDENCE

Correspondence should be sent to Paul Wesson, PhD, UCSF Box 0886, 550 16th St, 3rd Floor, San Francisco, CA 94143 (e-mail: paul.wesson@ucsf.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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CONTRIBUTORS

P. Wesson designed the analytic strategy, conducted the analyses, and led the writing of the article. E. Vittinghoff advised on the analytic strategy and provided feedback on article drafts. C. Turner performed the data analysis and provided feedback on the article. S. Arayasirikul, W. McFarland, and E. Wilson advised on the study design and contributed to article revisions. All of the authors collaborated on the overall study design.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

HUMAN PARTICIPANT PROTECTION

The Trans*National Study was approved by the institutional review board of the University of California, San Francisco.

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Defeating JUUL's Effort to Rewrite San Francisco's E-Cigarette Regulations

Neiloy R. Sircar, JD, LLM, and Stanton A. Glantz, PhD

In 2019, San Francisco, California, prohibited the sale of electronic cigarettes lacking US Food and Drug Administration authorization. JUUL then promoted a ballot initiative (Proposition C) to replace San Francisco's e-cigarette legislation with legislation JUUL wrote that required future legislation to be approved by the voters. JUUL promoted Proposition C as a way to reduce youth e-cigarette use while allowing adult choice.

Health groups argued that JUUL's measure could nullify San Francisco's prohibition on selling flavored tobacco products. Health groups benefitted from having an established campaign network that recently defended the flavor ban. They successfully framed Proposition C as a tobacco industry ploy to undo San Francisco's e-cigarette regulations, particularly the prohibition on selling flavored tobacco products. JUUL ended its campaign on September 30, 2019, and the measure failed on election day, with 82% voting against it.

Lessons learned from the campaign include the importance of framing an industry initiative as a threat to local public health lawmaking and the potential for the e-cigarette issue to attract parents as new leaders and engage a powerful constituency to support tobacco control measures. (*Am J Public Health*. 2021;111: 457–464. https://doi.org/10.2105/AJPH.2020.305993)

Electronic cigarettes (e-cigarettes) have become popular among youths with flavors playing an important role.[1] The US Food and Drug Administration (FDA) took authority over e-cigarettes in 2016,[2] but as of 2019 had not regulated them. Without federal rules in place, cities and states passed measures to control e-cigarette youth access and taxation[3,4] or included them in clean indoor air laws.[5] By August 2020, 207 municipalities[6] and five states[7] had restricted the sale of flavored tobacco products, including 65 municipalities that prohibited the sale of all flavored tobacco products, including menthol.

In August 2016, FDA required e-cigarette companies to submit Premarket Tobacco Product Applications for authorization to market specific e-cigarette products; as of March 2019, none had submitted one.[8] In 2017, the San Francisco, California, Board of Supervisors passed the nation's first comprehensive ban on the sale of flavored tobacco products (except tobacco flavor).[9] In response, RJ Reynolds (maker of the leading menthol cigarette, Newport) forced a referendum (Proposition E) to overturn the law. Despite a $12 million campaign by Reynolds and other tobacco interests, 68% of San Francisco voters upheld the law in June 2018.[9] Concern about continued youth use of e-cigarettes—and the FDA's failure to act—led the Board of Supervisors to pass two ordinances in June 2019, including a moratorium on the sale of e-cigarettes that had not received FDA premarket authorization.[10]

On May 14, 2019, a month before the Board of Supervisors voted on the ordinances, JUUL Labs, the San Francisco–based company that manufactured and sold e-cigarettes that were dominating the youth market,[11] announced its initiative, "An Act to Prevent Youth Use of Vapor Products," to "comprehensively authorize and regulate" e-cigarettes in San Francisco that would supersede existing (and pending) e-cigarette legislation. Notwithstanding this threat, the Board unanimously passed the ordinances on June 25 and the mayor signed them on July 1.

The next day, JUUL filed its initiative to place it before the voters in November. Despite JUUL's superior financial resources, public health advocates coalesced to resoundingly defeat the JUUL initiative (with 82% voting "no") through expanding their network to include influential parents concerned about their children using e-cigarettes and successfully engaging national health organizations.

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A detailed description of events appears in the "Expanded Timeline and Discussion of Proposition C Events" in the Appendix (available as a supplement to the online version of this article at http://www.ajph.org).

PROPOSITION C'S RISK TO TOBACCO CONTROL

In March 2019, San Francisco Supervisor Shamann Walton and City Attorney Dennis Herrera held a press conference announcing the two ordinances.[12] The first imposed a moratorium on the sale of e-cigarettes in San Francisco effective January 29, 2020, unless FDA had authorized the specific e-cigarette.[13] The second added e-cigarettes to the existing prohibition on the sale, manufacture, and distribution of tobacco products on city-owned property.[14]

The ordinances largely received negative media, including opposition from the *San Francisco Chronicle* editorial board.[15] Furthermore, health groups wanted to concentrate on replicating San Francisco's flavor ban in other localities around the San Francisco Bay Area and beyond.[16] Walton and Herrera's ordinances were a surprise and not a policy priority for the health groups.[17] The American Heart Association, Breathe California, and San Francisco Marin Medical Society endorsed the ordinances from the start, but other prominent tobacco control organizations including the San Francisco Tobacco-Free Coalition, Campaign for Tobacco-Free Kids, American Lung Association, and American Cancer Society stayed on the sidelines.[17,18]

On July 10, 2019, JUUL's initiative was placed on the November ballot as Proposition C, with the JUUL-backed Coalition for Reasonable Vaping Regulations ("Yes on C") already funded and mobilizing (Figure 1, and Figure A and Table A, available as supplements to the online version of this article at http://www.ajph.org).[19,20] The initiative replaced both new ordinances and amended the Health Code to replace San Francisco's e-cigarette legislation with JUUL's legislation (Table 1 and Table B, available as a supplement to the online version of this article at http://www.ajph.org). Among other provisions, the initiative stated, "This article is intended to *comprehensively authorize and regulate* the retail sale, availability, and marketing of vapor products in the City and County of San Francisco [emphasis added]."[23(p5)] This provision, reflecting the tobacco industry's long-standing strategy of preempting tobacco control regulations,[24,25] removed the Board of Supervisors' authority to regulate tobacco products and e-cigarettes without another public vote, adding a "veto player" (the voting public) to San Francisco's policymaking process that could impede further tobacco control policymaking.[21] The initiative also created a new definition for e-cigarettes as "vapor products," which could exempt e-cigarettes from existing tobacco product regulations.[26]

JUUL framed its initiative as strong action to prevent youth e-cigarette use while preserving adult choice. The messaging strategy was simple: agree that e-cigarette use is a problem among youths and claim that Proposition C would have strengthened protections against youth use, while arguing that it was unnecessary and government overreach to ban e-cigarette sales (Figure B, available as a supplement to the online version of this article at http://www.ajph.org). Polling from July 18 to 23, 2019, for the Campaign for Tobacco-Free Kids[27] revealed that voters were likely to be swayed by JUUL's messaging. The poll presented two variations of the same question:

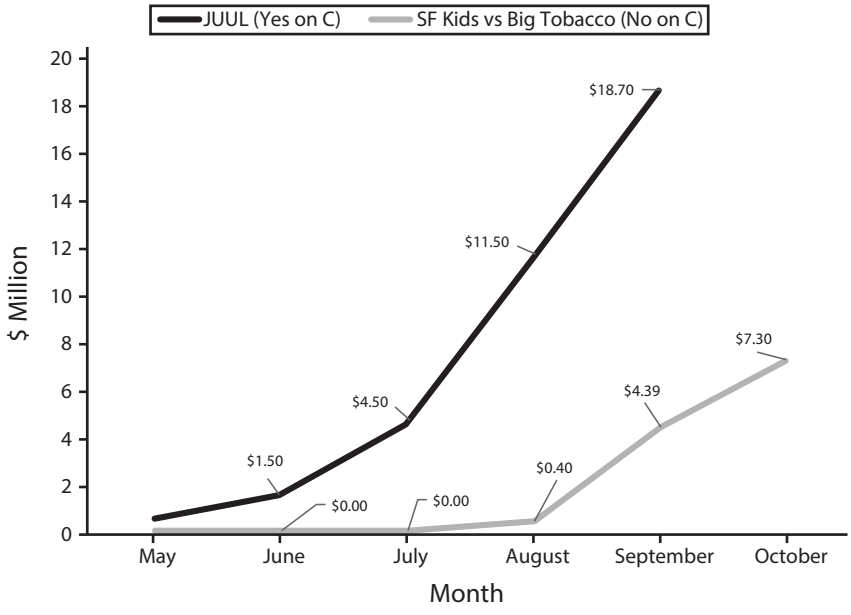

FIGURE 1— Cumulative Funding For and Against Proposition C: San Francisco, California

Note. JUUL provided 99.99% of Yes on C's funding. (For more details, see Tables A and C and Figure A, available as supplements to the online version of this article at http://www.ajph.org.)
Source. City and County of San Francisco Ethics Commission.[20]

TABLE 1— How the JUUL Initiative, "An Act to Prevent Youth Use of Vapor Products" (Proposition C) Would Change the San Francisco, California, E-Cigarette Regulation

	San Francisco Law on July 1, 2019[a]	"An Act to Prevent Youth Use of Vapor Products"	What Would Change
Regulatory authority	Board of Supervisors and mayor may enact tobacco-related legislation	Requires any legislation enacted by the Board to be approved by the voters before taking effect	Requiring new legislation to be approved by voters discourages new legislation because it creates a veto player—the voting public—to the policymaking process and thereby decreases likelihood of change[21]
Sale of e-cigarettes (Ordinance 190312)	Only allows sale of e-cigarettes authorized by FDA	No restrictions	Repeals requirement that e-cigarettes be authorized by FDA before they can be sold
Sale of flavored tobacco products, including e-cigarettes	Prohibited	Not specified	"Comprehensively authorize and regulate" language likely repeals flavor ban for e-cigarettes (but not other tobacco products)
Minimum sale age (no sale of tobacco products to people aged younger than 21 years)	Violation if retailer sells tobacco product to person aged younger than 21 years	Violation if retailer "knowingly" sells to person aged younger than 21 years	Makes law difficult to enforce by adding "knowingly" standard, a less-strict standard of review for an action that may further be applied to an employee instead of a retailer
Definition of e-cigarettes	Defines e-cigarettes as tobacco products	Creates a new definition for e-cigarettes as "vapor products"	Existing laws that apply to "tobacco products" would no longer apply to e-cigarettes
Regulated entities	Covers all establishments that sell, distribute, or manufacture tobacco products, including e-cigarettes	Creates specific definitions for retailer, wholesaler, manufacturer	Strict, complex definitions make implementation and enforcement harder and create a potential for certain entities to evade regulation by not neatly fitting a particular definition
Online sales	All online sales of tobacco products must comply with San Francisco's rules on tobacco products, including prohibitions on the sale of flavored products	Only applies to online retailers that have San Francisco addresses or deliver to San Francisco addresses	Creates a loophole for online retailers who sell fewer than 100 units per month (current law has no threshold for sales)
Online retail permit	Not specified	Creates new process to apply for an online permit to sell e-cigarettes ("vapor products"); automatically issued after 90 d unless the public health director denies it	Allows for automatic permitting when regulators take no action on an application within 90 d
Online sales age verification	Not specified	Online retailers must require purchasers to create a profile with sufficient personal identifying information to allow the retailer to verify their age through a third party against public records, or purchaser must upload a valid government-issued ID	Unlikely to have practical impact because online age verification systems are ineffective with respect to minors' purchase and receipt of e-cigarettes online[22]; accountability for data and information security is unclear
Education and outreach	Part of San Francisco Department of Public Health Tobacco Free Project	Requires director of health to develop educational and outreach programs directed at minors in partnership with other government agencies	Shifts some of the burden of compliance with prohibition on sales and use of e-cigarettes by minors to the government and away from vendors
E-cigarette business operations on city-owned property (Ordinance 190311)	Prohibits sale, manufacture, and distribution of tobacco products, including e-cigarettes, on city property	Limits prohibition to onsite retailers; exempts online retailers, manufacturers, and distributors	Repeals the prohibition

Note. FDA = US Food and Drug Administration. See Table B (available as a supplement to the online version of this article at http://www.ajph.org) for specific legal details.

Source. City and County of San Francisco Ethics Commission.[20]

[a]Ordinance 190312 and Ordinance 190311 were signed into law by the mayor on July 1, 2019, to take effect January 29, 2020.

- "Shall the city overturn the current bans on flavored vapor products and other electronic cigarettes, and amend local restrictions pertaining to the marketing and sale of vapor products?"
- "Shall the city adopt local regulations restricting youth access to electronic cigarettes and other flavored vapor products, and otherwise allow the sale of such products to adults?"

Of the respondents, 59% responded "no" to the first question, but only 24% responded "no" to the second.[27] The health groups felt they could win if the public perceived JUUL's initiative as a threat to local e-cigarette policymaking, particularly the flavor ban, but JUUL could win if its framing of Proposition C as a way to protect youths from e-cigarettes while protecting adult choice dominated the public debate.

After the initiative was filed, the health groups united in support of the ordinances and resolved to fight JUUL out of concern that Proposition C would overturn San Francisco's ban on flavored e-cigarettes.[18] The health groups' opposition campaign, SF Kids versus Big Tobacco (No on C) was re-formed from the 2018 campaign of the same name and leadership that defended the flavor ban. No on C's campaign presented JUUL as another Big Tobacco giant (stressing Altria's part-ownership of JUUL since December 2018[28]) wanting to sell flavored tobacco products to kids in San Francisco.[29]

NEW E-CIGARETTE CONTROL CONSTITUENCY EMERGES

In the early days, No on C ran austerely as major national donors waited to see how the campaign developed and whether they would succeed in framing the fight as a defense of the flavor ban. No on C secured its first substantial funding in August from new local donors and volunteers with little to no tobacco control history: wealthy parents of adolescents who used e-cigarettes.

Smoking and tobacco use has long been associated with socioeconomic status, with flavored tobacco products popular with lower-income communities.[30,31] The distributions of e-cigarette use as a function of income is different from cigarettes, with 5.2% of youths from households making more than $100 000 a year using e-cigarettes, compared with 1.9% for cigarettes (B. Chaffee, e-mail correspondence with Stanton Glantz, August 21, 2020). Parents of these wealthier youths represented a new constituency with a direct interest in addressing the e-cigarette problem. A group of mothers created Parents Against Vaping E-Cigarettes (PAVe) in New York, and they networked and advocated in New York, which brought them to national attention as spearheads for their cause.[32] PAVe connected San Francisco parent Christine Chessen to the No on C campaign. By August 16, Chessen and other donors she recruited donated $140 950 to No on C, the first substantial monetary contribution to the campaign (Figures 1 and A and Table C, available as a supplement to the online version of this article at http://www.ajph.org).

DEFEATING THE JUUL INITIATIVE

JUUL began losing the argument for its initiative in August, after No on C countered the main thrust of JUUL's messaging.

A series of important victories for No on C began with San Francisco's Ballot Simplification Committee, which provides plain-language summaries of propositions placed in official voter information pamphlets alongside proponents' and opponents' arguments, which the city mails to registered voters (Table D, available as a supplement to the online version of this article at http://www.ajph.org). The Committee largely agreed with No on C's framing of Proposition C as preemptive and potentially repealing the flavor ban.[33] Following a suit JUUL filed after this decision, a local court agreed with the Committee.[34]

With this victory, No on C legitimated its contention that Proposition C threatened the flavor ban, and major donors, notably Michael Bloomberg, started supporting this campaign (Figures 1 and A and Table C). JUUL continued to spend heavily to bolster its campaign, totaling $18.5 million (Figures 1 and A).[20,35]

Events outside San Francisco reinforced the No on C effort: encouraged by PAVe and others, Congress held hearings on JUUL's youth-oriented marketing practices,[36] and several attorneys general instituted investigations.[37] Rising cases and fatalities in young people attributable to e-cigarette or vaping product use–associated lung injury also put a negative light on JUUL, the country's largest e-cigarette maker.[11] Going into the November election, perceptions of JUUL's initiative were increasingly negative (Table E, available as a supplement to the online version of this article at http://www.ajph.org).

On September 9, FDA sent JUUL a warning letter[38] stating that JUUL's advertising and health claims violated FDA rules and noting specifically that JUUL had made unauthorized health claims when it marketed its products as safer than cigarettes. FDA expanded its investigation to include Yes on C's messaging and statements after Walton, with help from No

on C, sent FDA a letter contending that Yes on C had made unauthorized modified risk claims about e-cigarettes during efforts to secure the endorsement of an influential political club in San Francisco.[39]

On September 25, JUUL CEO Kevin Burns resigned and was replaced by Philip Morris executive K. C. Crosthwaite.[40] JUUL announced the same day it would cooperate fully with the FDA and other government authorities and suspend its digital, print, and TV marketing for its e-cigarettes.[41] Five days later, on September 30, JUUL ceased support for Proposition C and the formal Yes on C campaign folded.[42,43]

By October 1, it was too late to remove Proposition C from the ballot; the "yes" arguments were in the voter information pamphlet, and many of the "yes" outdoor advertisements remained up. Some Proposition C supporters continued to support it because they saw e-cigarettes as "the lesser of two evils" compared with cigarettes, while others more simply wanted to be able to purchase e-cigarettes in San Francisco regardless of FDA premarket authorization for their sale.[44] As a result, the No on C campaign did not stop.

On November 5, San Franciscans defeated Proposition C, with 82% voting no.[45,46]

THE BROADER CONTEXT

Initiatives are a feature of direct democracy developed during the Progressive Era to allow citizens and civic groups to circumvent captured legislative bodies.[47] Direct democracy can lock in laws because legislation passed by direct popular vote often requires another costly and time-consuming ballot initiative to change it.[48–50] However, those same special interests that direct democracy was developed to thwart have discovered that, through use of paid signature gatherers, they can also mount well-financed campaigns to secure (or block) legislation.[51]

After having to fight many tobacco control initiatives, the tobacco industry successfully made it harder to place initiatives on the ballot[49] and made several attempts—without success—to use direct democracy to enact proindustry legislation.[49,50,52] Like the JUUL initiative, these industry-written initiatives were framed and named as if supporting public health priorities, including reducing smoking and tobacco use; the industry has sought to lock in a regulatory environment that is stable and favorable to their interests, including preemption of further legislative action.[21,47,51,53–56]

LESSONS LEARNED

Like earlier tobacco industry efforts to use the initiative process to enact legislation undermining public health,[50,52,54,55,57] Campaign for Tobacco-Free Kids' polling confirmed that, if the public saw Proposition C as JUUL intended, it had a chance of passing.[27] While not every health group felt the Walton–Herrera ordinances were priorities, protecting the flavor ban was.

From the beginning, the No campaign countered JUUL's framing and presented Proposition C as an effort by Big Tobacco to protect its markets and undermine public health. They did not defend the ordinances per se—they defended the right of local legislators to create the rules, including prohibitions on the sale of certain products, be they flavors or any product lacking FDA authorization. No on C relied on uncontested facts: JUUL wrote the initiative, JUUL sold nicotine products, Altria owned a significant stake in JUUL, and JUUL's flavored e-cigarettes were popular with youths. JUUL's overreach in including the provision to "comprehensively authorize and regulate" e-cigarettes drove some who had opposed the Walton–Herrera ordinances, including the *San Francisco Chronicle*,[58] to oppose Proposition C.

No on C succeeded in part by reactivating the successful Proposition E (2018) campaign. Many of the same people and organizations who defended the flavor ban in San Francisco were leading the fight against Proposition C; they knew each other, which resulted in a trust that made cohesion and discipline easier. Their knowledge of how to fight a campaign in San Francisco afforded them a home-field advantage over JUUL in spite of the company's massive spending.[59] No on C knew where to campaign, which doors to knock on, who the influencers would be in local media and community organizations, and how to speak to San Francisco dispositions on Big Tobacco. Proposition E was still fresh on the minds of many key San Franciscan voters and civic groups.

In addition, the appearance of a new constituent—well-to-do parents concerned about their and other kids' addiction to JUUL and other e-cigarettes—generated early financial and political resources that sustained the No campaign until the larger national players joined. Significantly, these parents, with resources and access to political leadership, used their influence to focus broadly on protecting all youths—not just their children—from targeting by the tobacco industry, including by other flavored tobacco products. The emergence of a national network of concerned parents engaged influential parents in the fight against e-cigarettes.

For example, in addition to San Francisco, PAVe was contacted by mothers from Livermore, California, (a San Francisco suburb) who formed

Flavors Addict Kids–Livermore in December 2018, who networked with the traditional tobacco control organizations and authorities.[60] Inspired by the San Francisco ordinances, Flavors Addict Kids–Livermore lobbied for Livermore to pass its own prohibition on the sale of e-cigarettes that did not have FDA premarket authorization, which passed on July 8, 2019 (see "Three Livermore Mothers Join San Francisco in Fighting JUUL" in the Appendix).[60–62] As in San Francisco, JUUL mounted a ballot measure to overturn the ordinance, which it dropped after folding Proposition C.[43] These organizations and their leadership bridged a gap left by larger tobacco control networks with new, highly motivated players who enjoyed access to and credibility with policymakers on top of financial resources to leverage.

CONCLUSION

JUUL funded a massive campaign to ensure it could continue to sell its products in San Francisco. Tobacco control groups recognized the threat that the JUUL initiative represented to past, present, and future e-cigarette legislation and were able to mobilize national support to fight it. The San Francisco fight stimulated other communities to pass e-cigarette control legislation, including nearby cities and counties.[63,64] In the absence of federal regulations, state and local jurisdictions are filling the void in regulating the sale of e-cigarettes and flavored tobacco products.[65] By September 2020, 278 localities across the United States had measures restricting the sale of flavored tobacco products.[7] Fighting against preemption of local regulators' authority, as seen in San Francisco, must remain a core objective of tobacco control advocacy.[54]

No on C also benefitted from a new set of players: well-off parents concerned about their and other youths' use of e-cigarettes. This expansion of the traditional health constituency is similar to how the movement for smoke-free laws benefitted from involving a constituency of nonsmokers who would personally benefit from smoke-free laws. This constituency presents a potent force to address youth use of e-cigarettes and flavors that appeal to youth, one that has resources and network access to achieve policy goals health groups have sought. Future campaigns should work to engage parents as a powerful constituency to protect youths and the public in general from e-cigarettes and other new tobacco products. AJPH

ABOUT THE AUTHORS

Neiloy Sircar is a postdoctoral fellow at the Center for Tobacco Control Research and Education at the University of California San Francisco. S. A. Glantz was professor of medicine at the Center for Tobacco Control Research and Education and Institute for Health Policy Studies at the University of California San Francisco until he recently retired.

CORRESPONDENCE

Correspondence should be sent to Neiloy Sircar, JD, Postdoctoral Fellow, Center for Tobacco Control Research and Education, University of California San Francisco, 530 Parnassus, Suite 366, San Francisco, CA 94143-1390 (e-mail: neiloy.sircar@ucsf.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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S. A. Glantz had the idea for the study. N. Sircar collected the data and drafted the article. Both authors worked together to prepare the final article.

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N. R. Sircar has nothing to disclose. S. A. Glantz published a paid statement opposing Proposition C in the official voter information pamphlet paid for by himself and his wife.

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Interviews were conducted under a protocol approved by the University of California San Francisco Committee on Human Research.

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Selecting Review Outcomes for Systematic Reviews of Public Health Interventions

Luke Wolfenden, PhD, BSci (Hons), Ani Movsisyan, DPhil, MSc, MPH, Sam McCrabb, BPsych, PhD, Jan M Stratil, MD, BSc, and Sze Lin Yoong, PhD, BND (Hons)

For systematic reviews to have an impact on public health, they must report outcomes that are important for decision-making. Systematic reviews of public health interventions, however, have a range of potential end users, and identifying and prioritizing the most important and relevant outcomes represents a considerable challenge.

In this commentary, we describe potentially useful approaches that systematic review teams can use to identify review outcomes to best inform public health decision-making. Specifically, we discuss the importance of stakeholder engagement, the use of logic models, consideration of core outcome sets, reviews of the literature on end users' needs and preferences, and the use of decision-making frameworks in the selection and prioritization of outcomes included in reviews.

The selection of review outcomes is a critical step in the production of public health reviews that are relevant to those who use them. Utilizing the suggested strategies may help the review teams better achieve this. (*Am J Public Health*. 2021;111:465–470. https://doi.org/10.2105/AJPH.2020.306061)

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Systematic reviews of public health interventions have a range of potential end users, including consumers (the public and patients), practitioners (e.g., clinicians and public health practitioners), health care managers, policymakers and researchers, and research funders, as well as intermediaries such as journalists or guideline developers.[1] These groups use reviews for a variety of purposes, from decisions regarding individual health care and strategies to improve health systems to the development of public health recommendations, regulations, policy, and legislation.

Outcomes reported in systematic reviews are often criticized for not sufficiently informing the needs of their intended end users. For example, reporting of economic evaluations is evident in just 12% of reviews of obesity prevention interventions despite it being a fundamental consideration in the decision-making of health managers and policy makers.[2] Similarly, although judicious decisions regarding a public health intervention need to weigh its potential benefits and harms, systematic reviews of public health interventions typically do not report adverse effect outcomes[3] and other outcomes important to policymakers, health managers, clinicians, or patients.[2]

In this commentary, we describe potentially useful approaches that systematic review teams can use to identify outcomes that are relevant to end users of reviews of public health interventions. We do not intend to provide prescriptive guidance; rather, we suggest approaches that reviewers may find useful to consider to support decision-making for a range of end users.

SELECTING AND PRIORITIZING REVIEW OUTCOMES

Systematic reviews should seek to include meaningful outcomes for the primary intended end users of the review.[1] The diversity of end users of public health reviews and the range of potentially relevant outcomes for synthesis of public health interventions, however, represent a significant challenge for review teams in outcome selection. For clinical research, the Institute of Medicine suggests measuring benefits and harms, quality of life, symptomatology,

and satisfaction and economic outcomes, as they may be of importance to patients or clinicians.[4] Guidance from the Campbell Collaboration, as well as the GRADE Working Group and the MECIR (Methodological Standards of Cochrane Intervention Reviews) standards, suggests that a number of broad outcomes[5]—including those related to resource use or cost—and adverse effects may be of interest across a variety of public health or social policy end user groups and should be considered for inclusion in all reviews.[6,7] Ultimately, it is the role of the review team to identify the most important outcomes based on the nature of the review question and the preferences and needs of key review end users. Doing so requires them to develop a list of potential review outcomes and prioritize those that are "critical" and those that are "important" for decision-making. It is recommended that prioritized outcomes be included in reviews and specified a priori, ideally in a review protocol and register, and that a small number of prioritized critical and important outcomes are included in summaries of findings.[1] Here, we discuss a number of strategies that review teams can pursue to support the generation and prioritization of outcomes for systematic reviews.

CORE OUTCOME SETS

A core outcome set (COS) is an agreed minimum set of outcomes that should be measured and reported in all trials of public health or health care interventions.[8] They are intended to increase the relevance of outcomes to end users, reduce the risk of selective outcome reporting, and standardize outcomes to enable comparison with similar studies in evidence synthesis.[9] The Core Outcome Measures for Effectiveness Trials (COMET) initiative is an international effort to increase the development and use of COSs, and includes a database of registered and published COSs for a range of health conditions and population groups.[10] As methods for developing a COS require consensus processes with multiple stakeholder groups to ensure the value of the proposed outcomes to end users, a COS represents an efficient way of identifying relevant outcomes for systematic reviews, particularly in instances where stakeholder engagement may be challenging.

The number of outcomes reported in trials exceeds those typically included in systematic reviews, and the outcomes considered of importance in trials are not always well aligned to those prioritized by systematic reviewers.[11] Key to the value of COS use for systematic reviews is the extent to which the sets can be applied in reviews and represent the views of important stakeholders at the synthesis stage.[12] Systematic reviewers undertaking public health interventions should also be involved in COS development, as this has been suggested to facilitate their use in evidence syntheses.[13] Appraisal of COS development by reviewer author teams, including consideration of the stakeholders engaged, is recommended to ensure that the outcomes selected are an adequate representation of stakeholders priorities. The COMET Handbook can help reviewer author teams do this.[8]

Despite their intuitive appeal, few COSs are currently available for public health interventions. For the "public health category," a search of the COMET database (October 29, 2020) identified only seven of the more than 600 published and unpublished COS studies that covered a range of health conditions and behaviors, including obesity, mental health, and physical activity.[10] The development of COSs may represent a greater challenge for public health researchers given the complex nature of interventions and their diverse range of potential health and nonhealth outcomes relative to other medical disciplines. Nonetheless, we expect that COSs for public health interventions will become increasingly common, in line with their accelerating development in other fields of health research. In the absence of a COS directly aligned to the objectives of a review, compiling a list of potential review outcomes via searches of the COMET database for similar population groups or related interventions may be useful—for example, prior to engaging with stakeholders.

STAKEHOLDER ENGAGEMENT

The input of end users of reviews, including consumers and other stakeholder groups, is recommended across all phases of the development, conduct, and reporting of systematic reviews.[14] They also have an important role in identifying and prioritizing review outcomes, including those related to the benefits and harms of public health interventions. The comprehensive engagement of end users involves the use of "codesign" and "coproduction" processes, that is, planning and doing a review with those who will use it. Research codesign and coproduction can be complicated, and careful consideration needs to be given to ensure that appropriate end user groups are identified, that individuals involved can appropriately represent such groups, and that appropriate engagement strategies and decision-making processes are employed to manage group dynamics and empower stakeholder voice.[15] Many

resources are available to assist review teams with this.[16] Strategies suggested to be helpful in engagement processes include providing research skills training to end users, regular communications between researchers and end users, and setting clear roles and expectations among all parties involved.[16]

A common structure to ensure that this occurs is end user representation on Review Advisory Groups, which oversee the entire review production process. In a systematic review of environmental interventions to reduce the consumption of sugar-sweetened beverages, for example, a Review Advisory Group was established, with members involved in the identification and prioritization of key review outcomes.[17] Review teams can also use formal qualitative inquiry and consensus processes with stakeholders as part of a process to develop an inventory of potential review outcomes or to prioritize them. Surveys of key stakeholder groups could also be undertaken to identify important outcomes, including those pertaining to potential adverse effects. However, such processes are time-consuming and resource intensive. This may explain, in part, why few reviews of public health interventions appear to engage end users in review development and outcome selection.[2] Nonetheless, the absence of appropriate stakeholder engagement is an impediment to knowledge translation and places the onus on review teams to utilize other strategies that can capture their perspectives to inform outcome selection.

LOGIC MODELS

The use of logic models provides a conceptual framework on which to base a range of decisions regarding systematic review scope, questions, methods, and outcomes.[18] Logic models use graphics to describe the intervention context and the mechanism by which an intervention might have an effect. They serve as a useful approach to hypothesize important proximal, intermediate, or distal outcomes for potential inclusion in a review based on a plausible program theory (i.e., understanding how an intervention works).[18] Given the complexity of public health interventions, the development of review logic models is challenging. Guides[19,20] and practical tools such as logic model templates have been suggested to assist with logic model development. For example, a process-orientated logic model template has been recently developed that can assist in outlining processes and pathways that connect an intervention to multiple outcomes.[19,20] Consulting key stakeholders and Review Advisory Groups can also inform the construction of logic models.

The consideration of potential harms is important in logic model development.[21] Direct, psychological, equity, social, and opportunity harms could all arise from public health intervention.[22] However, as public health interventions operate within complex systems, anticipating potential harms or adverse effects can be difficult.[23] For example, the organ transplantation rates in Chile markedly decreased (rather than increased) following the implementation of a presumed consent ("opt-out") regulation, which was suggested to be driven by public mistrust.[24] The potential for harms should be explored and theorized as rigorously as the anticipated beneficial effects of public health interventions. Bonell et al. suggest a process to develop "dark logic models" to guide the evaluation of potential harms on public health interventions, which could similarly be applied to reviews.[21] As an example, the systematic review examining sugar-sweetened beverages developed a logic model (Figure A, available as a supplement to the online version of this article at http://www.ajph.org), used a structured feedback from the Review Advisory Group, and identified short- and long-term outcomes, health and nonhealth outcomes, and intended and unintended outcomes. Systematic review authors should indicate if their assessment of harm-related outcomes is exploratory—that is, the intent to include harms is prespecified (but not the specific outcomes) and all harm outcomes identified in the review process are assessed and reported. Alternatively, assessment of harm may be confirmatory, where specific harms are prespecified and assessed in all included studies. The Agency for Healthcare Research and Quality provides further guidance on the prioritization and selection of harms for inclusion in systematic reviews.[25]

SYSTEMATIC OR SCOPING REVIEWS OR OVERVIEWS OF REVIEWS

Overviews of reviews use systematic methods to search and identify multiple systematic reviews on a related research question, and scoping reviews use systematic methods to search, select, and screen studies with the aim of mapping key concepts, evidence, and gaps in research.[1,26] They may be particularly efficient tools to identify an inventory of potential outcomes for inclusion in systematic reviews, including potential harms experienced in the population targeted by a public health intervention. The Cochrane PICO finder is a demonstration tool that uses annotations of

Cochrane Reviews to enable users to efficiently search for reviews based on population, intervention, comparison, or outcome (PICO) characteristics. The tool may provide a useful resource to collate outcomes from prior reviews with similar interventions or population characteristics.[27] Although useful, reviews of outcomes reported in trials or reviews may reflect their ease of measurement, availability for synthesis, or simply what has previously been reported rather than what might be important to stakeholders. Qualitative reviews of stakeholder perspectives can help to address this limitation. Brunton et al. found that a scoping review of qualitative research on parent, patient, and professional caregiver perspectives on neonatal care identified more outcome domains than were identified following a review of trials, and provided greater depth of understanding of these outcomes to facilitate outcome selection.[28]

DECISION FRAMEWORKS

Decision frameworks present key factors considered when making health care and policy decisions and represent valuable aids for the selection of review outcomes. Among the most widely used is the GRADE Working Group's DECIDE project's (Developing and Evaluating Communication strategies to support Informed Decisions and practice based on Evidence) Evidence-to-Decision (EtD) frameworks. Although the project has produced different frameworks for making clinical recommendations, coverage decisions, and health system or public health decisions, all include assessment of the

1. extent to which the problem is a priority,
2. desirable and undesirable effects of the intervention,
3. certainty of the evidence,
4. value of the outcomes to those affected,
5. balance between desirable and undesirable effects, and if this favors the intervention or the comparison,
6. resource use (including cost-effectiveness),
7. impact on equity,
8. acceptability, and
9. feasibility.[6]

Despite the broad consistency of key decision-making criteria across the GRADE EtD frameworks, it is acknowledged that the degree to which they are prioritized may vary by different stakeholder groups. For public health policy and health system decision-making, for example, issues of resource use, equity, acceptability, feasibility, and implementation have been suggested to be particularly important. Selecting outcomes that are harmonized and can usefully serve the information needs of a range of key public health stakeholders may maximize the benefit and impact of systematic reviews. The Standardized Outcomes Linking Across Stakeholder (SOLAR)[29] approach provides some guidance on how this may be achieved, including making decisions using a range of evidence, applying the GRADE tool, and generating health outcome descriptors.[29]

The WHO-INTEGRATE EtD framework was developed to overcome the limitations of the GRADE EtD framework in this area.[30] The criteria in the framework have a foundation in norms and values of the World Health Organization (WHO); they were developed on the basis of a large overview of systematic reviews of real-world decision-making criteria[31] and are intended to accommodate a complexity perspective. The framework consists of six substantive criteria (which are further specified in 26 subcriteria): balance of health benefits and harms; human rights and sociocultural acceptability; health equity, equality, and nondiscrimination; societal implications; financial and economic considerations; and feasibility and health system considerations. The framework provides guidance on how to identify criteria of relevance where systematic reviews of interventions may usefully contribute (i.e., social, economic, or ecological implications) and the relevance of inclusion of reviews of various study designs for those criteria. The WICID (WHO-INTEGRATE COVID-19) framework is a version of the WHO-INTEGRATE framework, adapted for political decision-making on nonpharmacological interventions to tackle the SARS-CoV-2 pandemic; it consists of 11+1 criteria and 49 aspects of relevance.[32]

OUTCOME SPECIFICATION

For all outcomes of interest, it is recommended that systematic reviewers prespecify (and report) the outcome domain, the specific measurement technique or instrument used to assess the outcome, the metric or format of outcome data used for analysis, the method of aggregation (e.g., percentage, mean), and the time points used in analysis.[33] If variations of these outcome elements are anticipated, as is often the case in reviews of public health intervention, reviewers can specify that specific variations (or all) will be included. Such specification is important, as the measures, research designs, and synthesis methods included in reviews often vary based on the outcome of interest. For example, large observational studies with long-term follow-up may be particularly important to include in reviews interested in assessing

serious but uncommon harms of a public health intervention.[25]

CONCLUSION

The potential benefits of systematic reviews are currently not being realized. The selection of review outcomes is a critical step in the production of public health reviews that are relevant to those who use them. Comprehensive efforts to identify, select, and prioritize the inclusion of critical outcomes aligned to both the evidence needs of a range of relevant end users and to the underlying intervention theory will enhance the utility and impact of public health reviews. Importantly, expressing outcomes using standardized taxonomies will also foster a shared understanding of outcomes across various stakeholders and facilitate comparisons across reviews.[34] AJPH

ABOUT THE AUTHORS

Luke Wolfenden and Sam McCrabb are with the School of Medicine and Public Health, Faculty of Health and Medicine, University of Newcastle, Callaghan, Australia. Ani Movsisyan and Jan M. Stratil are with the Institute for Medical Information Processing, Biometry and Epidemiology and the Pettenkofer School of Public Health, Ludwig Maximilian University of Munich, Munich, Germany. Sze Lin Yoong is with the Faculty of Health, Arts and Design, Swinburne University of Technology, Melbourne, Australia.

CORRESPONDENCE

Correspondence should be sent to Associate Professor Luke Wolfenden, Hunter New England Population Health, Locked Bag 10 Wallsend, NSW 2287, Australia (e-mail: Luke.Wolfenden@hnehealth.nsw.gov.au). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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CONFLICTS OF INTEREST

The authors have no competing interests to declare.

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Opioid Misuse Among American Indian Adolescents

Linda R. Stanley, PhD, Meghan A. Crabtree, PhD, and Randall C. Swaim, PhD

Objectives. To present data for opioid misuse among US reservation-based American Indian (AI) adolescents and to compare these data with national rates from Monitoring the Future (MTF).

Methods. Data were from a national sample of 33 schools participating in a substance use epidemiological survey of reservation-based AI adolescents during 2018 and 2019. Participants were 8th-, 10th-, and 12th-grade AI students (n = 1592). Measures included 12-month and 30-day use of OxyContin, Vicodin, heroin, and narcotics. We computed prevalence and compared it with MTF national prevalence.

Results. Across grades, AI youths demonstrated significantly greater past 12-month and 30-day opioid use relative to a national sample. Significant absolute differences in 12-month and 30-day prevalence levels ranged from 1.6% (8th-grade heroin) to 4.7% (12th-grade narcotics) and from 1.6% (12th-grade narcotics) to 1.8% (12th-grade heroin), respectively.

Conclusions. Opioid misuse prevalence levels were significantly greater for reservation-based AI adolescents relative to national prevalence levels.

Public Health Implications. Findings suggest that implementation of evidence-based efforts, adapted or developed to be culturally appropriate, should be significantly increased in tribal communities, along with policies to address the unique social, economic, and health issues they face. (*Am J Public Health*. 2021;111:471–474. https://doi.org/10.2105/AJPH.2020.306039)

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Over the last 2 decades, opioid-related deaths have rapidly increased among Indigenous peoples of the United States.[1] For example, Centers for Disease Control and Prevention data indicate that 2018 age-adjusted, opioid-related overdose deaths among American Indians and Alaska Natives (AIANs) were nearly 5 times the comparable rate in 1999 (2.9 per 100 000 in 1999 vs 14.2 per 100 000 in 2018).[1,2] Moreover, these numbers are likely to be undercounted by as much as 40% through misidentification of race on AIAN death certificates.[3] Opioid misuse among AIANs aged 12 years and older is also higher than national levels (5.8% vs 3.6% for past-year misuse), according to 2018 data from the National Survey on Drug Use and Health (NSDUH).[4]

Many tribes report overwhelming consequences from misuse and overdose on their reservations; however, data on opioid misuse on American Indian (AI) reservations is sparse.[5] To help fill this data gap, this article presents 2018–2019 data on the prevalence of opioid misuse among AI adolescents attending schools on or near reservations in the United States. These rates are compared with national rates measured by Monitoring the Future (MTF), a long-term epidemiological study of substance use among US adolescents.[6]

METHODS

Study data were from 33 schools that participated in an ongoing substance use epidemiological study of reservation-based AI adolescents (Our Youth, Our Future [OYOF]) during fall 2018 and spring and fall 2019 (hereafter, 2018–2019). Each year, a geographically stratified random sample of schools on or near reservations is drawn, and for schools that participate in the study, all students enrolled in grades 7 through 12 are surveyed. A description of the sampling frame, sample, and recruitment procedures; 2018–2019 sample; and procedures are provided in the supplemental materials (available as a

TABLE 1— Prevalence of Opiates and Other Narcotics, Comparing Reservation AI Students (2018–2019) and MTF Students (2018) in Grades 8, 10, and 12: United States

	8th Grade			10th Grade			12th Grade		
Type of Substance Use	AI (n = 647), % (95% CI)[a]	MTF, %[b] (95% CI)[a]	Diff % (95% CI)	AI (n = 559), % (95% CI)[a]	MTF, %[c] (95% CI)[a]	Diff, % (95% CI)	AI (n = 386), % (95% CI)[a]	MTF, %[d] (95% CI)[a]	Diff, % (95% CI)
Oxycontin, 12-mo	3.2 (1.9, 5.2)	0.8 (0.3, 1.7)	2.4* (1.2, 3.5)	6.3 (4.0, 9.7)	2.2 (1.4, 3.5)	4.1* (2.1, 6.0)	5.4 (2.5, 10.9)	2.3 (1.5, 3.3)	3.1* (0.5, 5.7)
Oxycontin, 30-d	1.3 (0.6, 3.2)	NA	. . .	2.5 (1.0, 6.1)	NA	...	3.1 (1.7, 5.5)	NA	...
Vicodin, 12-mo	0.8 (0.3, 1.8)	0.6 (0.2, 1.7)	0.2 (–0.6, 0.9)	2.4 (1.0, 5.6)	1.1 (0.5, 2.5)	1.3 (–0.3, 2.8)	1.7 (0.8, 3.7)	1.7 (1.3, 2.3)	0.0 (–1.4, 1.4)
Vicodin, 30-d	0.6 (0.2, 1.9)	NA	. . .	2.4 (1.0, 5.6)	NA	. . .	1.7 (0.8, 3.7)	NA	...
Narcotics (not heroin),[e] 12-mo	4.1 (2.5, 6.5)	NA	. . .	5.9 (3.6, 9.8)	NA	. . .	8.1 (5.3, 12.1)	3.4 (2.8, 4.1)	4.7* (2.5, 6.8)
Narcotics (not heroin), 30-d	0.9 (0.3, 2.6)	NA	. . .	3.3 (1.6, 6.8)	NA	. . .	2.7 (1.5, 4.7)	1.1 (0.7, 1.6)	1.6* (0.5, 2.7)
Heroin, 12-mo	1.9 (1.2, 2.9)	0.3 (0.2, 0.8)	1.6* (1.0, 2.2)	3.5 (2.0, 6.3)	0.2 (0.1, 0.3)	3.3* (2.8, 3.9)	2.5 (1.5, 4.1)	0.4 (0.2, 0.7)	2.1* (1.3, 2.9)
Heroin, 30-d	0.2 (0.0, 0.6)	0.1 (0.0, 0.3)	0.1 (–0.2, 0.3)	1.8 (0.7, 4.6)	0.1 (0.0, 0.2)	1.7* (1.3, 2.1)	2.0 (1.0, 4.3)	0.2 (0.1, 0.4)	1.8* (1.3, 2.4)
Opioids,[f] 12-mo	6.5 (4.7, 9.0)	NA	. . .	9.1 (6.7, 12.3)	NA	. . .	10.2 (6.8, 14.9)	NA	. . .
Opioids, 30-d	2.3 (1.2, 4.5)	NA	. . .	3.6 (1.8, 6.9)	NA	. . .	3.7 (2.1, 6.4)	NA	. . .

Note. AI = American Indian; CI = confidence interval; Diff = the absolute percentage point difference in prevalence (AI prevalence – MTF prevalence); MTF = Monitoring the Future; NA = not available.

[a]CIs are Clopper–Pearson binomial CIs, which are more optimal with proportions with a small number of events. The MTF CIs reported here may therefore differ from those in the MTF published report.
[b]MTF sample sizes for grade 8 are 3826 (annual OxyContin), 3814 (annual Vicodin), 9147 (annual heroin), and 9145 (30-day heroin).
[c]MTF sample sizes for grade 10 are 4294 (annual OxyContin), 4267 (annual Vicodin), 9521 (annual heroin), and 9506 (30-day heroin).
[d]MTF sample sizes for grade 12 are 6029 (annual OxyContin), 6008 (annual Vicodin), 13 460 (annual narcotics), 13454 (30-day narcotics), and 13 316 (30-day heroin).
[e]Narcotics defined as narcotics other than heroin—such as methadone, opium, morphine, codeine, Demerol, Vicodin, OxyContin, and Percocet—that are sometimes prescribed by doctors.
[f]Opioid use is use of any of the following: Oxycontin, Vicodin, narcotics other than heroin, and heroin.
*$\alpha < .01$.

supplement to the online version of this article at http://www.ajph.org), along with a brief summary of MTF sample and research design.

Prior to survey administration, parents could opt their child out of the survey; fewer than 1% of students were opted out. School staff administered the surveys online with Qualtrics software (Qualtrics, Provo, UT) during classroom hours to all 7th- through 12th-grade students enrolled and attending school on the survey dates. Responses were anonymous, and students were instructed to skip questions they did not wish to answer.

Participants were 8th-, 10th-, and 12th-grade students who self-identified as AI (n = 1592; we excluded students identifying as AN but not AI), with sample sizes of 647 for grade 8 (50.1% female, 49.3% male; mean age = 13.7 years), 559 for grade 10 (51.3% female, 47.8% male; mean age = 15.6 years), and 386 for grade 12 (47.2% female, 51.6% male; mean age = 17.5 years). MTF sample sizes were above 3500 for each grade and substance.[7]

The OYOF survey asks participants to report their last 12-month and 30-day use of OxyContin, Vicodin, heroin, and narcotics other than heroin (hereafter, narcotics), using verbatim wording from MTF (questions provided in the online supplemental materials). MTF reports 12-month use of OxyContin, Vicodin, and heroin, and 30-day use of heroin for 8th, 10th, and 12th grades, as well as 12-month and 30-day use of narcotics for 12th grade. Questions for OxyContin, Vicodin, and narcotics contain the phrase "without a doctor telling you to take it" to measure misuse. We coded all measures as 1 for any use and 0 for no use. Additionally, for OYOF, we calculated 12-month and 30-day opioid misuse as any use of OxyContin, Vicodin, narcotics, and heroin.

For each OYOF measure at each grade, we computed 12-month and 30-day prevalence and their 95% confidence intervals, excluding missing data (ranging from 3.8% to 4.5%), using Stata 15 survey commands (StataCorp LP, College Station, TX), with weighting to correct for regional over- or underrepresentation (for more information, see online supplemental materials). We calculated comparable MTF prevalence levels using data from Miech et al.,

following their instructions for use.[7,8] We calculated absolute differences between AI and MTF specific opioid use prevalence levels and corresponding 95% confidence intervals using a Wald test for significance.

RESULTS

Table 1 presents OYOF (AI) and MTF (national) prevalence levels and absolute differences in prevalence levels, where available. Frequency of use and relative risk ratios are provided in Table B (available as a supplement to the online version of this article at http://www.ajph.org). For brevity, the following summarizes notable absolute differences in prevalence levels across grades and specific opioids.

Last 12-Month Prevalence

Within each grade level, 12-month prevalence of use across specific opioids was significantly greater for the AI sample than for the national sample, except for Vicodin use, which showed no difference for any grade. Narcotics use in grade 12 demonstrated the largest difference, with AI prevalence nearly 5 percentage points greater than national prevalence (absolute difference = 4.7; $z = 4.2$; $P < .001$). Overall, 12-month AI opioid misuse was 6.5%, 9.1%, and 10.2% for grades 8, 10, and 12, respectively.

Last 30-Day Prevalence

Within each grade level, AI 30-day prevalence of use across specific opioids was significantly greater compared with the national sample, except for Vicodin and 8th-grade heroin. Grade-10 and grade-12 heroin use and grade-12 narcotics use showed the largest differences, with levels nearly 2 percentage points greater than national levels (absolute difference = 1.7, $z = 11.5$, $P < .001$; absolute difference = 1.8, $z = 6.8$, $P < .001$; absolute difference = 1.6, $z = 2.8$, $P = .005$, respectively). Overall, OYOF 30-day opioid misuse was 2.3%, 3.6%, and 3.7% for grades 8, 10, and 12, respectively.

DISCUSSION

AI 12-month and 30-day levels of opioid misuse, except for Vicodin and 8th-grade heroin, were significantly greater than national levels. These significant differences are further substantiated by the finding that AI opioid misuse levels were several times higher than 2018 NSDUH annual and 30-day opioid misuse prevalence for ages 12 to 17 years (2.8% and 0.7%, respectively).[4]

The higher misuse for AIs may reflect, in part, regional differences between the more rural sample of OYOF compared with MTF. We compared prevalence of misuse for 10th- and 12th-grade non-AI students in the OYOF sample with the corresponding levels for AI students (there were not enough non-AI 8th graders for these comparisons). The non-AI levels were generally lower than AI levels, although the differences were not always as large as those found in this study. This suggests that our results are not solely caused by a regional phenomenon. In addition, OYOF sample sizes are relatively small compared with those of MTF, and use of opioids, especially heroin, is low. A larger sample would give greater reliability in estimation and more confidence in the findings. However, the OYOF sample represents the largest and most representative sample of reservation AI youths to date.

Higher AI opioid misuse prevalence does not necessarily indicate higher levels of prescription opioid disorder, but it may portend subsequent increases in diagnoses of disorders, a diagnosis more common among AI adults than among other racial/ethnic groups.[9] Yule et al.[10] note that safe medication storage and disposal and evidence-based prevention can decrease adolescent opioid misuse. Our results suggest that implementation of such efforts, adapted or developed to be culturally appropriate, should be significantly increased in tribal communities. In conjunction with such efforts, there is an imperative for strategies to address the broader social and economic issues—giving special consideration to the roles of systemic discrimination and historical trauma—that lead to adverse childhood and community events and, ultimately, to the substantially higher rates of substance use among AI adolescents.[11,12] AJPH

ABOUT THE AUTHORS

Linda R. Stanley, Meghan A. Crabtree, and Randall C. Swaim are with the Tri-Ethnic Center for Prevention Research, Department of Psychology, Colorado State University, Fort Collins.

CORRESPONDENCE

Correspondence should be sent to Linda R. Stanley, Campus Delivery 1879, Colorado State University, Fort Collins, CO 85023 (e-mail: linda.Stanley@colostate.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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CONTRIBUTORS

L. R. Stanley, the primary author, conducted the statistical analysis and drafted the original article. M. A. Crabtree helped revise the article and wrote the supplementary materials. L. R. Stanley and R. C. Swaim were co-investigators and designers of the

original study. R. C. Swaim edited the original and revised articles.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

HUMAN PARTICIPANT PROTECTION

The Colorado State University institutional review board approved all procedures, under Protocol 19-9522H. Several tribal institutional review boards also approved conduct of the study.

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First-Destination Outcomes for 2015–2018 Public Health Graduates: Focus on Employment

Christine M. Plepys, MS, Heather Krasna, MS, Jonathon P. Leider, PhD, Emily M. Burke, MPH, Craig H. Blakely, PhD, MPH, and Laura Magaña, PhD

See also Shah, p. 336, and Galea and Vaughan, p. 350.

Objectives. To improve understanding of the future public health workforce by analyzing first-destination employment outcomes of public health graduates.

Methods. We assessed graduate outcomes for those graduating in 2015–2018 using descriptive statistics and the Pearson χ^2 test.

Results. In our analysis of data on 53 463 graduates, we found that 73% were employed; 15% enrolled in further education; 5% entered a fellowship, internship, residency, volunteer, or service program; and 6% were not employed. Employed graduates went to work in health care (27%), corporations (24%), academia (19%), government (17%), nonprofit (12%), and other sectors (1%). In 2018, 9% of bachelor's, 4% of master's, and 2% of doctoral graduates were not employed but seeking employment.

Conclusions. Today's public health graduates are successful in finding employment in various sectors. This new workforce may expand public health's reach and lead to healthier communities overall.

Public Health Implications. With predicted shortages in the governmental public health workforce and expanding hiring because of COVID-19, policymakers need to work to ensure the supply of public health graduates meets the demands of the workforce. (*Am J Public Health*. 2021;111:475–484. https://doi.org/10.2105/AJPH.2020.306038)

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Public health academics has grown rapidly in the past 2 decades at both the undergraduate and graduate levels.[1,2] However, we lack information on postgraduate first-destination employment and educational outcomes of public health graduates. A scoping review found 33 studies or reports since 1993 that included employment or educational outcome data for public health students after graduation.[3] Ten were studies of schools outside the United States, 18 were studies conducted by schools of their own alumni, 14 were studies of subdisciplines of public health (e.g., health communication, global health), 8 focused on either undergraduates or doctoral students, and 16 combined multiple cohorts of graduates (often more than a decade's worth of graduates) into 1 analysis, making the assessment of short- and long-term impacts of degrees on graduates' careers impossible. We have identified only 4 broad, recent, US-based studies, 2 of which are in the gray literature, including the results from the pilot project for this study.[4–7]

An assessment of first-destination outcomes of public health graduates is needed to ensure that there are enough trained public health professionals to fill rapidly changing workforce demands. On the workforce side, researchers have posited that vacancies from retiring governmental public health workers might be filled by the ample supply of recent public health graduates.[8] On the education side, an analysis of first-destination outcomes will help match curricula with workforce needs and identify emerging employment sectors. Trends in public health enrollment have changed, particularly with the increase in graduates at all degree levels. It is important for both academia and practice to know that graduates have a wide choice of employment options, stretching beyond government and into academia and the health care, nonprofit, and for-profit sectors.[6]

In 2016, the Council on Education for Public Health, recognized by the US Department of Education to accredit schools and programs of public health, made changes to their criteria that opened the door to curricula that "center learning around application and translation, giving students the opportunity to apply their . . . knowledge to real-life scenarios and job demands."[9(p3)] Further, schools and programs of public health should "educate the educators, practitioners, and researchers as well as . . . prepare public health leaders and managers."[10(p108)] The public health professional degrees, such as the master of public health degree, are expressly intended to prepare students for public health careers. Determining whether graduates enter the public health workforce and which sectors they join are key parts of evaluating these programs.

In 2014, the Association of Schools and Programs of Public Health (ASPPH) developed data-reporting standards, aligned with the Council on Education for Public Health, to capture the first-destination outcomes of public health graduates within a year after graduation.[11] The data set also includes information on graduates' continued education, fellowships, and other outcomes. We analyzed this new first-destination outcome data set, focusing on employment, to improve our understanding of the future public health workforce.

METHODS

We assessed first-destination employment and educational outcome data reported by members of ASPPH, a membership organization for domestic and international Council on Education for Public Health–accredited schools and programs of public health.[12] We collected first-destination outcome data for 64 592 public health graduates across bachelor's, master's, and doctoral degree programs for the graduating years 2015–2018 (Table 1 and Table A [available as a supplement to the online version of this article at http://www.ajph.org]). This included 9513 graduates from 55 institutions in 2015, 13 588 graduates from 75 institutions in 2016, 20 394 graduates from 112 institutions in 2017, and 21 097 graduates from 111 institutions in 2018. Across the pooled data, 31% of graduates were from bachelor's, 63% from master's, and 7% from doctoral degree programs.

ASPPH collects data on first-destination outcome statuses—employed; employed in a fellowship, internship, or residency; pursuing continued education; not employed but seeking employment; not employed and not seeking employment; and unknown. The statuses were mutually exclusive; respondents were asked to select the response that best described their situation. ASPPH members also report detailed employment information, continuing education information, and public health degree debt.

Individual ASPPH member schools and programs collected data from their graduates and reported to ASPPH. ASPPH offered a core survey instrument to members that was developed in tandem with the data-reporting standards. ASPPH members could also use their own data collection instruments, which may have been in-house surveys or surveys based on other nationally accepted first-destination reporting systems, such as the National Association of Colleges and Employers survey.[13] Members also may have collected information from faculty, social media (e.g., LinkedIn), or elsewhere on the Internet, with the precaution to verify the data collected with these alternative approaches. Consequently, the data can generally be categorized as self-reported graduate outcomes.

Because members have up to 1 year to obtain a first-destination outcome on their graduates, data reported to ASPPH were reported on graduates from the academic years 2014–2015, 2015–2016, 2016–2017, and 2017–2018 (the class of 2014–2015, for example, was defined as graduates from July 1, 2014–June 30, 2015, with the time frame for obtaining an outcome ending in June 2016). We cleaned the data set and standardized it to affirm data-reporting definitions and ensure that survey display logic and skip patterns were adhered to, as well as to identify any incompatibilities in questions individual members asked that may have deviated from the core survey instrument or ASPPH data-reporting standards and definitions.

The data variables included graduate outcome (we refer to this as "first-destination outcome" throughout this article, and this includes employed, pursuing continued education, not employed but seeking employment, etc.), employment type (i.e., full time, part time), employment sector (government, nonprofit, hospital, corporation, etc.), employment sector detail (federal government, local government, etc.), salary, and degree debt. Detailed descriptions of variables and value labels are available in Table D (available as a supplement to the online version of this article at http://www.ajph.org). We calculated descriptive statistics on first-destination outcomes, employment by sector, and employment by sector detail. We also assessed continued education outcomes. We made bivariate comparisons using the Pearson χ^2 test. In further analysis, we focused on the percentage of graduates not employed but seeking employment by area of study, although a number of areas had

TABLE 1— Number and Percentage of Public Health Graduate Respondents by Characteristic and Year Graduated: Association of Schools and Programs of Public Health Members, Graduating Years 2015–2018

Characteristic	2015 (n = 9513), No. (%)	2016 (n = 13 588), No. (%)	2017 (n = 20 394), No. (%)	2018 (n = 21 097), No. (%)	Pooled (n = 64 592), No. (%)
Degree					
Bachelor's	2 184 (23)	3 981 (29)	6 394 (31)	7 150 (34)	19 709 (31)
Master's	6 475 (68)	8 720 (64)	12 673 (62)	12 645 (60)	40 513 (63)
Doctoral	854 (9)	887 (7)	1 327 (7)	1 302 (6)	4 370 (7)
Area of study					
Allied health	431 (5)	891 (7)	1 192 (6)	1 505 (7)	4 019 (6)
Biomedical sciences	120 (1)	150 (1)	292 (1)	465 (2)	1 027 (2)
Biostatistics	443 (5)	576 (4)	862 (4)	923 (4)	2 804 (4)
Environmental sciences	585 (6)	674 (5)	1 091 (5)	929 (4)	3 279 (5)
Epidemiology	1 334 (14)	1 805 (13)	2 516 (12)	2 526 (12)	8 181 (13)
General public health	1 361 (14)	2 984 (22)	5 185 (25)	5 441 (26)	14 971 (23)
Global health	388 (4)	600 (4)	818 (4)	653 (3)	2 459 (4)
Health disparities	12 (0)	24 (0)	67 (0)	31 (0)	134 (0)
Health education/behavioral sciences	1 446 (15)	2 147 (16)	2 719 (13)	2 860 (14)	9 172 (14)
Health informatics	0 (0)	3 (0)	58 (0)	38 (0)	99 (0)
Health policy and management	1 668 (18)	1 820 (13)	2 850 (14)	2 852 (14)	9 190 (14)
Maternal and child health	296 (3)	361 (3)	519 (3)	426 (2)	1 602 (2)
Nutrition	335 (4)	349 (3)	396 (2)	415 (2)	1 495 (2)
Public health practice	295 (3)	358 (3)	562 (3)	502 (2)	1 717 (3)
Other	799 (8)	846 (6)	1 267 (6)	1 531 (7)	4 443 (7)
Reporting institutions					
Unique count of reporting institutions	55	75	112	111	118

relatively few first-destination outcomes. We cleaned the data and analyzed them in Stata 16.1.[14]

RESULTS

Across all years and 64 592 alumni, general public health was the most common area of study (23% of graduates), followed by health policy and management (14%), health education or behavioral sciences (14%), and epidemiology (13%).

Among a cohort of 55 institutions reporting for each graduating year from 2015 to 2018, reporting of bachelor's degree program graduates increased 62% (from 2184 to 3541), master's degree program graduates increased 21% (from 6475 to 7820), and doctoral degree program graduates increased 6% (from 854 to 903). This was largely driven by an increase in reporting of graduates from the general public health area of study. For bachelor's degree programs, 31% were general public health in 2015, compared with 47% in 2018 ($P \leq .001$). For master's degree programs, 10% were general public health in 2015 and 16% in 2018 ($P \leq .001$). For doctoral degree programs, 3.0% were general public health in 2015, and 4.6% in 2017 ($P = .07$).

Of the reported 64 592 public health graduates, 53 463 (83%) had known first-destination outcomes. This was 71% for bachelor's, 88% for master's, and 92% for doctoral degree programs. We observed differential success in determining first-destination outcomes by institution. For students graduating in 2018, the interquartile range (IQR) for capturing postgraduate outcomes was 80% to 97% for bachelor's (n = 43 institutions), 85% to 97% for master's (n = 110 institutions), and 94% to 100% for doctoral (n = 70 institutions) degree programs. First-destination outcomes are shown in Table 2.

Across all years, 73% of all graduates with reported first-destination outcomes were employed; 15% were enrolled in further education; 5% had a fellowship, internship, residency,

TABLE 2— Number and Percentage of Public Health Graduates by Degree Level and Known First-Destination Graduate Outcome: Association of Schools and Programs of Public Health Members, Graduating Years 2015–2018

Degree	Employed, No. (%)	Fellowship, Internship, Residency, No. (%)	Volunteer or Service Program, No. (%)	Enrolled in Further Study, No. (%)	Not Employed and Not Seeking, No. (%)	Not Employed and Seeking, No. (%)	Total Reported Outcomes, No.	Outcome Unknown, No.
Bachelor's								
2015	880 (65)	27 (2)	8 (1)	350 (26)	8 (1)	79 (6)	1 352	832
2016	1 991 (66)	34 (1)	24 (1)	726 (24)	29 (1)	198 (7)	3 002	979
2017	2 710 (63)	63 (1)	59 (1)	1 163 (27)	30 (1)	305 (7)	4 330	2 064
2018	2 961 (57)	78 (1)	80 (2)	1 623 (31)	26 (0)	452 (9)	5 220	1 930
Master's								
2015	4 294 (77)	324 (6)	14 (0)	690 (12)	26 (0)	231 (4)	5 579	896
2016	6 237 (79)	484 (6)	20 (0)	818 (10)	55 (1)	313 (4)	7 927	793
2017	8 531 (79)	435 (4)	29 (0)	1 314 (12)	80 (1)	474 (4)	10 863	1 810
2018	8 513 (76)	628 (6)	34 (0)	1 393 (12)	126 (1)	457 (4)	11 151	1 494
Doctoral								
2015	617 (78)	118 (15)	1 (0)	35 (4)	6 (1)	9 (1)	786	69
2016	645 (77)	153 (18)	2 (0)	16 (2)	6 (1)	15 (2)	837	51
2017	975 (80)	198 (16)	3 (0)	21 (2)	6 (0)	21 (2)	1 224	104
2018	919 (77)	226 (19)	0 (0)	15 (1)	8 (1)	24 (2)	1 192	107
Total	39 273 (73)	2 768 (5)	274 (1)	8 164 (15)	406 (1)	2 578 (5)	53 463	11 129

volunteer, or service program appointment; 5% were not employed but were seeking employment, and 1% were not employed and were not seeking employment (by choice). Comparing the 2015 and 2018, respectively, graduating years, the percentages of employed graduates by degree level were 65% and 57% for bachelor's ($P \leq .001$), 77% and 76% for master's ($P = .37$), and 79% and 77% for doctoral ($P = .38$). Twenty-six percent of bachelor's degree program graduates were reported as enrolled in further education for graduating year 2015, compared with 31% in 2018 ($P \leq .001$), 12% of master's in 2015 and 2018 ($P = .82$), and 4% versus 1% of doctoral graduates in, respectively, 2015 and 2018 ($P \leq .001$). Not employed but seeking employment was highest for bachelor's degree program graduates at 6% in 2015 and 9% in 2018 ($P \leq .001$), followed by 4% for master's degree program graduates in 2015 and 2018 ($P = .90$), and 1% versus 2% for doctoral degree program graduates in, respectively, 2015 and 2018 ($P = .14$).

Among those with reported full-time employment, we captured employment sector for 26 422 graduates. Employment sector was not reported for fellowships or internships. Overall, 27% of graduates were employed in health care organizations, 24% for-profit organizations, 19% academic institutions, 17% government agencies, 12% nonprofit organizations, and 1% other sectors or self-employed. The distribution of employment sectors varied by degree level (Table 3). Doctoral degree graduates' top employment sectors were academic institutions (42%), for-profit organizations (21%), and government agencies (16%). Master's degree graduates found employment in health care organizations (29%), for-profit organizations (21%), government agencies (19%), and academic institutions (18%). Bachelor's degree graduates were different from both doctoral and master's degree graduates, with for-profit

TABLE 3— Number and Percentage of Full-Time Employed Public Health Graduates by Degree Level and Known Employment Sector: Association of Schools and Programs of Public Health Members, Graduating Years 2015–2018

Employment Sector	Bachelor's Degree, No. (%)	Master's Degree, No. (%)	Doctoral Degree, No. (%)	Total, No. (%)
Academic institution	507 (10)	3479 (18)	947 (42)	4933 (19)
Academic	493 (10)	3248 (17)	894 (40)	4635 (18)
Other	14 (0)	231 (1)	53 (2)	298 (1)
For-profit organization	1905 (38)	3978 (21)	467 (21)	6350 (24)
Consulting	240 (5)	1359 (7)	95 (4)	1694 (6)
Health information technology	70 (1)	287 (1)	31 (1)	388 (1)
Insurance	82 (2)	324 (2)	14 (1)	420 (2)
Other	1513 (30)	2008 (10)	327 (15)	3848 (15)
Government agency	518 (10)	3748 (19)	357 (16)	4623 (17)
Federal	141 (3)	834 (4)	175 (8)	1150 (4)
Local	175 (4)	985 (5)	37 (2)	1197 (5)
Other	75 (2)	800 (4)	76 (3)	951 (4)
State	124 (2)	1106 (6)	67 (3)	1297 (5)
Tribal	3 (0)	23 (0)	2 (0)	28 (0)
Health care organization	1351 (27)	5488 (29)	266 (12)	7105 (27)
Hospital	452 (9)	3039 (16)	126 (6)	3617 (14)
Other	899 (18)	2449 (13)	140 (6)	3488 (13)
Nonprofit organization	596 (12)	2401 (12)	182 (8)	3179 (12)
Other	569 (11)	2271 (12)	173 (8)	3013 (11)
Trade association	27 (1)	130 (1)	9 (0)	166 (1)
Other employment sector	64 (1)	61 (0)	10 (0)	135 (1)
Self-employed	23 (0)	68 (0)	6 (0)	97 (0)
Total known sector	4964	19 223	2235	26 422
Unknown sector	369	874	65	1308

organizations (38% overall, with 30% of all undergraduates finding employment in for-profit corporations outside consulting, health information technology, and insurance) being the top employment sector, followed by health care organizations (27%), nonprofit organizations (12%), and government agencies and academic institutions, each at 10%.

Table 4 shows the proportion of alumni with known first-destination outcomes, excluding those enrolled in further education, who were not employed but were seeking employment by degree level and area of study. A higher than average proportion of graduates sought employment in certain areas of study. At the bachelor's degree level, maternal and child health (19%) and allied health, nutrition, and public health practice (each at 11%) had higher than the average of 10% not employed but seeking employment. At the master's level, health disparities (13%), nutrition (11%), global health (8%), environmental sciences (6%), and biomedical sciences (6%) were higher than the average (5%). At the doctoral level, the areas of study above the average (2%) were nutrition (4%) at the highest, followed by general public health, health education and behavioral sciences, biomedical sciences, global health, and maternal and child health (all at 3%).

Salary data were reported for 9857 full-time employed graduates. The data were reported as absolute values and are presented in ranges in Table B (available as a supplement to the online version of this article at http://www.ajph.org). The median salary among bachelor's degree graduates who were employed full time was $36 000 (IQR = $30 000–$46 000). For full-time employed master's degree graduates, the median salary was $58 000 (IQR = $45 000–$73 000), and for doctoral degree graduates, it was $80 000 (IQR = $55 000–$101 000).

Public health degree debt was captured consistently among those who reported debt, although it was not captured consistently regarding whether a graduate had debt. Consequently, we were able to examine debt levels only for the 6451 responses with reported debt loads (Table C, available as a supplement to the online version of this article at http://www.ajph.org). Among 1574 bachelor's degree program graduates with any debt, 55% had $25 000 or more debt, as did 80% of 4521 master's degree program graduates and 73% of 356 doctoral degree program graduates. Overall, 44% of graduates with reported debt had more than $50 000 in debt and 10% had more than $100 000 (comprising 3% of bachelors, 12% of master's, and 24% of doctoral graduates).

TABLE 4— Number and Percentage of Public Health Graduates Not Employed but Seeking Employment by Degree Level and Area of Study: Association of Schools and Programs of Public Health Members, Pooled for Graduating Years 2015–2018

Area of Study	Bachelor's Degree, No (%)	Master's Degree, No (%)	Doctoral Degree, No (%)
Allied health	145 (11)	25 (5)	3 (2)
Biomedical sciences	0 (0)	25 (6)	4 (3)
Biostatistics	0 (0)	45 (3)	2 (0)
Environmental sciences	12 (5)	109 (6)	8 (2)
Epidemiology	1 (9)	259 (5)	12 (1)
General public health	373 (9)	151 (3)	5 (3)
Global health	5 (6)	134 (8)	6 (3)
Health disparities	. . .	12 (13)	. . .
Health education/behavioral sciences	138 (8)	251 (5)	15 (3)
Health informatics	. . .	2 (2)	. . .
Health policy and management	28 (9)	265 (4)	6 (1)
Maternal and child health	46 (19)	43 (5)	2 (3)
Nutrition	18 (11)	66 (11)	3 (4)
Public health practice	13 (11)	40 (4)	0 (0)
Other	255 (17)	48 (3)	3 (2)
Total	1034 (10)	1475 (5)	69 (2)

Note. The table excludes respondents who reported they were enrolled in further study.

DISCUSSION

First-destination outcomes for public health graduates, particularly employment outcomes, are a key metric in assessing the supply and demand equation of the public health workforce. Graduates' first-destination outcomes provide academia insight into changes in the job market, which may then inform decisions on the degrees and areas of study an institution offers. If first-destination outcome data show changes in employment trends in an area of study, schools and programs of public health may alter their courses and curricula to align with these trends. A school's or program's ability to prepare graduates with the competencies demanded by the workforce may help ensure student success, not only in finding employment that uses their education but also in finding career satisfaction. Further, as public health responds to the COVID-19 pandemic, new competencies may be needed to address such crises.

The variability in employment outcome by area of study is consistent with previous research. It is not surprising that biostatistics graduates have the lowest rates of unemployment, considering that statistics is the eighth fastest-growing occupation in the United States.[15] Global health graduates, on the other hand, have higher than average rates of job seeking, consistent with another study.[16] Higher job seeking in global health graduates may be attributable to current job openings in the field requiring more extensive experience than most recent graduates have.[17]

Employment by degree level shows that graduates with advanced public health degrees had better employment outcomes, similar to findings of a national data collection by the National Association of Colleges and Employers.[5] This study shows that first-destination employment outcomes of public health doctoral graduates are more favorable than had been reported in another study, in which data were collected before or upon graduation.[18] However, questions remain regarding whether bachelor's degree graduates are competing for the same jobs as master's degree graduates. This study does show that there are differences in employment sectors by degree level, however; an analysis of employer requirements may elucidate the answer further. In addition, there may be demand for different education formats to replace or bolster formal degrees (certifications, micromasters, etc.) that increase the number of public health workers with needed competencies.

Governmental public health remains a key necessity for communities, nations, and the world, as shown in the COVID-19 response. Filling new or vacated government public health positions is crucial.[8] However, although there has been an increase in bachelor's degree graduates, they do not seem to be filling governmental vacancies at high rates. Historically, master's and doctoral degree graduates have entered governmental public health at higher rates. A study analyzing 2404 public health graduates from 1978 and 1979 showed that 52% of graduates found employment in government,[19] and in a 1992 longitudinal study of 2429 graduates, 42% of graduates in the classes of 1956–1965 found their first-destination employment in health departments, whereas 17% of the classes of 1976–1985 began their careers in health departments.[20]

If government agencies wish to recruit public health graduates, recent literature suggests they may need to reassess hiring practices to recruit enough trained candidates.[21,22] Even if only a small minority of current governmental public health employees have degrees in public health[23]—although it could be argued that this is also an indicator of underfunding—if there is a workforce shortage, it is uncertain whether there will be enough public health graduates who will enter government agencies to fill the gap. This potential workforce mismatch should be explored further.[24]

Although it is too soon to know how the COVID-19 pandemic will affect the class of 2020, the hardest hit employment sectors (e.g., restaurant, travel, entertainment, and retail) are less likely to employ public health graduates,[25] although furloughs and layoffs in the public sector have begun.[26] Additionally, health care systems across the country have been laying off staff, although health care, science, technology, engineering, and mathematics occupations may have smaller numbers of jobs at risk for layoffs.[27] Overall, sharp declines in job postings, including for statisticians and other highly skilled professionals, in geographic areas most affected by COVID-19 are concerning.[28]

There may be new opportunities related to pandemic response, such as epidemiology and contact-tracing efforts.[29,30] Occupations that were growing quickly before the pandemic, such as data analytics, may continue to grow.[31] However, informal surveys of college recruiters (not specific to public health; n = 246) show that 7.8% to 9.0% have rescinded job offers and 31.0% delayed start dates for full-time hires.[32] Anecdotally, informal discussions with career service professionals from several public health schools indicate that

2020 graduates appear to be employed at rates similar to those of previous years. For both traditional public health roles and new COVID-19–related positions, graduates appear to be more flexible about the roles they will accept. Regardless of what we now know about the workforce, recalibration may be necessary after the current pandemic.

Return on investment in higher education is a much-discussed topic that may play a larger part in explaining the vocational decisions of graduates. A recent study found

> a net benefit in career outcomes associated with a public health master's degree, although . . . some other master's degrees likely offer greater lifetime earning potentials or lower lifetime debt associated with degree attainment.[7(p1)]

A future analysis of this data set may identify salary differentials among employment sectors and the possible impact of degree debt on vocational choice—perhaps showing graduates with higher debt choosing fields with higher salaries.

Overall, a study of the longitudinal career paths of public health graduates would illuminate the longer-term earnings of public health professionals. Such career path studies would also show whether public health graduates gain government experience at some point in their careers, whether they are moving to higher-paying sectors earlier to pay off debt, whether new and different employers are seeking graduates with public health skills, and the impact of the COVID-19 pandemic on graduates' careers.

Limitations

This study has several limitations of note. The data we analyzed were collected by more than 100 institutions during the first 4 years of ASPPH members reporting graduates' first-destination outcomes. The decentralized approach to first-destination outcomes reporting allows institutions to customize their collection methods, creating possible hard-to-detect issues with standardization. Therefore, we used rigorous data cleaning and member data checking to identify data issues, although data-reporting issues may remain. For instance, we found that some institutions reported unknown graduate debt levels as 0, whereas other institutions reported no debt levels at 0 and unknown debt levels as missing. Additionally, some institutions relied on graduate self-reporting of debt, and even when asked about "public health degree debt," some graduates may have reported all educational debt (including from previous degrees). Relatedly, there are several areas that have high levels of unknown or missing data. About 80% of records had associated graduate outcomes for graduating in 2017, and 83% in 2018.

Of note, 2017 was the first year that all members of ASPPH reported graduate outcomes across all public health degrees. Certain members have higher levels of unknown or missing data; this is problematic as an internal validity consideration. This is particularly the case for bachelor's degree graduates' data, which have greater levels of unknown outcomes. We have analyzed multiple years and examined outcomes by institution (some institutions may have more resources than others for complex data collection on alumni). Sensitivity analyses, excluding institutions with lower reported outcome rates, did not appear to change national estimates. Consequently, generalizability is not implicated, although greater precision would be achieved with higher levels of reporting. Another caveat with these data is that previous work experience of the graduates is not known. Additionally, we did not directly clarify the factors influencing the career decisions of public health graduates, including salary, debt, or previous internship experience. Finally, employment sector data were not collected for graduates entering into fellowship, internship, or residency programs, which might change the percentages entering certain sectors, along with the salary data, for sectors that rely more heavily on fellowships for recruitment.

Public Health Implications

Postgraduate first-destination employment and educational outcomes of public health graduates have important implications for public health policy and practice. Especially now, public health has an unprecedented opportunity to affect the health and well-being of populations via different employment sectors. Governmental public health has long experienced a workforce shortage owing to underfunding,[8] but research has shown that public health graduates experience barriers to employment in the sector.[22] This new study, showing that only 17% of graduates enter government work, underscores the need for continued policy efforts to increase funding to and encourage employment in the government sector.

Employment data indicate that public health graduates are entering employment sectors at different rates than historical data show and potentially expanding public health's impact—whether these graduates are contributing to the 10 essential services of public health in an obvious way[33] or advancing the sustainable

developmental goals and innovating with new technologies for the well-being of diverse populations. With the COVID-19 pandemic, new opportunities for employment may be on the horizon as government, businesses, and communities continue to respond and change their practices.

In addition, with the growth and changes in public health degree programs, it is important to know which areas of study are achieving the best employment outcomes, identify which sectors are recruiting these graduates, and help schools and programs of public health communicate their impact to prospective students, employers, and those who support their educational missions. With more focus on public health and more students studying public health, there will be a better-educated citizenry who "understand and appreciate public health and value its contributions to their lives."[34(p428)] With more graduates embarking on careers both in and outside the traditional public health workforce and being engaged citizens, public health graduates are ready to "[embrace] health as a value worth pursuing and protecting," which may then lead to healthier communities overall.[35(p200)] AJPH

ABOUT THE AUTHORS

Christine M. Plepys, Emily M. Burke, and Laura Magaña are with the Association of Schools and Programs of Public Health, Washington, DC. Heather Krasna is with Columbia University Mailman School of Public Health, New York, NY. Jonathon P. Leider is with the University of Minnesota School of Public Health, Minneapolis. Craig H. Blakely is with the University of Louisville School of Public Health and Information Sciences, Louisville, KY.

CORRESPONDENCE

Correspondence should be sent to Christine M. Plepys, MS, Association of Schools and Programs of Public Health, 1615 L St NW Suite 510, Washington, DC 20036 (e-mail: cplepys@aspph.org). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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C. M. Plepys and H. Krasna are co-first authors. C. M. Plepys, H. Krasna, E. M. Burke, and C. H. Blakely conceptualized the project and collected the data. J. P. Leider analyzed the data. All authors contributed to and provided critical review and final approval of the editorial.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

HUMAN PARTICIPANT PROTECTION

We have reported all data in aggregate with no identifiers; therefore, the Association of Schools and Programs of Public Health determined that this study is not human participant research.

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Monitoring Sexual Violence Trends in Emergency Department Visits Using Syndromic Data From the National Syndromic Surveillance Program—United States, January 2017–December 2019

Ashley Schappell D'Inverno, PhD, Nimi Idaikkadar, MPH, and Debra Houry, MD, MPH

See also Waechter, p. 339.

Objectives. To report trends in sexual violence (SV) emergency department (ED) visits in the United States.

Methods. We analyzed monthly changes in SV rates (per 100 000 ED visits) from January 2017 to December 2019 using Centers for Disease Control and Prevention's National Syndromic Surveillance Program data. We stratified the data by sex and age groups.

Results. There were 196 948 SV-related ED visits from January 2017 to December 2019. Females had higher rates of SV-related ED visits than males. Across the entire time period, females aged 50 to 59 years showed the highest increase (57.33%) in SV-related ED visits, when stratified by sex and age group. In all strata examined, SV-related ED visits displayed positive trends from January 2017 to December 2019; 10 out of the 24 observed positive trends were statistically significant increases. We also observed seasonal trends with spikes in SV-related ED visits during warmer months and declines during colder months, particularly in ages 0 to 9 years and 10 to 19 years.

Conclusions. We identified several significant increases in SV-related ED visits from January 2017 to December 2019. Syndromic surveillance offers near-real-time surveillance of ED visits and can aid in the prevention of SV. (*Am J Public Health*. 2021;111:485–493. https://doi.org/10.2105/AJPH.2020.306034)

The Centers for Disease Control and Prevention (CDC) defines sexual violence (SV) as a sexual act that is committed or attempted by another person without freely given consent of the victim or against someone who is unable to consent or refuse.[1] SV is a significant and preventable public health issue. Nearly 52.2 million women and 27.6 million men in the United States have experienced some form of contact SV (i.e., rape, being made to penetrate someone else, sexual coercion, or unwanted sexual contact) in their lifetime.[2] SV is associated with multiple negative health impacts and costs to society,[3,4] with a recent study suggesting an estimated lifetime economic burden of $3.1 trillion for rape.[5]

Monitoring SV temporal and demographic trends is important for informing prevention and response efforts, yet because of the limitations of current data collection systems and other methodological challenges, national data on this topic are rarely reported in a timely manner. This lag time challenges timely monitoring and response for populations currently at risk of SV that are urgently in need of prevention programs. Using data from CDC's National Syndromic Surveillance Program (NSSP), we examined SV-related emergency department (ED) visits

in the United States from January 1, 2017, through December 31, 2019, according to sex and age groups.

METHODS

NSSP's BioSense Platform launched in 2003 to establish a national public health surveillance system for early detection and assessment of potential bioterrorism-related illness. It has expanded to track infectious diseases and injuries. The cloud-based BioSense Platform is a secure, integrated health information system with standardized tools and procedures that allows public health officials to collect, analyze, and share syndromic data. Syndromic data from hospitals that voluntarily participate include data from several sources, including patient encounter data from EDs, urgent care, ambulatory care, and inpatient health care settings, as well as pharmacy and laboratory data. Health officials can analyze syndromic data in near real time to monitor and detect events, diseases, or outbreaks of public health significance. These data improve awareness of health threats over time and across regional boundaries, which can then inform response efforts (see https://www.cdc.gov/nssp/overview.html#bioSense).

We used NSSP data derived from participating states and jurisdictions to monitor trends in SV-related ED visits among all age groups from January 1, 2017, through December 31, 2019. ED visits are determined by facilities that are categorized as "emergency" and exclude patients designated as only inpatient or only outpatient. Forty-seven states participate in NSSP by contributing demographics, chief complaint data, and *International Classification of Diseases, Tenth Revision, Clinical Modification* (*ICD-10-CM*; Hyattsville, MD: National Center for Health Statistics; 2000) diagnostic codes, which covers approximately 73% of ED visits in the United States.[6,7] Availability and completeness of data vary across participating EDs with chief complaint text and discharge diagnosis codes missing in 12% and 38% of ED visits in NSSP, respectively. NSSP coverage has been increasing over time; the latest details on coverage can be found at https://www.cdc.gov/nssp/overview.html. NSSP data were analyzed using the Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE) platform.

A CDC-developed syndrome definition was validated and used to assess SV-related ED visits. The SV syndrome definition used in this report was uploaded to ESSENCE and labeled Sexual Violence V2. It was developed and refined after coauthors developed Sexual Violence V1 in collaboration with the Washington State Health Department. The definition allowed for querying patients' chief complaint history, discharge diagnosis, and admission reason code and description fields for a combination of terms frequently used in SV visits and Boolean operators (e.g., sexual assault, rape, forced sex, or SANE exam), as well as SV-related *ICD-10-CM* codes (Table 1, available as a supplement to the online version of this article at http://www.ajph.org). The definition also contained exclusions such as terms that are spelled similar to SV-related terms, but are not related to an SV incident (e.g., grape or scrape). Finally, the *ICD-10-CM* diagnosis code Z62.810 (history of physical or sexual abuse in childhood) was originally included in the syndrome definition but ultimately was removed because a determination was made to only include visits in which the patient was seeking medical care immediately following a SV-related event.

We computed monthly SV rates (per 100 000 ED visits) overall and stratified by sex and age group. We calculated rates for each stratum by providing the Joinpoint Regression Program[8] with the numerator (i.e., the number of SV-related ED visits per month) and the denominator (i.e., the total number of ED visits per month). Joinpoint then produced a rate by dividing the numerator by the denominator and multiplying by 100 000. Trends were characterized in terms of monthly percentage change (MPC) estimates by trend segment as well as average monthly percent change estimates for the overall study period and for each stratum. We calculated all reported percent changes using the modeled average MPC; thus, all percent changes reflect modeled increases or decreases. We selected log-transform and Poisson variance options in Joinpoint. Under this approach, Joinpoint uses the numerators to construct a separate weight for each data point and then conducts a weighted least squares regression.

RESULTS

Approximately 298 million ED visits were captured by NSSP from January 2017 to December 2019; 196 948 of those met the syndrome definition criteria as an SV-related visit (an overall rate of about 66 per 100 000 ED visits). There were several fluctuations during the 3-year time period, which reflect significant changes in the rates of SV-related ED visits over time. From January 2017 to July 2017, the MPC significantly increased (7.17%), significantly decreased from July 2017 to January 2018 (–5.70%), significantly increased from January 2018 to July 2018 (6.53%), significantly decreased again from July 2018 to January 2019 (–4.08%), significantly

TABLE 1— Trends and Changes in Monthly Rates for Emergency Department Visits Related to Sexual Violence Overall and by Sex—National Syndromic Surveillance Program: United States, January 2017–December 2019

	% Change January 2017–December 2019[b]	Average MPC (95% CI)	Trend 1[a] January 2017–July 2017, MPC[c] (95% CI)	Trend 2[a] July 2017–January 2018, MPC[c] (95% CI)	Trend 3[a] January 2018–July 2018, MPC[c] (95% CI)	Trend 4[a] July 2018–January 2019, MPC[c] (95% CI)	Trend 5[a] January 2019–July 2019, MPC[c] (95% CI)	Trend 6[a] July 2019–December 2019, MPC[c] (95% CI)
Overall	26.58	1.03 (0.18, 1.90)	7.17 (4.92, 9.48)	−5.70 (−7.39, −2.69)	6.53 (4.11, 9.02)	−4.08 (−6.16, −1.96)	5.89 (3.66, 8.16)	−4.24 (−6.17, −2.27)
Sex								
Female	26.87	1.04 (0.11, 1.97)	7.48 (5.01, 10.00)	−5.42 (−7.93, −2.85)	6.88 (4.25, 9.58)	−4.49 (−6.73, −2.20)	6.37 (3.95, 8.85)	−4.53 (−6.62, −2.41)
Male		0.90 (−0.42, 2.23)	5.74 (2.39, 9.19)	−5.12 (−8.56, −1.54)	7.05 (1.74, 12.63)[d]	−1.82 (−4.19, 0.62)[d]	3.88 (0.62, 7.25)	−2.90 (−5.84, 0.13)

Note. CI = confidence interval; ED = emergency department; MPC = monthly percent change. Monthly rate per 100 000 ED visits. Rates calculated as number of ED visits related to sexual violence divided by the total number of ED visits for each month and multiplied by 100 000. Data current as of July 1, 2020.

[a]Joinpoint regression determines the number of linear segments needed to describe a trend and identifies points (i.e., Joinpoints) in which linear trends change. The Joinpoint is included in each adjoining linear segment.
[b]Any percent change not reported indicates the trend line for that stratum was not significant.
[c]Joinpoint reports annual percent change, but the unit of time in this analysis is 1 month, so this has been modified to MPC.
[d]The time period for trend 3 in males is January 2018–June 2018, and the time period for trend 4 in males is June 2018–January 2019.

increased from January 2019 to July 2019 (5.89%), and significantly declined from July 2019 to December 2019 (–4.24%; Figure 1 and Table 1).

Trends Stratified by Sex

From January 2017 to December 2019, there were 173 244 SV-related ED visits by females. Females experienced a significant positive trend in SV-related ED visits over the entire time period (1.04% per month; Figure 2 and Table 1). Rates of female SV-related ED visits showed a sharp, significant increase (7.48%) from January 2017 to July 2017, significantly decreased from July 2017 to January 2018 (–5.42%), significantly increased from January 2018 to July 2018 (6.88%), significantly declined from July 2018 to January 2019 (–4.49%), significantly increased from January 2019 to July 2019 (6.37%), and significantly declined from July 2019 to December 2019 (–4.53%; Figure 2 and Table 1).

During the study period, males accounted for 23 071 of SV-related ED visits. Male SV-related ED visits showed a nonsignificant positive trend from January 2017 to December 2019 (0.90% per month; Figure 2 and Table 1). However, male rates of SV-related ED visits showed several fluctuations, some of which were significant changes. From January 2017 to July 2017, the MPC significantly increased (5.74%), significantly decreased from July 2017 to January 2018 (–5.12%), significantly increased again from January 2018 to June 2018 (7.05%), did not change significantly from June 2018 to January 2019 (–1.82%), significantly increased from January 2019 to July 2019 (3.88%), and did not change significantly from July 2019 to December 2019 (–2.90%; Figure 2 and Table 1).

Trends Stratified by Age Group

When stratified by age group, there were significant increases in SV-related ED visits for certain age groups for the overall period (Figure 3 and Table B, available as a supplement to the online version of this article at http://www.ajph.org). From January 2017 to December 2019, SV-related ED visits significantly increased for persons aged 20 to 29 years (30.67%) and 50 to 59 years (55.57%; Figure 3 and Table B). Nearly all age groups observed substantial fluctuations during the 2-year time period, with several significant linear segments (Table B). All age groups showed a common pattern of increasing rates, followed by leveling off or decreasing rates, an increase in rates, a decrease or leveling off, another increase, and ended with a decline in rates at the end of the time period. Throughout the 3-year time period, those aged 10 to 19 years had the highest rates of SV-related ED visits.

Trends Stratified by Age Groups and Sex

Several trends emerged when we stratified SV-related ED visits by sex and age groups (Figures A and B, available as supplements to the online version of this article at http://www.ajph.org). For females, significant increases for the overall period were observed for

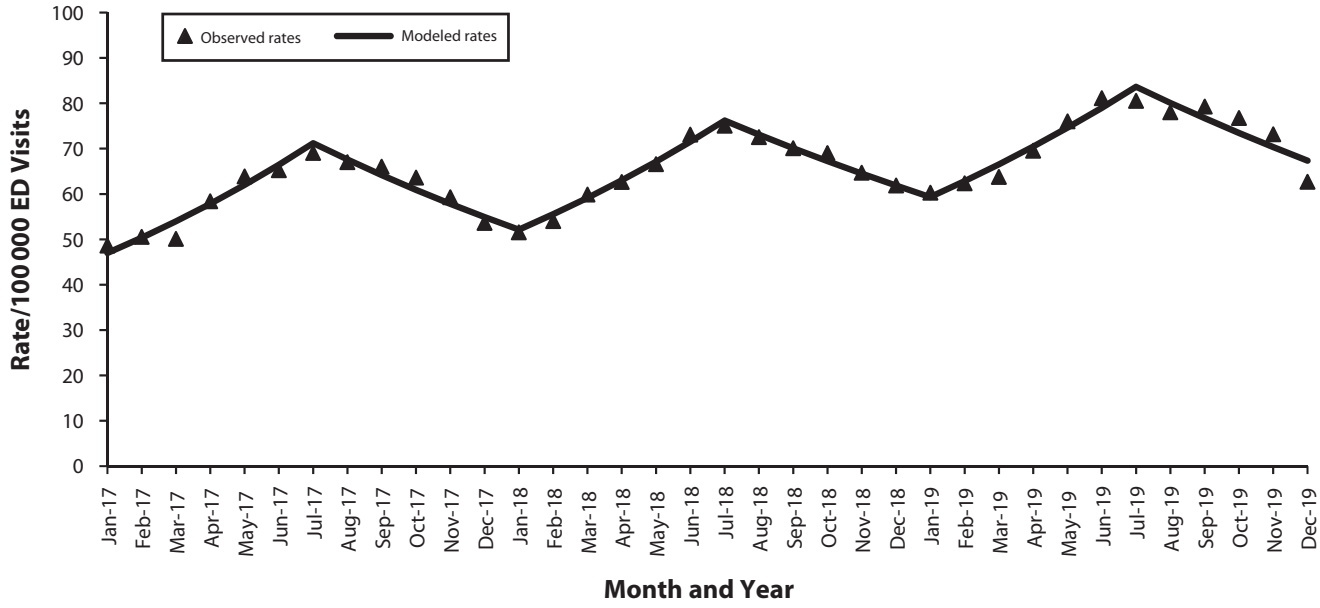

FIGURE 1— Overall Monthly Rates of Emergency Department Visits for Sexual Violence—National Syndromic Surveillance Program Data: United States, January 2017–December 2019

Note. ED = emergency department; SV = sexual violence. Monthly rate per 100 000 ED visits. Rates calculated as number of SV-related ED visits divided by the total number of ED visits for each month and multiplied by 100 000. Data current as of July 1, 2020.

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persons aged 20 to 29 years (32.47%) and 50 to 59 years (57.33%; Figure A and Table B). For males, there were significant overall increases in SV-related ED visits for persons aged 10 to 19 years (15.80%), 20 to 29 years (31.87%), 40 to 49 years (49.04%), and 60 years or older (32.77%; Figure B and Table B). Continuing the trend detected in all other strata, we observed substantial fluctuations during the 3-year time period, with several significant linear segments (Table B). Of the strata that had 6 linear segments (which were all female age groups except 1), all showed a common pattern of increasing rates, followed by leveling off or decreasing rates, an increase in rates, a decrease or leveling off, another increase, and a decline in rates at the end of the time period. For females, those aged 10 to 19 years had the highest rates of SV-related ED visits throughout the 3-year time period; for males, those aged 0 to 9 years had the highest rates of SV-related ED visits, followed by those aged 10 to 19 years.

DISCUSSION

Using syndromic surveillance data from CDC's NSSP, we examined SV-related ED visits from January 2017 to December 2019. In all of the strata examined, SV-related ED visits displayed positive trends during the 3-year time period. Females had higher rates of SV-related ED visits than males. This is consistent with other national studies that have reported that 1 in 5 females reported experiencing completed or attempted rape and 1 in 14 males reported experiencing completed or attempted forced penetration in their lifetime.[2] When combined, males and females aged 10 to 19 years had the highest overall rates of SV-related ED visits.

Significant increases in SV-related ED visits were observed for females aged 20 to 29 years and 50 to 59 years. Females aged 50 to 59 years showed the highest increase (57.33%) in SV-related ED visits, compared with other female age groups and all male age groups. Females aged 10 to 19 years had the highest overall rates of SV-related ED visits. This is also consistent with the National Intimate Partner and Sexual Violence Survey, which found that, among female victims of rape, 43.2% reported that it first occurred before age 18 years, with 30.5% reporting that their first victimization occurred between the ages of 11 and 17 years.[2]

For males, there were significant increases in SV-related ED visits for those aged 10 to 19 years, 20 to 29 years, 40 to 49 years, and 60 years or older. Contrary to the age trends for females, among males, the group aged 0 to 9 years had the highest rates of SV-related ED visits, followed by those aged 10 to 19 years. The recent National Intimate Partner and Sexual Violence Survey report found that, among male victims of rape, more

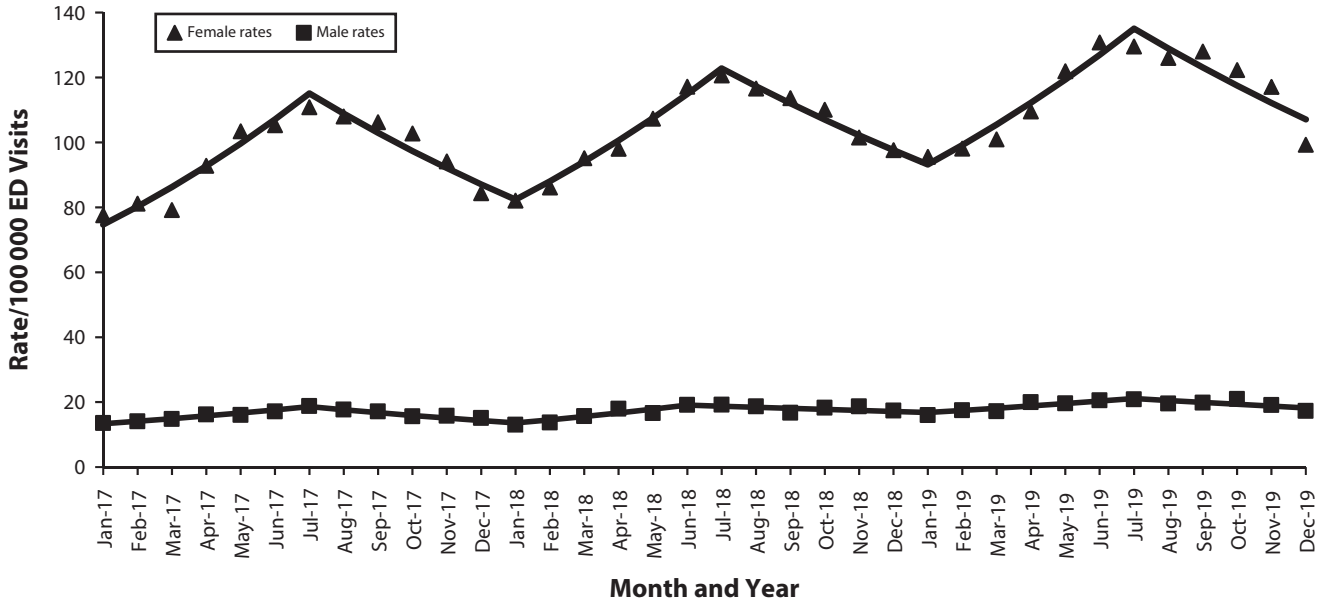

FIGURE 2— Monthly Rates of Emergency Department Visits for Sexual Violence by Sex—National Syndromic Surveillance Program Data: United States, January 2017–December 2019

Note. ED = emergency department; SV = sexual violence. The geometric shapes represent observed rates and the solid lines indicate modeled rates. Monthly rates per 100 000 ED visits. Rates calculated as number of SV-related ED visits divided by the total number of ED visits for each month by sex and multiplied by 100 000. Data current as of July 1, 2020.

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than half (51.3%) reported first being raped before age 18 years, with 25.3% reporting that their first victimization occurred between the ages of 11 and 17 years and 26.0% at age 10 years or younger.[2]

Consistently, in all strata examined, SV-related ED visits displayed positive trends from January 2017 to December 2019; 10 out of the 24 observed positive trends were statistically significant increases. Joinpoint accounts for the variance in trends, and some observed trends had wide confidence intervals, which may explain why some increases were not significant. Nonetheless, the general trend of increasing SV-related ED visits is inconsistent with decreasing crime reports for rape or SV,[9] but it aligns with an increasing trend among injured female victims of rape and sexual assault who seek treatment for their injuries in a hospital, doctor's office, or ED (65% of females in 1994–1998 compared with 80% of females in 2005–2010).[10] Thus, the number of victims who seek medical treatment as a result of SV is only a small portion of all SV victims. In the fall of 2017, #metoo became a viral hashtag across social media, bringing SV to the forefront of the national conversation.[11] As a result, victims may have felt more comfortable disclosing their SV experience and seeking help for their injuries. It is also worth noting that the present findings represent a snapshot of a select 3-year time period, but the longer-term trends could look quite different if more years of data were included in the analysis.

Another interesting trend that emerged when we examined the strata with the highest rates by sex and age group was the spike in SV-related ED visits during warmer months once school is out of session and the decline during the school year and winter months. Particularly for females aged 0 to 9 years and 10 to 19 years, this trend corresponds with the academic calendar (males aged 0 to 9 years also exhibited this trend; see Figures A and B). This seasonal pattern is also consistent with the trend in serious violent victimization rates, which includes rape and sexual assault, robbery, and aggravated assault.[12] Although increased temperatures during summer months have been associated with increased crimes and aggression,[13] given the age range most impacted, these findings may be attributable to being out of school. School can provide a protective environment and supervision of children. These findings suggest the need to strengthen protective environments and for closer supervision during summer months for children. Quality childcare settings that are licensed and accredited promote positive and supportive relationships and experiences

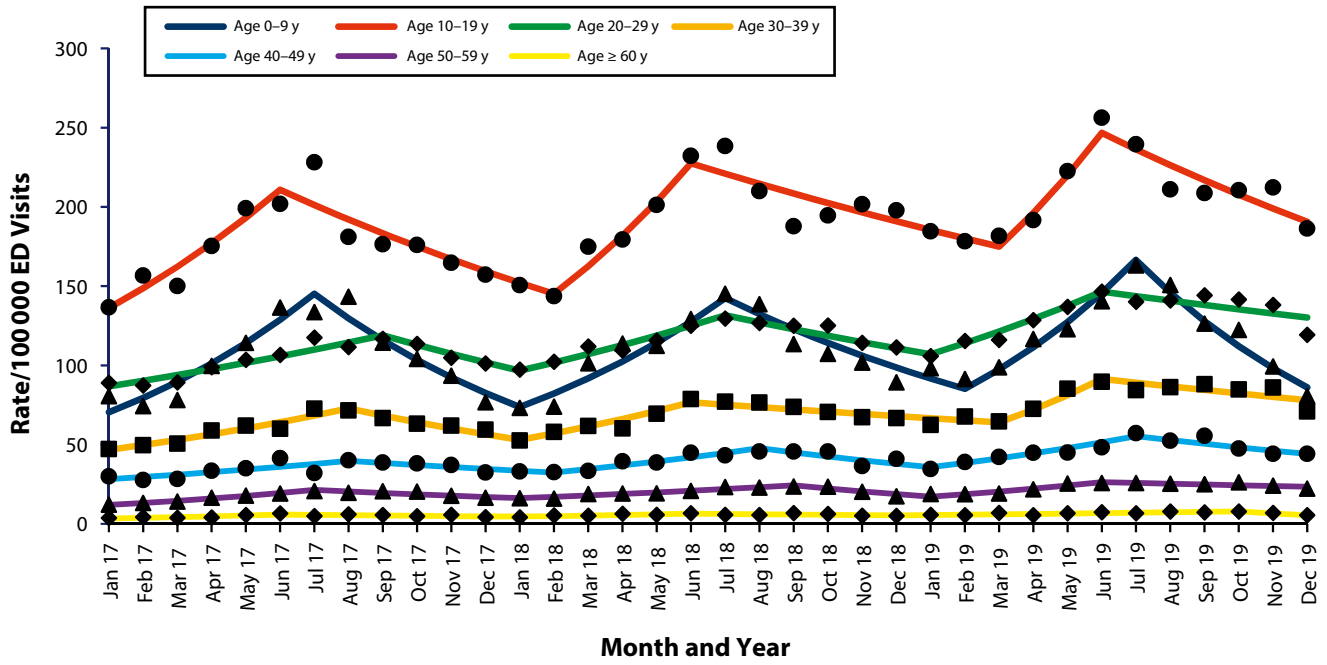

FIGURE 3— Monthly Rates of Emergency Department Visits for Sexual Violence by Age Group—National Syndromic Surveillance Program Data: United States, January 2017–December 2019

Note. ED = emergency department; SV = sexual violence. The geometric shapes represent observed rates and the colored lines indicate modeled rates. Monthly rates per 100 000 ED visits. Rates calculated as number of SV-related ED visits divided by the total number of ED visits for each month by age group and multiplied by 100 000. Data current as of July 1, 2020.

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and ensure that the environment is safe, nurturing, and stimulating.[14]

The results indicate that females aged 0 to 9 years and 10 to 19 years have the highest rates of SV-related ED visits overall; within males, the same age groups (0–9 and 10–19 years) also displayed the highest rates of SV-related ED visits, although females are impacted at a much higher rate than males (Figures A and B). Sexual abuse during childhood is an adverse childhood experience with lasting negative impacts.[15] For boys in particular, self-reporting sexual victimization is complicated by the fact that the perpetrator may be of the same sex, adding to the stigma of being a victim. Being a male victim of SV is incompatible with the norms of masculinity and may create a sense of shame, embarrassment, and emasculation.[16] In turn, male victims may be less likely to disclose, resulting in severe underreports of SV for this population.[17] Therefore, it is important for nurses and health care providers to develop trust and engage patients in a therapeutic discussion that will reduce fear and encourage disclosure of sexual abuse.[17] A recent study found that the number of ED admissions for child sexual abuse more than doubled from 2010 to 2016, with girls experiencing the highest rate of ED admissions.[18] In summary, the results offer evidence for the importance of primary prevention of child sexual abuse and adverse childhood experiences. Comprehensive approaches that focus on creating safe, stable, nurturing relationships and environments allow children to thrive and achieve their full potential and prevent adverse childhood experiences from occurring.[19]

Limitations

This study had some limitations, particularly around the use of syndromic surveillance data. First, the number of ED visits in ESSENCE may vary at any point in time because facilities might have a lag in reporting their information to ESSENCE, and hospital participation may vary by month. To control for this, instead of using ED visit counts, we calculated monthly SV rates. However, SV-related ED trends may be partially accounted for by changes in the total number of ED visits per month or characteristics of the participating hospital populations.

Next, while the syndrome definition for SV includes terms and *ICD-10-CM* codes, there is the potential to unintentionally omit SV terms or *ICD-10-CM* codes that participating hospitals use

that would result in an underestimate. Underestimating SV-related ED visits may also occur because of the availability or missingness of *ICD-10-CM* diagnostic codes and quality of the chief complaint data. Completeness of *ICD-10-CM* diagnostic codes has been increasing over time, which could influence the observed trends. However, to test this potential concern, we conducted additional analyses. Using the SV syndrome definition, we queried the chief complaint fields separately from the discharge diagnosis fields. When we overlaid the 2 trend lines for the same period of time, the patterns mirrored each other. The similarity in trends offers confidence that the increase in SV-related ED visits is not attributable to the increasing completeness of *ICD-10-CM* diagnostic codes but represents a true increase in SV-related ED visits for the examined time period.

When one is using this study to inform prevention programs and interventions in the broader population, the results should be cautiously interpreted. Despite several strata showing increasing trends, it is worth emphasizing that the results show trends for the proportion of ED visits that are SV-related visits. Thus, the same strata that showed high rates of SV-related ED visits (when stratified by sex and age group it was females aged 10 to 19 years and males aged 0 to 9 years; see Figures A and B) in our study may not be the highest risk in the general population for experiencing SV. This is attributable in part to the fact that other males or females of differing age groups may be seeking medical care for non–SV-related reasons at a higher rate,[20] which would make their rates of SV-related ED visits appear lower. To that end, rates derived from syndromic surveillance should not replace prevalence estimates generated by other data sources. Instead, they should be used in conjunction with other data to verify trends. Moreover, syndromic surveillance only captures individuals who seek medical care as a result of an injury; thus, it only represents a portion of all individuals that are victims of SV.

In a related vein, the current findings are not generalizable to areas not participating in NSSP. It should also be noted that certain populations are difficult to identify. For example, it is challenging to report on racial and sexual minorities because of the way in which data are collected and recorded and the lack of completeness in data fields that offer this information. Future coding and system improvements to enhance the completeness and validity of fields that potentially capture information about a patient's race and sexual orientation could enhance surveillance of SV victims seeking medical care and improve targeted interventions.

It is worth noting why we did not include data during the COVID-19 pandemic in the present analysis. During COVID-19, there was an unprecedented decrease in the number of ED visits of approximately 42% from early in the pandemic compared to the same time period in 2019.[21] As a result, the denominator (i.e., total ED visits per month) in the present analysis would drastically change and skew the rates of SV-related ED visits. To adequately unpack this complex time period, future studies should examine SV-related ED visits during COVID-19 and compare the rates and counts with the same time period in 2019. Finally, the present results provide a broad picture of SV-related ED visits using a national public health surveillance system, but local and state context is needed to identify clusters or hot spots and inform response efforts in near real time.[6,7]

Public Health Implications

SV is preventable. The CDC developed a technical package, STOP SV, which highlights several strategies with the best available evidence.[22] EDs provide important treatment and referral services for those seeking care after an assault, but communities and health care providers can be engaged in prevention efforts at all stages. In addition, the results of the present analysis, which showed several significant increases (and nonsignificant positive trends) in rates of ED visits for SV across multiple age groups, underscores the need for prevention strategies that consider risk across the life span. Furthermore, our analysis found large significant increases in men aged 60 years or older and women aged 50 to 59 years, yet there is a dearth of research on SV in older individuals, particularly older men. More research is needed on this population, as they are vulnerable and may require different prevention approaches.

Our study demonstrated that syndromic surveillance can be a valuable data source to monitor national SV trends. Syndromic surveillance data at the local level can be useful for those working in SV prevention by helping identify which populations are most in need of services, where to target prevention efforts, and what services survivors need. For example, this analysis showed that, among males, those aged 0 to 9 years had the highest rates of SV-related ED visits (Figure B), suggesting that hospitals may need to strengthen pediatric SV services. In addition, once community-level prevention services have been established, syndromic surveillance can assist in evaluating those services to determine if rates decrease after intervention.

The results of the present study suggest a seasonality in SV-related ED visits, especially in the younger population. Hospitals can examine staffing and resources to be prepared for the surge in SV-related visits during these high-volume months. Emergency physicians should also have awareness of the increased SV in youths during summer months and consider asking youths about SV, as many victims do not exhibit physical signs of an assault.[23]

Given that the age groups with the highest rates of SV-related ED visits among each sex were males aged 0 to 9 years and females aged 10 to 19 years, it is critically important to link patients with SV injuries and their families to victim advocates and therapeutic providers. Treatment programs can help children acknowledge and identify inappropriate sexual behavior, process trauma symptoms, learn sexual behavior rules and self-control techniques, and provide sex education, which may prevent sexual behavior problems.[24–28] The high rates of ED visits for SV found in younger individuals also suggests that the SV-related ED visit examined in this study may not be the first SV victimization for some older victims, so these victims may need additional assistance.

Conclusions

The present study provides the first examination of SV-related ED visits using syndromic surveillance data from across the nation. Capturing these visits is an important element in measuring the scope of SV victimization, particularly because these survivors may choose to not report their victimization to law enforcement or self-report it in surveys. Thus, syndromic data capture victimization experiences that can be used to further inform surveillance efforts and aid in the prevention of sexual violence. AJPH

ABOUT THE AUTHORS

Ashley Schappell D'Inverno is with the Division of Violence Prevention, National Center for Injury Prevention and Control, Centers for Disease Control and Prevention (CDC), Atlanta, GA. Nimi Idaikkadar is with the Division of Health Informatics and Surveillance, Center for Surveillance, Epidemiology, and Laboratory Services, CDC. Debra Houry is with the National Center for Injury Prevention and Control, CDC.

Note. The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the CDC.

CORRESPONDENCE

Correspondence should be sent to Ashley D'Inverno, PhD, 4770 Buford Highway NE, MS S106-10, Chamblee, GA 30341 (e-mail: lyi5@cdc.gov). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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A. S. D'Inverno conceptualized the study, developed the sexual violence definition, and conducted the analyses. N. Idaikkadar conceptualized the study, developed the sexual violence definition, and assisted with analyses. D. Houry assisted with interpretation of the results. All authors contributed to writing and editing the article.

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The authors have no conflicts of interest to declare.

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Because this study used de-identified information from an existing surveillance system, it was determined to be nonresearch and, thus, did not require CDC institutional review board review.

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Food Insecurity in a Low-Income, Predominantly African American Cohort Following the COVID-19 Pandemic

Tamara Dubowitz, MSc, SM, ScD, Madhumita Ghosh Dastidar, PhD, Wendy M. Troxel, PhD, Robin Beckman, MPH, Alvin Nugroho, BS, Sameer Siddiqi, PhD, Jonathan Cantor, PhD, Matthew Baird, PhD, Andrea S. Richardson, PhD, MPH, Gerald P. Hunter, MCP, Alexandra Mendoza-Graf, MPP, and Rebecca L. Collins, PhD

Objectives. To examine the impact of COVID-19 shutdowns on food insecurity among a predominantly African American cohort residing in low-income racially isolated neighborhoods.

Methods. Residents of 2 low-income African American food desert neighborhoods in Pittsburgh, Pennsylvania, were surveyed from March 23 to May 22, 2020, drawing on a longitudinal cohort (n = 605) previously followed from 2011 to 2018. We examined longitudinal trends in food insecurity from 2011 to 2020 and compared them with national trends. We also assessed use of food assistance in our sample in 2018 versus 2020.

Results. From 2018 to 2020, food insecurity increased from 20.7% to 36.9% ($t = 7.63$; $P < .001$) after steady declines since 2011. As a result of COVID-19, the United States has experienced a 60% increase in food insecurity, whereas this sample showed a nearly 80% increase, widening a preexisting disparity. Participation in the Supplemental Nutrition Assistance Program (52.2%) and food bank use (35.9%) did not change significantly during the early weeks of the pandemic.

Conclusions. Longitudinal data highlight profound inequities that have been exacerbated by COVID-19. Existing policies appear inadequate to address the widening gap. (*Am J Public Health*. 2021;111:494–497. https://doi.org/10.2105/AJPH.2020.306041)

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The disease burden of COVID-19 has disproportionately fallen on racial/ethnic minority groups and marginalized populations in the United States.[1] Food insecurity—a lack of consistent access to enough food for an active, healthy life—is a fundamental social determinant of health linked to poor nutrition, obesity, and chronic disease.[2] Food insecurity is projected to grow across the United States and globally in response to the COVID-19 pandemic[3] and is likely to exacerbate existing racial inequities, as African Americans experienced disproportionate rates of food insecurity even before the pandemic.[3,4] Structural racism has been identified as an upstream determinant of these inequities as well as a critical determinant of population health.[5] To date, no longitudinal investigations of which we are aware have assessed changes in food insecurity in response to COVID-19 in at-risk, low-income communities.

We examined the impact of COVID-19 and shutdowns on food insecurity in a cohort of low-income, primarily African American residents of 2 food deserts (neighborhoods without access to healthy, fresh foods) in Pittsburgh, Pennsylvania. We assessed longitudinal trends in food insecurity over 9 years, before and during the early stages of the COVID-19 pandemic, in this sample relative to the US population.

METHODS

Our participants were part of the PHRESH (Pittsburgh Hill/Homewood Research on Eating Shopping and Health) cohort,[6] and they had taken part

in up to 5 previous waves of data collection (in 2011, 2013, 2014, 2016, and 2018). Detailed descriptions of PHRESH design and enrollment have been reported previously.[6,7] Briefly, PHRESH drew a random sample from a complete listing of residential addresses in the 2 food desert study neighborhoods in 2011. Both neighborhoods are urban and residential, are approximately 1.4 square miles in area, and have a density of about 6500 households per square mile. They were sociodemographically matched (e.g., with respect to race, median income, and percentage of unemployment).

Data collectors were neighborhood residents who completed 80 hours of training in survey administration, community-based participatory research, ethics, and data collection methods. They enrolled the household's primary food shopper (18 years or older) through door-to-door recruitment. In 2018, additional participants were recruited to refresh the sample according to the same procedures (random sampling of households recruited and enrolled by data collectors).

Between March 23 and May 22, 2020, we contacted all PHRESH cohort participants who had completed the most recent wave of data collection (2018; n = 855) for a 15-minute telephone survey (PHRESH COVID); 605 participated (72% response rate), 163 could not be reached, 18 were no longer eligible (cognitive decline), and 69 refused (Figure A, available as a supplement to the online version of this article at http://www.ajph.org). Participants were compensated $20.

We estimated the percentage of food insecurity in the resulting cohort (n = 605) at the 4 study waves (2011, 2014, 2018, and 2020). In 2018, 599 participants had complete food insecurity data. In 2011 and 2014, before sample refreshment, 449 of the 605 cohort members had participated, and 441 and 443 had complete data, respectively.

We measured food insecurity using the validated 6-item Adult Food Security Survey Module, administered with a reference period of the past 30 days.[8] Participants with low (reports of reduced diet quality, variety, or desirability) or very low (reports of disrupted eating patterns and reduced food intake) food security were categorized as food insecure.[8]

Participation in the Supplemental Nutrition Assistance Program (SNAP) and use of food banks were self-reported in 2018 and 2020. Other sample characteristics (from 2018) that were self-reported included neighborhood of residence, age, gender, race, education, employment, whether the participant's home was rented, annual household income, marital status, presence of children in the household, whether the participant was living alone, and presence of a chronic health condition (heart disease, kidney disease, diabetes or high blood sugar). Body mass index was derived from participants' height and weight as measured by interviewers. High blood pressure was assessed via an interviewer-measured blood pressure level of 140/90 mm Hg or higher, a self-reported hypertension diagnosis, or reported use of blood pressure medications.

US food insecurity rates for 2011 to 2018, based on the Current Population Survey Food Security Supplement, were drawn from the Economic Research Service of the US Department of Agriculture.[9] The US 2020 (COVID-related) food insecurity estimate was based on the Coronavirus Tracking Survey.[10]

RESULTS

In 2018, the PHRESH COVID sample was 94% African American, with a mean age of 62 years and an average annual household income of $23 021. Sixty-seven percent of the participants rented their home, 54% had completed some education beyond high school, and 74% had high blood pressure; the mean body mass index was 31.6. Overall, 55% of sample members were SNAP participants, and 32% used food banks. Chi-square and *t* tests revealed no significant differences between the PHRESH COVID sample and the full 2018 sample, indicating that there was no systematic nonresponse. Full sample descriptives are reported in Table A (available as a supplement to the online version of this article at http://www.ajph.org).

SNAP participation (52.2%) and food bank use (35.9%) at the time of the PHRESH COVID survey did not differ from 2018 ($t = -1.43$; $P = .15$; and $t = 1.82$; $P = .07$, respectively).

Figure 1 plots the percentage of participants who were food insecure at each PHRESH wave in comparison with food insecurity rates in the US population. Across all periods, food insecurity was, on average, 2 times higher in the PHRESH cohort than in the US population. Both trend lines show relatively high levels of food insecurity in 2011 (following the Great Recession) and steady declines until 2018, when 20.7% of the PHRESH cohort members were food insecure. In 2020, within weeks of the COVID-19 stay-at-home orders, food insecurity in the PHRESH sample was 37%, an increase of nearly 80% ($t = 7.63$; $P < .001$). By comparison, in the general US population, the prevalence of food insecurity in May 2020 was 17.7%, an increase of 60% from 2018.[10]

DISCUSSION

In this marginalized, predominantly African American, low-income cohort,

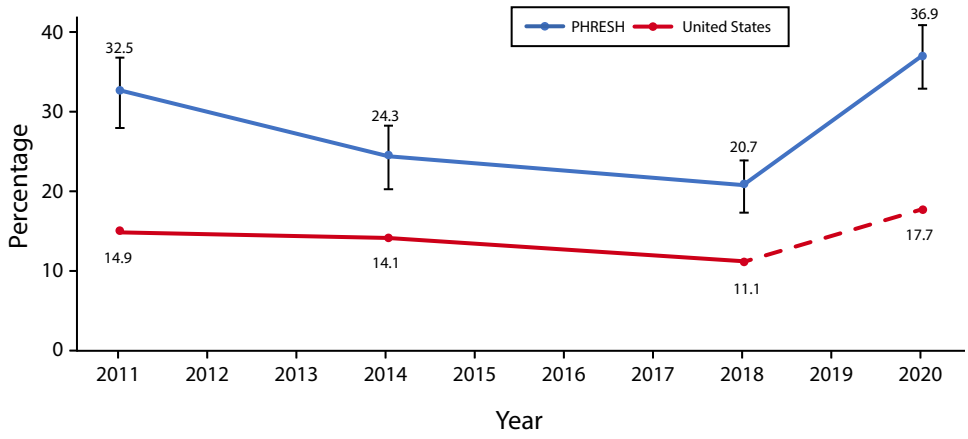

FIGURE 1— PHRESH (Pittsburgh Hill/Homewood Research on Eating Shopping and Health) Trend Plot of Shifts in Food Insecurity: Pittsburgh, PA, 2011–2018

Note. PHRESH sample sizes for food insecurity in 2011, 2014, and 2018 were based on participants who were part of the PHRESH COVID sample. Denominators for the PHRESH sample are as follows: 2020, n = 605; 2018, n = 599; 2014, n = 441; and 2011, n = 443. National data for 2011 to 2018 were derived from the Current Population Survey Food Security Supplement. The national prevalence of food insecurity in 2020 included in this figure is based on a recent estimate produced by the Urban Institute and the Coronavirus Tracking Survey.[10]

COVID-19 has magnified preexisting racial/ethnic disparities in food security in a very short time, a circumstance linked to a wide variety of health outcomes. We observed a significant spike in food insecurity during the first weeks of the pandemic that far outpaced the increase in the general US population. Disparities between our African American cohort and the nation that had gradually narrowed since 2011 are now at the highest levels observed over the past decade.

In spite of this spike, food bank use and SNAP participation were relatively unchanged. This suggests that existing safety nets may be failing to reach those with emerging needs. Difficulties enrolling in SNAP, problems accessing food banks during shutdowns, or feelings of stigma or uncertainty regarding eligibility may be to blame. Other factors contributing to the food insecurity spike may be loss of work, increased psychological distress, and concerns about leaving one's home for food shopping. Major food sources are outside of participants' neighborhoods, and most use public transit or shared rides for food shopping.[11] Systemic racism is evident in the 2 racially isolated low-income neighborhoods and their reduced access to retail, employment, housing, and education and likely plays an overarching role in their increasing food insecurity.

Limitations

The findings of this study may be limited to our sample or to the 10% of census tracts that can be classified as food deserts.[12] The 2020 survey modality (telephone) differed from past survey waves (in person).

Public Health Implications

Social distancing, unemployment, and health risks have continued since May 2020, likely exacerbating food insecurity beyond what we observed. Policymakers should consider strategies including continuing flexible enrollment and certification requirements for SNAP and expanding benefits for and outreach to the communities at greatest risk of food insecurity. Novel approaches to reach these communities and reduce growing racial disparities in food insecurity may also be needed. AJPH

ABOUT THE AUTHORS

The authors are with the RAND Corporation, and this work was performed in the Division of Social and Economic Well-Being.

CORRESPONDENCE

Correspondence should be sent to Tamara Dubowitz, MSc, SM, ScD, 4570 Fifth Ave #600, Pittsburgh, PA 15213 (e-mail: dubowitz@rand.org). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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CONTRIBUTORS

T. Dubowitz conceptualized the study with the assistance of W. M. Troxel and R. L. Collins and supervised all aspects of its implementation. W. M. Troxel and R. L. Collins helped lead the writing. M. Ghosh Dastidar led all statistical analyses. R. Beckman performed analyses. A. Nugroho helped with

implementation and administering surveys. A. Mendoza-Graf helped to administer surveys. All of the authors contributed to the writing of the article and interpretation of data.

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CONFLICTS OF INTEREST

The authors have nothing to disclose and no conflicts of interest.

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This research was approved by the RAND Corporation institutional review board.

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The Costs of Contradictory Messages About Live Vaccines in Pregnancy

Elana Jaffe, MPH, Ilona Telefus Goldfarb, MD, MPH, and Anne Drapkin Lyerly, MD, MA

The increased risk of harm from COVID-19 infection in pregnancy highlights the importance of including pregnant people in COVID-19 vaccine development and deployment. Promising vaccines being developed include replication-competent platforms, which are typically contraindicated during pregnancy because of theoretical risk. However, replicating vaccines are administered in and around pregnancy, either inadvertently because of unknown pregnancy status or when recommended.

The historical cases of Ebola virus, yellow fever, and rubella demonstrate that contradictory messages around the safety of live vaccines in pregnancy have critical public health costs. First, restricting study or use of replicating vaccines in pregnancy may delay or deny access to the only available protection against deadly diseases. Additionally, not vaccinating pregnant people may slow epidemic control. Finally, uncertainty and worry around the safety of live vaccines may lead to terminations of otherwise desired pregnancies after inadvertent vaccination in pregnancy.

If one of the vaccines deployed to combat the current global COVID-19 pandemic is replication competent, historical cases offer important lessons for ethical and effective protection for pregnant populations. (*Am J Public Health*. 2021;111:498–503. https://doi.org/10.2105/AJPH.2020.306045)

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Researchers and policymakers face challenging decisions about how to study and deploy COVID-19 vaccines. Although pregnancy is often an exclusion criterion in vaccine research, there is increasing recognition of the importance of generating data on and attending to the unique health needs of pregnant people—and ethical pathways to do so.[1] Building on prior epidemic responses, experts during the COVID-19 pandemic have called to protect pregnant people through research—rather than from it—and to ensure that their interests are represented fairly in vaccine research and development.[2]

Promising candidates for prevention of COVID-19 include replicating vaccines.[3] These "live" vaccines are generally contraindicated in pregnancy because of concerns that the attenuated pathogen will replicate, cross the placenta, and harm the fetus. However, these risks are considered largely theoretical, and a recent systematic review found no evidence of harm related to any live vaccines in pregnancy, with the exception of low-quality evidence around smallpox vaccination.[4] Still, concern about theoretical risk has very real consequences on research design, evidence generation, and access to lifesaving interventions. Overemphasis on theoretical risk—despite accumulating evidence of safety—leads to another harm: persistence of messaging that live vaccines are unsafe in pregnancy, even when recommended or administered to protect pregnant people and offspring from harm.

Replicating vaccines offer benefits over and above nonreplicating counterparts, typically requiring fewer doses and eliciting faster and more durable immunity. Should a replicating candidate emerge as a front-runner in the COVID-19 vaccine race or in future pandemic contexts, research and public health communities will face difficult questions around the study and use of this critical protection in pregnancy. Historical cases offer important lessons to consider. Our objectives are to examine the historical context of contradictory messaging around live vaccines and pregnancy, to describe the harms of such messaging on immunization policy, and to distill historical lessons for public health and

research decision-making during the COVID-19 pandemic and beyond.

VACCINATION AND PREGNANCY

Vaccines are one of public health's most important tools against illness and epidemics. Vaccination in pregnancy provides two benefits: (1) primary maternal protection against infections, by extension protecting the fetus from harms of maternal disease; and (2) secondary fetal protection through maternal–fetal transfer of antibodies.

Yet in the context of pregnancy, perceptions of vaccine safety reflect a curious disjunct. For replication-incompetent vaccines, the components necessary to replicate within cells have been inactivated, and emphasis in public health messaging is on benefit. Two such vaccines—influenza, and tetanus, diphtheria, and acellular pertussis—are now strongly recommended in pregnancy on the basis of evidence indicating that benefits outweigh risks.[5] But for replication-competent vaccines (live), rhetoric around use in pregnancy centers on precaution.[4,5] These vaccines contain weakened virus, and the components elicit an immune response against the original pathogen but are extremely unlikely to cause disease. Theoretically, it is biologically plausible that live attenuated virus could replicate and cause viremia, and the virus could pass through the placenta to infect or affect the fetus. Theoretical risk may vary by specific vaccine candidate or gestational timing of administration, but despite rare transplacental transfer of some replicating vaccines, data from hundreds of thousands of exposures to most live vaccines throughout pregnancy show no clinical evidence of fetal harm. Nevertheless, the added theoretical risk associated with live vaccines has shaped messaging about their safety and use, over and above documented benefits and research indicating minimal or negligible risk.[4]

Historically, the development and deployment of vaccines included pregnant people. In fact, data from as early as 1879 demonstrate significant benefit from a live smallpox vaccine in pregnancy.[6] Guidelines have since then increasingly reflected reassurance around the safety of inactivated vaccines in pregnancy. However, this contrasts with a parallel shift toward concern regarding theoretical risk of live vaccines in pregnancy, shaped by events in the 1950s and 1960s. The first, known as the Cutter Incident, directed public attention toward possible risks of live virus in vaccines. In 1955, pregnant people and children were prioritized in the rollout of the new inactivated poliovirus vaccine. Within days, reports emerged of paralysis among vaccine recipients. It was later discovered that during the manufacturing process, live polio virus was ineffectively inactivated by one company (Cutter Laboratories); as a result, up to 120 000 children were inadvertently injected with a lethal polio strain, resulting in 220 000 infections among the children and their contacts.[7] Soon after the Cutter Incident came the thalidomide tragedy, which foregrounded the vulnerability of the fetus to developmental harm from interventions used in pregnancy, particularly early in gestation during organogenesis. In the late 1950s and early 1960s, thalidomide was widely prescribed in Europe for morning sickness, but was soon recognized as a significant teratogen; the US Food and Drug Administration had refused to license the drug without additional evidence—a decision hailed as an exemplar of appropriate caution.[8] In the wake of these events arose policies excluding pregnant people and women of childbearing age from clinical research, public reticence around the use of pharmaceuticals in pregnancy, expanded oversight including establishment of the Advisory Committee on Immunization Practices (ACIP) in 1964,[9] and increased liability for pharmaceutical development in general.[7] These events also set the stage for a strong precautionary principle to emerge around live vaccines in pregnancy.

Despite caution about live vaccines, they will inevitably be administered throughout pregnancy and in the periconception period. First, during an outbreak, public health authorities may recommend vaccination in pregnancy, as has occurred during yellow fever and Ebola outbreaks.[10,11] Second, people will be vaccinated who do not know about or report pregnancy—pregnancy tests are often not recommended in routine vaccination, are considered unfeasible in mass vaccination campaigns, and are not always required in research. Finally, people immunized with live vaccines may become pregnant within a relevant window. Although each of these scenarios carries complex ethical questions, there is a larger issue: where live vaccines are summarily avoided in pregnancy, pregnant people and their offspring will not be afforded critical protection. There are four costs of contradictory messaging around live vaccines in pregnancy (Figure 1).

PROTECTED TO DEATH

Protecting pregnant people from the theoretical risk of live vaccines has left

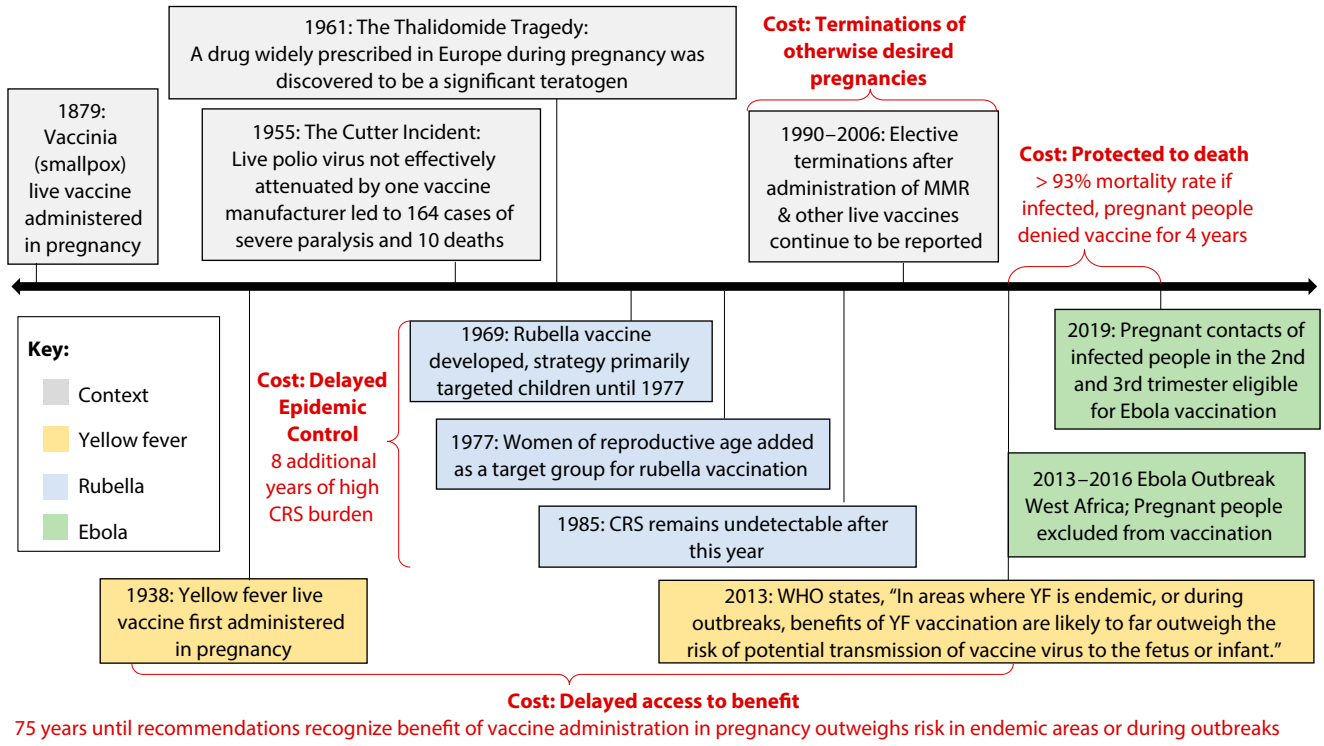

FIGURE 1— Contradictory Messaging Around Live Vaccines in Pregnancy: Context and Costs

Note. CRS = congenital rubella syndrome; MMR = measles, mumps, and rubella; WHO = World Health Organization; YF = yellow fever.

them unprotected from deadly diseases, or "protected to death."[12] Consider the case of Ebola virus disease. The 2013–2016 West Africa Ebola outbreak documented a 93% mortality rate for infections in pregnancy and a near 100% fetal mortality rate.[12] Although the experimental vaccine did not contain live attenuated Ebola virus, it used a replication-competent platform containing live vesicular stomatitis virus. During 2015 and early 2016, 49 trial participants became pregnant within 60 days of vaccination, providing reassuring though inconclusive data showing no difference in rates of pregnancy loss or congenital anomalies and no neonatal deaths.[13] Pregnant people were denied the experimental vaccine until 2019, when mounting outcry led to policy change allowing limited access.[10]

DELAYED ACCESS TO BENEFIT

Exclusion from research can also translate to delayed evidence and access to benefit, as demonstrated by the story of the yellow fever vaccine. Yellow fever is associated with high morbidity and mortality in pregnancy; a prominent symptom—fever—is in early pregnancy associated with risk of congenital malformations.[14] The yellow fever vaccine was first administered to pregnant people in its debut study in 1938 with no serious adverse effects recorded; pregnant individuals were immunized regularly in some countries until 1946.[15] But as the memory of yellow fever outbreaks in the United States grew distant and with the Cutter Incident and the thalidomide tragedy salient, ACIP in 1969 described avoiding yellow fever vaccination in pregnancy as "prudent" because of theoretical risk.[16(p28)] By 1989, on the basis of slowly accumulated data, ACIP messaging shifted, describing the possibility of offering yellow fever vaccination in pregnancy when there was "substantial risk" of exposure.[17] However, in the decade following this recommendation, data from small cohorts and published case studies suggested possible safety concerns and lower efficacy of yellow fever vaccine in pregnancy.[15] Consequently, the World Health Organization (WHO) recommended against vaccination in 2003, allowing only that it might be considered in high-risk scenarios. The organization attributed avoidance of the vaccine in pregnancy to "theoretical grounds," rather than limited data around safety and efficacy.[18]

Clear messaging that the benefits of yellow fever vaccination are "likely to far outweigh the risk of potential transmission of vaccine virus to the fetus or infant"[11(p282)] finally came 75 years after vaccine development. After a 2006 report of inadvertent vaccinations during pregnancy demonstrated strong safety and high efficacy in pregnancy, WHO updated recommendations in 2013, recommending counseling and risk-benefit assessment likely to favor vaccination in endemic contexts.[11] And yet, the orientation toward theoretical risk in these guidelines implicitly shifts the responsibility of making the risk–benefit calculation onto those administering vaccines in the field, exposing pregnant people to consequences of risk distortion and avoidance that characterize decisions in pregnancy.[19]

DELAYED EPIDEMIC CONTROL

Discouraging live vaccine administration in pregnancy may have ramifications for efforts to slow epidemic spread. Rubella offers a notable example.[20] Although typically mild in adults, rubella infection during pregnancy presents up to an 85% risk of congenital rubella syndrome (CRS) in infants, characterized by deafness, heart defects, and other disabilities.[21] The Cutter Incident and the thalidomide tragedy are also relevant here: each occurred before the rubella vaccine was developed in 1969. The United States adopted a strategy of vaccinating "around" pregnancy by vaccinating young children,[20,21] justified with theoretical risk of vaccines in pregnancy and concerns about false safety signals. The reasoning was that "significant congenital anomalies occur regularly in approximately 3 percent of all births, and their fortuitous appearance after vaccine had been given during pregnancy could lead to serious misinterpretation."[16(p22)] Indeed, an early safety signal—whether it turns out to be true—may derail use of a beneficial intervention due to concerns about the possibility of harm or the precedent of no-fault pharmaceutical liability introduced by the Cutter Incident.[7]

Unfortunately, this approach delayed epidemic control.[20] Although cases decreased overall, cases among individuals aged 15 years and older increased. Because cases continued in the childbearing population, there was no substantial decline in CRS rates.[20] Eight years after the vaccine was first deployed, women of childbearing age were added as a target population and CRS incidence declined rapidly.[20] Globally, over 3500 cases of inadvertent vaccination with rubella vaccines have been documented; no cases of malformations compatible with CRS or vaccine-associated defects among vaccine-exposed offspring have been reported.[22] Currently, the rubella vaccine—included in the measles, mumps, and rubella (MMR) vaccine—is contraindicated in pregnancy.[23] However, WHO acknowledges this contraindication is "purely precautionary."[23]

TERMINATION OF OTHERWISE DESIRED PREGNANCIES

A final cost of caution is the termination of otherwise desired pregnancies. Most live vaccines are contraindicated because of theoretical risk of harm; simultaneously, inadvertent exposure is not considered an indication for pregnancy termination. There is—rightly—no guidance recommending termination after exposure. But those inadvertently exposed to live vaccines in pregnancy are left to make sense of two potentially conflicting messages: (1) the vaccine's potential impact on a fetus is concerning enough to warrant a contraindication—even when it protects against an infection that presents risks to the pregnant person or fetus, but (2) the same vaccine administered inadvertently in pregnancy should not factor into considerations about pregnancy termination. Despite reassuring data about the safety of contraindicated live vaccines in pregnancy, terminations following inadvertent vaccination with such vaccines continue to be reported.[24] Although all such terminations may not have occurred because of worry about vaccine-related harm, the trend remains concerning.

LESSONS FOR COVID-19 AND BEYOND

These experiences offer lessons for developing and deploying replicating vaccines. First is that caution does not come without costs—and that strong precaution toward theoretical risk around live vaccines in pregnancy may have real health consequences for pregnant people and children. Consider cases such as yellow fever and Ebola, where infected pregnant people face an extremely high risk of dying. Although many pregnant people now can receive these vaccines during outbreaks, concern around theoretical risk led to unnecessary deaths. Moreover, excluding pregnant people from premarket trials led to missed opportunities to efficiently gather pregnancy-specific safety and efficacy data. Timely and robust postmarketing surveillance is also necessary, as poor-quality or limited data can lead to false signals, as occurred in the case of yellow fever, and further delay pregnant people's access to protection they need and deserve.

The second lesson regards responsibility for risk. If a public health body endorses a vaccine, they take on a certain responsibility for the immunization outcome. Conversely, if they do not recommend a vaccine and it turns out risk is associated with the vaccine, then responsibility for harm is limited. The current paradigm of relying on inadvertent vaccine exposure to inform policy and messaging about risk shifts the burdens, risks—and responsibilities—of investigating vaccines in pregnancy from public health and research enterprises and onto providers and pregnant people. Uncertainty about safety may also lead to incongruities between regulatory and legislative messaging about vaccine safety in pregnancy. Ensuring harmonized messaging can mitigate inconsistencies in perceptions of vaccine safety.

The third lesson regards the need for contextualized and careful risk communication. Risk communication is always challenging, but in pregnancy—where perceptions of risk can be distorted and responsibility for risk is particularly fraught—conflicting messages are impactful.[19] Examples include simultaneously recommending against vaccination in pregnancy and recommending against pregnancy testing during vaccination campaigns, or recommending against vaccination in pregnancy but providing assurance that vaccination is not an indication for termination. Faced with responsibility for vaccination decisions (and potential harms), contradictory messages may negatively affect provider and patient vaccine acceptance and uptake in pregnancy. For those who do receive vaccines in pregnancy, or become pregnant within a relevant window, such messaging can raise concern and affect decisions about pregnancy continuation. Given general increasing vaccine hesitancy, efforts to streamline public health messaging and clearly convey understandings of risks and benefits are imperative.

Entrenched resistance toward live vaccines in pregnancy has consequences, but past lessons suggest a pathway forward. Proactively addressing pregnancy in vaccine research is possible: deliberate approaches to this important population can lead to earlier access to lifesaving interventions and evidence to guide confident messaging around safety and recommendations for use. As the global health community decides how to study and deploy vaccines during the COVID-19 pandemic and beyond, these historical lessons should be considered.

CONCLUSION

Concerns about theoretical—or even acceptably small—risks commensurate with expected benefits have circumscribed study and use of vaccines and medications in pregnancy, and more broadly in women of reproductive age. Appropriate representation of women, pregnant people, and lactating people in clinical trials is still a critical and uphill battle. Pregnant people must be prioritized in the public health response to ensure fair access to safe and effective vaccines—especially with emerging data suggesting COVID-19 is more severe in pregnancy.[25] With over six million pregnancies per year in the United States, vaccination in pregnancy is also a critical part of an effective public health response.

The stories of rubella, yellow fever, and Ebola demonstrate that precaution around interventions fails to attend to the risks and burdens that pregnant people face when they are left behind in the public health response. The current COVID-19 pandemic presents an opportunity to redress our reasoning around live vaccines in pregnancy and develop strategies for challenging the specter—and the untoward effects—of theoretical risk in the vaccine context. AJPH

ABOUT THE AUTHORS

Elana Jaffe is with the Center for Bioethics, Department of Social Medicine, School of Medicine, and the Department of Maternal, Child, and Family Health, Gillings School of Global Public Health, University of North Carolina, Chapel Hill. Ilona Telefus Goldfarb is with the Division of Maternal–Fetal Medicine, Department of Obstetrics and Gynecology, Massachusetts General Hospital, Harvard Medical School, Boston, MA. Anne Drapkin Lyerly is with the Center for Bioethics, Department of Social Medicine, and the Department of Obstetrics and Gynecology, School of Medicine, University of North Carolina, Chapel Hill.

CORRESPONDENCE

Correspondence should be sent to Anne Drapkin Lyerly, MD, MA, Center for Bioethics, Department of Social Medicine, University of North Carolina at Chapel Hill, 333 MacNider Hall, 333 S Columbia St, Chapel Hill, NC 27599 (e-mail: alyerly@e-mail.unc.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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CONFLICTS OF INTEREST

None of the authors have any conflicts of interest.

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Impact of a Family Economic Intervention (Bridges) on Health Functioning of Adolescents Orphaned by HIV/AIDS: A 5-Year (2012–2017) Cluster Randomized Controlled Trial in Uganda

Fred M. Ssewamala, PhD, Julia Shu-Huah Wang, PhD, Rachel Brathwaite, PhD, Sicong Sun, MSW, Larissa Jennings Mayo-Wilson, PhD, MHS, Torsten B. Neilands, PhD, and Jeanne Brooks-Gunn, PhD

See also Miller and Bonds, p. 342.

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Objectives. To investigate the long-term impacts of a family economic intervention on physical, mental, and sexual health of adolescents orphaned by AIDS in Uganda.

Methods. Students in grades 5 and 6 from 48 primary schools in Uganda were randomly assigned at the school level (cluster randomization) to 1 of 3 conditions: (1) control (n = 487; 16 schools), (2) Bridges (1:1 savings match rate; n = 396; 16 schools), or (3) Bridges PLUS (2:1 savings match rate; n = 500; 16 schools).

Results. At 24 months, compared with participants in the control condition, Bridges and Bridges PLUS participants reported higher physical health scores, lower depressive symptoms, and higher self-concept and self-efficacy. During the same period, Bridges participants reported lower sexual risk-taking intentions compared with the other 2 study conditions. At 48 months, Bridges and Bridges PLUS participants reported better self-rated health, higher savings, and lower food insecurity. During the same period, Bridges PLUS participants reported reduced hopelessness, and greater self-concept and self-efficacy. At 24 and 48 months, Bridges PLUS participants reported higher savings than Bridges participants.

Conclusions. Economic interventions targeting families raising adolescents orphaned by AIDS can contribute to long-term positive health and overall well-being of these families.

Trial Registration. ClinicalTrials.gov registration no. NCT01447615. (*Am J Public Health*. 2021;111:504–513. https://doi.org/10.2105/AJPH.2020.306044)

Sub-Saharan Africa (SSA) has the world's highest HIV prevalence rate, including a high prevalence of orphaned adolescents—defined as an adolescent without a biological mother, without a biological father, or without both. As of 2019, out of an estimated 13.8 million children and adolescents (aged 0–17 years) worldwide who lost 1 or both parents to AIDS, approximately 75% (10.3 million) resided in SSA.[1] Many of these young people experience compromised health and elevated mental health difficulties and risk behaviors with public health consequences (e.g., HIV transmission to others).[2]

Uganda, one of the SSA countries hardest hit by HIV, reports unprecedented numbers of adolescents orphaned as a result of AIDS (AoAIDS), as well as adolescents living with HIV. To illustrate, out of an estimated 1.2 million reported orphans, 45% were orphaned as a direct result of AIDS.[3] Although the incidence of HIV infection is projected to fall to 0.46% by the end of 2020,[4,5] prevalence of AoAIDS remains high

because of time lags between HIV infection and HIV-related death. Adolescents affected by HIV, including AoAIDS, often live in poverty and show high rates of depression,[6,7] anxiety, learning problems,[8,9] and sexual risk taking.[10,11] They often experience low self-esteem and hopelessness about their future, which can negatively affect their decisions, including substance use and sexual risk taking, further elevating the likelihood for contracting sexually transmitted infections and HIV,[12] all of which may compromise successful transition into adulthood.

The death of 1 or both parents because of AIDS significantly affects AoAIDS. In addition to disruptions in caregiving, AoAIDS's adversity is compounded by emotional and psychological anguish from living with a caregiver or parent who has a lifelong, highly stigmatized chronic illness. Moreover, parental illness and death may cause family financial instability because of poor health and increased medical care expenses, resulting in poverty and food insecurity.[13] Adolescents may sacrifice education to assume family income-generating responsibilities, contributing to negative educational outcomes—for example, reduced school attendance and school dropout.[14]

Investments in adolescents affected by HIV/AIDS are needed to enhance human capital for the next generation. Economic interventions (EIs) guided by asset theory[15] have demonstrated substantial promise with accumulating evidence.[6,8,10,16–18] Asset theory posits that asset ownership can lead to wide-scale benefits, including expectations for more future resources, optimistic thinking, feelings of safety and security,[19] and future planning.[15,20] Asset ownership is increasingly viewed as a critical factor for reducing poverty, having a positive impact on attitudes and behaviors, and improving psychosocial functioning and stability.[21–24] Asset theory is consistent with Bandura's social cognitive theory[23] and the theory of reasoned action.[25–30] Taken together, these theoretical frameworks contribute to understanding how attitudes and beliefs evolve, which in turn influences intentions and behaviors.[15,20,21,31]

Moreover, among limited research that examines the effect of EIs on health and overall developmental outcomes for adolescents, findings have alluded to short-term impacts immediately following intervention initiation.[11,32,33] Longer-term postintervention effects of EIs on various outcomes are not well-documented. As emphasized in a *Lancet* series on the science of HIV prevention, there is an important role for "combined" interventions to address multiple dimensions of preventive health.[34] This article reports results from a recently completed cluster randomized controlled trial called Bridges (2012–2017), one of the few longitudinal large-scale combination interventions using a savings-led EI approach aimed at addressing socioeconomic and psychological challenges of AoAIDS in SSA as they transition into young adulthood. EIs comprised financial savings incentives, financial literacy workshops, and peer mentoring. Data from 5 years were used (2012–2017), including 2 post-intervention follow-ups (at 36 and 48 months), allowing intervention effects to be assessed over a longer time period.

We hypothesized that AoAIDS who received the Bridges EI would experience a wide range of greater positive outcomes, including better physical, mental, and sexual health; improved education; and overall financial stability compared with adolescents in a control condition. Given the study's theoretical framework[21–30] and that interventions improving families' economic capabilities in resource-constrained communities have a wide range of positive outcomes (as detailed in theory previously), we captured multiple outcomes resulting from EIs.

Specifically, in addition to 4 primary outcomes related to physical health (self-rated health), mental health (depression and hopelessness), and sexual-related health (sexual risk-taking intentions), we explored effects of the EI on indicators of financial stability, education, and self-concept. This aligns with our trial proposal on Clinicaltrials.gov in which we proposed to investigate multiple relationships and outcomes—guided by theory.[15,35] Indeed, asset theorists would posit that financial instability may increase the likelihood that poor AoAIDS will be trapped in a vicious cycle of hopelessness, further increasing their likelihood for risk-taking behaviors—including sexual risk taking. Yet, if AoAIDS believe their future holds promises of success (e.g., financial stability), then engagement in sexual risk taking might be reduced.[11] People with more assets in the present expect to have more future resources.[36] For AoAIDS transitioning into young adulthood, financial stability offers a belief that future success is likely, which may reduce mental health distress and prevent adolescent risk behaviors and negative health and developmental outcomes.

Thus, we addressed the following questions: (1) What are short- and long-term effects of Bridges EIs on the following primary outcomes: physical, mental, and sexual health–related outcomes? (2) What are short- and long-term effects of Bridges EI on the following secondary outcomes: financial

stability, an education-related indicator, and self-concept? (3) Is there heterogeneity in the effect of EIs: (a) do higher financial incentives lead to stronger EI effects or (b) do Bridges EIs produce differential effects among male and female adolescents?

METHODS

The Bridges study (grant R01HD070727) utilized a 3-arm cluster randomized controlled trial collecting data over a 5-year period (2012–2017). Participant inclusion criteria were (1) an adolescent enrolled in 5th or 6th grade in a public primary school, (2) having lost 1 or both biological parent(s) to AIDS (hence defined as AIDS-orphaned), (3) attending 1 of 48 public primary schools enrolled in the study, and (4) living within a family (not an institution or orphanage as these adolescents may have different characteristics and material needs).

Appendix Figure A (available as a supplement to the online version of this article at http://www.ajph.org) illustrates the Consolidated Standards of Reporting Trials (CONSORT) flow diagram. Study team criteria for schools selection included the following: First, the study's collaborator, Masaka Diocese in Uganda, provided a list of 88 primary schools from the greater Masaka region. Second, from 88 schools, the team selected schools that were public, mixed sex, at comparable size, and at a comparable level of academic performance (based on the last 3 years of national Primary Leaving Examinations, a requirement for all students by the Government of Uganda, which certifies completion of primary school).[37] Third, applying aforementioned selection criteria, the team remained with 69 public primary schools. Fourth, from the 69 remaining schools, 48 schools were randomly selected and assigned to 1 of 3 study conditions: control (16 schools), Bridges (16 schools), or Bridges Plus (16 schools). Randomization at the school level can minimize cross-arm contamination. The randomization process resulted in a total of 1410 adolescents recruited at baseline. Twenty-seven participants were found to be ineligible for the study during the first year, leaving 1383 adolescents from 48 primary schools. This (n = 1383) constituted the total sample with the following distribution: control (n = 16 schools; n = 487 students), Bridges (n = 16 schools; n = 396 students), and Bridges PLUS (n = 16 schools; n = 500 students).

All 3 study condition participants received bolstered standard of care for school-going AIDS-orphaned adolescents in the study area. Specifically, standard of care included school lunches, scholastic materials including textbooks and notebooks, and counseling provided by priests in the community. The 2 treatment conditions (Bridges and Bridges PLUS) included standard of care as well as the following 3 intervention components: (1) workshops focused on asset building, financial literacy, and future planning; (2) peer mentors to reinforce learning[38]; and (3) a matched financial savings account to be used for education for the participating adolescent or family microenterprise development. More details on the mentorship program can be found in "Details of the Bridges Mentorship Program" in the Appendix. The only difference between Bridges and Bridges PLUS was the matching rate for financial savings: participants in the Bridges condition received a 1:1 savings match rate, whereas participants in the Bridges PLUS condition received a 2:1 savings matching rate. The intervention was provided for a total of 24 months.

Repeated measures were used for data collection at 12-month intervals between 2012 and 2017. The baseline assessment (wave 1) occurred in 2012 with 12-, 24-, 36-, and 48-month follow-up assessments afterward. In this article, we used data from all 5 time points.

By study end (48-month follow-up), the attrition rate for each study condition was the following: Bridges, 8.8%; Bridges PLUS, 10.6%; and control, 8.6%. The result from a design-based test for the independence of loss to follow-up locates no attrition rate differences by study conditions (F[1.94, 91.20] = 0.5249; $P = .595$).

Outcome Measures

We investigated the following primary outcomes: physical health, mental health functioning, and sexual health–related functioning. Specifically, (a) physical health was measured using a self-rated health measure captured by the following question: "at the present time, would you say that your physical health is excellent = 5, good = 4, fair = 3, poor = 2, or very poor = 1?"; (b) mental health functioning was captured using 2 mental health conditions: (1) depressive symptoms, measured using the 27-item Children's Depression Inventory,[39] and (2) hopelessness, assessed using the 20-item Beck Hopelessness Scale[40]; and (c) sexual health was captured by sexual risk-taking intentions (continuous summated score from 5 items).

In addition, our secondary outcomes captured financial stability, school enrollment, self-concept, self-efficacy, and additional sexual health indicators. Financial stability was assessed from responses to 2 variables: self-reported savings amount (continuous) and whether adolescents experienced food insecurity. Food insecurity was defined

as having only 1 or fewer than 1 meal per day in the past 7 days versus more than 1 meal per day (dichotomous). School enrollment was defined as a participant attending school. At baseline, enrollment in 1 of the selected 48 public primary schools was required for inclusion in the study. Subsequent school enrollment was self-reported by the student and confirmed by the research team from the students' respective schools. Next, we further investigated the effect of EI on self-concept, measured using the 20-item Tennessee Self-Concept Scale,[41] and self-efficacy, measured using the 29-item Youth Self-Efficacy Survey.[42] We also measured sexual health using 2 additional indicators: HIV prevention intentions (continuous summated score from 5 items) and self-reported HIV/AIDS status, a binary variable with no = 0 and yes = 1.[11,16,43] Overall, measures of hopelessness, self-concept, self-efficacy, and sexual health have acceptable internal consistency levels (Cronbach $\alpha \geq 0.7$), while the depression measure (Children's Depression Inventory) showed moderate internal consistency levels ($\alpha = 0.69$). All continuous outcomes were standardized except for the savings outcome that was transformed by a natural log.

Statistical Power

Details on statistical power calculations for the Bridges study can be found in Wang et al.[33]

Data Analysis

We used Stata version 14 (StataCorp LP, College Station, TX) to perform all statistical analyses. First, we summarized continuous outcomes using means and standard deviations and categorical outcomes using proportions at each time point. Next, we used 3-level multilevel models to examine the effects of interventions on each outcome. Multilevel models account for clustering of data where individuals are nested within each school and observations are nested within each individual. We estimated the school-level random intercepts, individual-level random intercepts, and individual random slopes across time points based on a continuous time variable. In each model, we included study group status (Bridges, Bridges PLUS, or control conditions), a time-point variable (baseline and 12-, 24-, 36-, and 48-month follow-ups), and their interactions. We used linear mixed models to examine continuous outcomes and logistic generalized linear mixed models to examine dichotomous outcomes. The covariance structure for the individual-level random effects was modelled as unstructured. We employed robust standard errors (Huber–White "sandwich" variance estimator), clustered by school ID, for continuous outcomes to protect inferences against misspecification of the correlation structure and potential assumption violations (e.g., nonconstant or nonnormal residuals in linear mixed models).[44,45]

The main analyses compared intervention effects between adolescents in the intervention and control conditions. Main coefficients of interest were the interactions between study group status and the time-point variable. To answer the 2 subsequent research questions, we conducted 2 additional sets of comparisons: (1) Bridges PLUS (2:1 match rate) versus Bridges (1:1 match rate) and (2) intervention versus control among female and male respondents.

Across all study outcomes, the highest rate of missing data was sexual risk-taking intention at 2.6%. A missing rate of less than 5%[46] or 10%[47] is inconsequential and is unlikely to bias statistical analysis. Our study addressed the missing data problem with our mixed-effect models, which used direct maximum likelihood estimation under the missing-at-random assumption.

RESULTS

At baseline (Table 1), the average adolescent was aged 12 years, living on average in a 6-person household. Slightly more than half of the adolescents sampled were female (56%), and 21% lost both parents to AIDS (hence classified as double orphans). Most adolescents sampled lived with a surviving biological parent or grandparent as the primary caregiver. Only 29% of caregivers were formally employed.

Table 1 indicates that, at baseline, adolescents in the control and intervention conditions were different on 2 observable characteristics: orphanhood status and caregiving family. Specifically, adolescents in the control condition were more likely to have a primary caregiver who was not a biological parent. When we controlled for these 2 characteristics, results were similar to our reported main findings (Appendix Table A).

Effects of the Bridges and Bridges PLUS Intervention

Table 2 presents the effects of the intervention on our primary outcomes—self-rated physical health, mental health (depression and hopelessness), and sexual risk-taking intention. Both intervention conditions significantly improved self-rated health at 12, 24, 36, and 48 months (Table 2 and Appendix Table B). Results suggest that the intervention was effective in reducing

TABLE 1— Description of Demographic Characteristics Across Intervention and Control Conditions at Baseline: Uganda, 2012

Characteristics	Control (n = 487), Mean (SD) or %	Bridges (n = 396), Mean (SD) or %	Bridges PLUS (n = 500), Mean (SD) or %
Age, y	12.75 (1.23)	12.56 (1.31)	12.71 (1.25)
Female	55.0	57.0	56.0
Household size	6.43 (2.97)	6.29 (2.62)	6.32 (2.74)
Years living in the households	7.12 (4.41)	7.19 (4.44)	7.44 (4.54)
Double orphan	25.0	18.0	20.0
Primary caregiver			
Biological parents	37.0	41.0	44.0
Grandparents	40.0	35.0	36.0
Other relatives	23.0	24.0	21.0
Caregiver: employed	31.0	34.0	24.0

depressive symptoms at the end of the intervention period (24-month follow-up), but the difference in depressive symptom scores between adolescents in the intervention and control conditions were not statistically significant at 36- or 48-month follow-ups (Table 2). By contrast, the Bridges PLUS condition had more sustained effects in reducing hopelessness levels. Adolescents in the Bridges PLUS condition generally showed significantly lower levels of hopelessness than control condition adolescents during and after the intervention period at 12, 24, 36, and 48 months. We found that the intervention did not have a statistically significant effect on reducing sexual risk-taking intention. Although adolescents in the Bridges condition reported significantly lower sexual risk-taking intentions at 24 months, the effect was short term, and statistical significance was not sustained beyond this.

In Table 3, the intervention effects on secondary outcomes show that, although adolescents in the intervention and control conditions did not differ on self-reported financial savings at baseline, adolescents in the Bridges and Bridges PLUS conditions reported significantly more financial savings in subsequent time points than those in the control condition. At 48-month follow-up, there were significantly more food-insecure adolescents in the control condition compared with adolescents in Bridges and Bridges PLUS conditions. At baseline, all adolescents in the intervention and control conditions were in school. At subsequent follow-ups, there was no statistical difference in school enrollment between control and intervention groups.

Bridges was more efficacious in improving self-concept outcomes during the intervention period (12- and 24-month follow-ups) relative to the control condition, while the Bridges PLUS condition led to improved self-concept throughout the observed periods (at 12, 24, 36, and 48 months). Self-efficacy showed a similar pattern. As measured by HIV-prevention intentions and self-reported HIV/AIDS status, we found that the intervention did not have a statistically significant effect on sexual health indicators (Appendix Table C). We also present results from pooling Bridges and Bridges PLUS groups in Appendix Table D.

Intervention Effects of Higher Savings Incentive

We compared the effects of the intervention on adolescents in the Bridges (1:1 match rate) and Bridges PLUS (2:1 match rate) across all study outcomes. Adolescents in Bridges and Bridges PLUS conditions did not differ on all primary outcomes (Appendix Table B). With regard to secondary outcomes, we found that a higher level of financial savings incentive led to a higher level of self-reported savings from 24- to 48-month follow-up (Figure 1 and Appendix Table B) but there were no differences for other secondary outcomes. Specifically, at 48-month follow-up, the average amount of savings for Bridges PLUS adolescents was UGX 89 751, significantly higher than the average amount of savings for Bridges adolescents (UGX 67 330).

Differential Effects by Gender

To address this question, we further included the following variables in our analytic models: interaction between gender and intervention status, interaction between gender and time-point dummies, and a 3-way interaction among gender, intervention, and time-point dummies. We administered a Wald test to test the assumption that the 3-way-interaction terms among gender,

TABLE 2— Regression Results for Self-Rated Physical Health, Mental Health, and Sexual Health (Primary Outcomes): Uganda, 2012–2017

Outcomes	Self-Rated Health, B (95% CI) or χ^2 (*P*)	Child Depression, B (95% CI) or χ^2 (*P*)	Hopelessness, B (95% CI) or χ^2 (*P*)	Sexual Risk-Taking Intention, B (95% CI) or χ^2 (*P*)
Group (Ref: control)				
Bridges	−0.20 (−0.35, −0.04)	0.01 (−0.17, 0.18)	−0.08 (−0.21, 0.05)	0.02 (−0.13, 0.18)
Bridges PLUS	−0.17 (−0.33, −0.01)	0.07 (−0.12, 0.26)	0.05 (−0.11, 0.21)	0.01 (−0.14, 0.15)
Time (Ref: baseline)				
12 months	−0.18 (−0.31, −0.05)	−0.10 (−0.23, 0.02)	−0.33 (−0.43, −0.24)	0.20 (0.01, 0.38)
24 months	−0.08 (−0.20, 0.05)	−0.21 (−0.31, −0.11)	−0.44 (−0.53, −0.36)	0.04 (−0.13, 0.20)
36 months	−0.06 (−0.15, 0.04)	−0.19 (−0.29, −0.09)	−0.43 (−0.55, −0.30)	0.07 (−0.08, 0.23)
48 months	−0.16 (−0.29, −0.02)	−0.23 (−0.34, −0.11)	−0.53 (−0.62, −0.45)	−0.07 (−0.20, 0.06)
Group × time				
Group × time	37.57 (<.001)	19.72 (.011)	22.97 (<.001)	5.43 (.71)
Bridges × 12 months	0.40 (0.25, 0.55)	−0.12 (−0.31, 0.07)	−0.12 (−0.30, 0.06)	−0.10 (−0.33, 0.12)
Bridges PLUS × 12 months	0.36 (0.18, 0.55)	−0.21 (−0.37, −0.04)	−0.26 (−0.40, −0.12)	−0.10 (−0.30, 0.10)
Bridges × 24 months	0.33 (0.16, 0.49)	−0.23 (−0.39, −0.06)	−0.17 (−0.34, 0.01)	−0.24 (−0.47, −0.01)
Bridges PLUS × 24 months	0.37 (0.19, 0.54)	−0.29 (−0.43, −0.15)	−0.24 (−0.36, −0.11)	−0.09 (−0.32, 0.14)
Bridges × 36 months	0.33 (0.18, 0.48)	−0.12 (−0.31, 0.07)	−0.06 (−0.26, 0.14)	−0.17 (−0.39, 0.06)
Bridges PLUS × 36 months	0.18 (0.05, 0.31)	−0.12 (−0.29, 0.06)	−0.17 (−0.33, −0.01)	−0.10 (−0.30, 0.09)
Bridges × 48 months	0.27 (0.09, 0.45)	−0.10 (−0.31, 0.11)	−0.10 (−0.26, 0.06)	−0.16 (−0.36, 0.03)
Bridges PLUS × 48 months	0.26 (0.06, 0.45)	−0.14 (−0.31, 0.04)	−0.28 (−0.44, −0.12)	−0.06 (−0.21, 0.10)
Constant	0.05 (−0.05, 0.16)	0.20 (0.07, 0.33)	0.44 (0.35, 0.54)	0.02 (−0.09, 0.12)
Variance of school random Intercepts	0.01 (0.00, 0.02)	0.02 (0.01, 0.04)	0.01 (0.00, 0.03)	0.01 (0.01, 0.02)
Variance of child random slopes (time)	0.02 (0.01, 0.03)	0.02 (0.02, 0.03)	0.02 (0.02, 0.03)	0.01 (0.00, 0.03)
Variance of child random intercepts	0.28 (0.22, 0.36)	0.37 (0.30, 0.46)	0.37 (0.31, 0.44)	0.23 (0.17, 0.32)
Covariance of child slopes and intercepts	−0.04 (−0.06, −0.02)	−0.03 (−0.05, −0.02)	−0.04 (−0.06, −0.03)	−0.03 (−0.06, −0.01)
Variance of residuals	0.75 (0.69, 0.81)	0.59 (0.55, 0.64)	0.59 (0.56, 0.62)	0.81 (0.74, 0.88)
ICC (95% CI)	0.02 (0.01, 0.04)	0.03 (0.02, 0.07)	0.01 (0.00, 0.06)	0.01 (0.00, 0.04)
Control mean at baseline	4.28	9.72	5.42	9.02
No.	6402	6350	6394	6238

Note. CI = confidence interval; ICC = intraclass correlation coefficient. The mixed model in Stata version 14 (StataCorp LP, College Station, TX) was used for all outcomes. ICCs and their 95% CIs were derived for each outcome variable by running unconditional models for each outcome variable at baseline.

intervention, and time points were jointly equal to zero. Across all the outcomes examined and reported in this article, the intervention did not have varying effects for male and female adolescents on all primary outcomes, but the intervention had varying effects by gender on 2 secondary outcomes: self-efficacy and HIV prevention intentions (Appendix Table E and Appendix Figure C). For self-efficacy, the effect of Bridges PLUS was stronger for males than females at 24 months. For HIV prevention intentions, we found that the effect of Bridges was stronger for males than females at 24 months. However, for these 2 outcomes, effects by gender were similar during other time points.

DISCUSSION

This article presents the efficacy of an EI, comprising incentivized financial savings accounts, mentorship, and financial literacy training, on a wide range of adolescent health and developmental outcomes over 48 months. We found that, at the end of the 24-month intervention initiation period (classified as

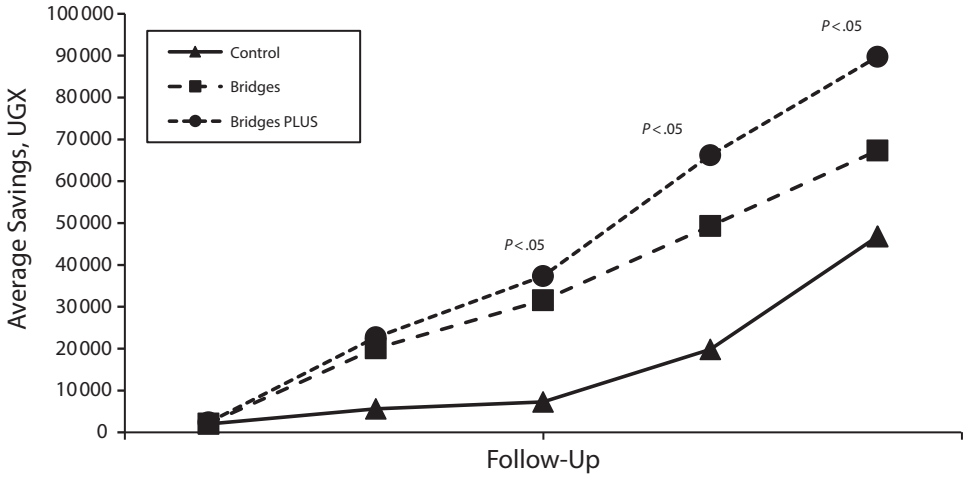
TABLE 3— Regression Results for Financial Stability, Education, Self-Concept, and Self-Efficacy (Secondary Outcomes): Uganda, 2012–2017

	Log (Savings Amount),[a] B (95% CI) or χ^2 (*P*)	Food Insecurity: Had 0–1 Meals per Day,[b] Log Odds (95% CI) or χ^2 (*P*)	Enrollment Status in School,[b] Log Odds (95% CI) or χ^2 (*P*)	Self-Concept,[a] B (95% CI) or χ^2 (*P*)	Self-Efficacy,[a] B (95% CI) or χ^2 (*P*)
Group (Ref: control)					
Bridges	0.15 (–0.50, 0.80)	0.32 (–0.14, 0.78)	0.06 (–2.52, 2.65)	–0.00 (–0.14, 0.14)	–0.09 (–0.25, 0.07)
Bridges PLUS	0.42 (–0.21, 1.05)	0.20 (–0.25, 0.64)	0.65 (–1.73, 3.04)	–0.20 (–0.34, –0.06)	–0.23 (–0.44, –0.01)
Time (Ref: baseline)					
12 months	0.25 (–0.09, 0.59)	–0.04 (–0.42, 0.33)	. . .	0.09 (–0.02, 0.20)	0.10 (–0.02, 0.23)
24 months	0.45 (–0.10, 1.01)	0.03 (–0.35, 0.41)	–4.01 (–5.35, –2.68)	0.30 (0.21, 0.39)	0.15 (–0.06, 0.36)
36 months	1.22 (0.83, 1.61)	–0.61 (–1.03, –0.18)	–8.35 (–10.51, –6.18)	0.26 (0.14, 0.38)	0.16 (0.04, 0.29)
48 months	2.38 (1.91, 2.85)	–0.03 (–0.41, 0.35)	–9.88 (–12.12, –7.65)	0.39 (0.25, 0.53)	0.37 (0.25, 0.50)
Group × time					
Group × time	290.21 (<.001)	18.85 (.016)	11.79 (.07)	49.20 (<.001)	25.85 (<.001)
Bridges × 12 months	3.10 (2.23, 3.98)	–0.78 (–1.35, –0.21)	. . .	0.27 (0.10, 0.44)	0.22 (0.04, 0.39)
Bridges PLUS × 12 months	3.66 (2.83, 4.50)	–0.20 (–0.72, 0.32)	. . .	0.36 (0.22, 0.50)	0.35 (0.16, 0.55)
Bridges × 24 months	3.08 (1.78, 4.39)	–0.91 (–1.50, –0.32)	–0.43 (–2.05, 1.20)	0.21 (0.07, 0.35)	0.30 (0.05, 0.55)
Bridges PLUS × 24 months	4.15 (3.31, 5.00)	–0.51 (–1.05, 0.03)	–0.57 (–2.00, 0.85)	0.37 (0.23, 0.51)	0.35 (0.09, 0.61)
Bridges × 36 months	2.58 (1.60, 3.57)	–0.24 (–0.86, 0.37)	1.33 (–0.46, 3.11)	0.13 (–0.05, 0.30)	0.17 (–0.03, 0.37)
Bridges PLUS × 36 months	3.52 (2.80, 4.24)	–0.03 (–0.61, 0.55)	0.89 (–0.74, 2.51)	0.23 (0.06, 0.40)	0.24 (–0.02, 0.50)
Bridges × 48 months	1.17 (0.31, 2.04)	–0.88 (–1.47, –0.30)	1.05 (–0.78, 2.88)	0.02 (–0.17, 0.21)	0.02 (–0.16, 0.20)
Bridges PLUS × 48 months	1.96 (1.13, 2.80)	–0.69 (–1.24, –0.13)	0.93 (–0.73, 2.60)	0.25 (0.07, 0.42)	0.26 (0.08, 0.44)
Constant	2.36 (1.89, 2.84)	–2.02 (–2.35, –1.69)	10.85 (7.10, 14.61)	–0.25 (–0.34, –0.17)	–0.17 (–0.29, –0.05)
Variance of school random intercepts	0.22 (0.09, 0.56)	0.07 (0.03, 0.24)	6.07 (3.29, 11.22)	0.01 (0.00, 0.02)	0.01 (0.01, 0.03)
Variance of child random slopes (time)	0.56 (0.41, 0.78)			0.02 (0.02, 0.03)	0.01 (0.00, 0.03)
Variance of child random intercepts	1.82 (1.17, 2.82)	1.49 (1.17, 1.89)	35.24 (19.80, 62.74)	0.40 (0.35, 0.47)	0.25 (0.19, 0.32)
Covariance of child slopes and intercepts	0.36 (–0.02, 0.73)			–0.04 (–0.05, –0.02)	–0.02 (–0.04, 0.00)
Variance of residuals	15.37 (14.51, 16.28)			0.56 (0.52, 0.60)	0.72 (0.66, 0.79)
ICC (95% CI)	0.02 (0.01, 0.05)	0.07 (0.04, 0.13)	0.03 (0.00, 0.25)	0.02 (0.00, 0.07)	0.05 (0.02, 0.08)
Control mean at baseline	1999.38	0.17	1.00	67.49	99.31
No.	6246	6402	6402	6388	6374

Note. CI = confidence interval; ICC = intraclass correlation coefficient. ICCs and their 95% CIs were derived for each outcome variable by running unconditional models for each outcome variable at 1 time point.

[a]Mixed model in Stata version 14 (StataCorp LP, College Station, TX).
[b]Melogit model in Stata version 14 (StataCorp LP, College Station, TX); results are presented as log odds.

short-term), both Bridges and Bridges PLUS were efficacious in improving self-rated health and reducing levels of adolescent depressive symptoms and hopelessness, 3 of our 4 primary outcomes. However, only participants in the Bridges arm reported fewer intentions to engage in sexual risk-taking behavior, and this was only significant at 24 months. The intervention was also efficacious in increasing financial savings, reducing food insecurity, and improving self-concept and self-efficacy, our secondary outcomes, in the short term. Forty-eight months following



	Baseline	12 mo	24 mo	36 mo	48 mo
Control	1999	5589	7252	19818	46813
Bridges	2097	20082	31524	49315	67330
Bridges PLUS	2364	22736	37324	66198	89751

FIGURE 1— Average Self-Reported Savings (in Ugandan Shillings [UGX]) for Participants in the Control and 2 Intervention Conditions, Bridges and Bridges PLUS: Uganda, 2012–2017

Note. To compare the intervention effects by Bridges PLUS versus Bridges, we ran the following model: outcome = intercept + α_1 Bridges + α_2 Bridges PLUS + $\sum\alpha_3$ time + $\sum\alpha_4$ Bridges × time + $\sum\alpha_5$ Bridges PLUS × time + ε. We conducted pairwise comparisons between Bridges and Bridges PLUS groups at each time point. From 24- to 48-month follow-ups, Bridges PLUS adolescents had a significantly higher amount of self-reported savings than Bridges adolescents had.

intervention initiation (classified as long-term), the effects of the Bridges intervention remained statistically significant for 1 primary outcome, increased self-rated health, and 2 secondary outcomes, increased financial savings and reduced food insecurity. The Bridges PLUS intervention was additionally efficacious in reducing levels of hopelessness and increasing self-concept at 48-month follow-up. However, the intervention was not efficacious in improving sexual health outcomes.

This study demonstrates that a family-based EI can sustainably improve physical health, mental health functioning, financial stability, and food security for AoAIDS. Our experience adds to the evidence that financial savings (even modest), peer mentorship, and financial literacy training have the potential to be a requisite and critical part of standard of quality care for AoAIDS in SSA and in other resource-constrained settings.

In the context of HIV prevention, despite a strong study design, we found no effects on sexual risk-taking–related outcomes after the intervention. This could be attributed to the younger age of adolescents participating in the study (average age of 12 years at recruitment). Given that the documented age of sexual debut in the region is 16 years and that participants were school-going at the time of recruitment and lived within families, these may act as protective factors for sexual activity, especially for this age group.

During the intervention period, the mentoring component, which was only offered in the first year of the intervention, was efficacious in reducing depression levels, and the results were sustained 12 months after the intervention, but not beyond. These results are similar to outcomes of another intervention that utilized peer mentoring.[48] It could be that for AoAIDS, ongoing social support (in this case, mentorship) is critical—if results are to be sustained in the long run. Nonetheless, Bridges PLUS adolescents who received a higher level of savings incentives showed sustained lower levels of hopelessness after the intervention.

Overall, our findings suggest that Bridges had several culturally relevant services that demonstrated long-term benefits to AoAIDS in the areas of physical health, mental health, economic status (e.g., savings), and nutrition (e.g., improved food security). Yet, it appeared to be less efficacious on sexual risk-taking behaviors. A further study on economic interventions incorporating sexual risk-reduction education into

programming for AoAIDS is recommended. This may yield further evidence and validate new intervention content or foci targeting sexual risk specifically.

Although we found that Bridges PLUS adolescents reported more sustained effects on hopelessness, savings, self-concept, and self-efficacy at 48 months, their differences to Bridges adolescents were only statistically significant for the self-reported savings outcome. This finding indicates that a higher savings incentive had a stronger savings effect even after the incentives ceased for 2 years, a novel finding demonstrating effects of savings incentives with a longer-term follow-up than previous studies.[33] However, the effects of higher savings incentives were confined to the savings outcome only.

Likewise, we did not find strong evidence that the intervention effects relating to physical health, mental health, sexual health, savings, and food security were significantly moderated by gender. It is possible that the younger age of adolescents resulted in less-developed gender norms that may have led to differentiated intervention experiences. However, there were limitations to this analysis as the study was not powered to look at 3-way interactions involving gender; hence, these analyses were more exploratory. Moreover, we were unable to further investigate the impact of intervention on HIV status because of the small number of participants self-reporting being diagnosed with HIV. Because we did not use objective measures to determine HIV status, HIV status is likely to be underreported because of possible social desirability bias. Future studies can consider incorporating objective HIV measures to better capture intervention effects on objective sexual health outcomes.

Adolescents impacted by AIDS face numerous challenges. It is imperative to develop responsive, multifaceted, family-based economic interventions, such as Bridges, to achieve long-term improvements in physical health and mental health beyond what is currently achieved by the usual care of psychosocial interventions for adolescent orphans. This cluster-randomized controlled trial contributes to the continuing discussion on how to address the health needs of the growing numbers of AoAIDS in SSA. Further research on interventions that can achieve sustained improvements in sexual health for AoAIDS is recommended. AJPH

ABOUT THE AUTHORS

Fred M. Ssewamala, Rachel Brathwaite, and Sicong Sun are with Brown School and the International Center for Child Health and Development, Washington University in St Louis, St Louis, MO. Julia Shu-Huah Wang is with the University of Hong Kong, Department of Social Work and Social Administration, Hong Kong. Larissa Jennings Mayo-Wilson is with Indiana University, School of Public Health, Department of Applied Health Science, Bloomington, IN. Torsten B. Neilands is with the Division of Prevention Science, University of California, San Francisco. Jeanne Brooks-Gunn is with Teachers College and Vagelos College of Physicians and Surgeons, Columbia University, New York, NY.

CORRESPONDENCE

Correspondence should be sent to Fred M. Ssewamala, William E. Gordon Distinguished Professor, Brown School, Washington University in St Louis, St Louis, MO 63130 (e-mail: fms1@wustl.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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CONTRIBUTORS

F. M. Ssewamala conceptualized and designed the Bridges study on which this article is based and obtained funding for the Bridges study. J. S.-H. Wang performed the analysis, supervised by T. B. Neilands. J. Brooks-Gunn served as a consultant on the research team. All authors contributed to drafting of the final submitted article and have approved the final article for submission.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare that are relevant to the content of this article.

HUMAN PARTICIPANT PROTECTION

Ethics approval was granted by the Columbia University Institutional Review Board (AAAI1950) and the Uganda National Council for Science and Technology (SS2586). All adolescents provided assent and their caregivers provided consent for participation.

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Disrupting the COVID-19 Misinfodemic With Network Interventions: Network Solutions for Network Problems

Lindsay E. Young, PhD, Emily Sidnam-Mauch, PhD, Marlon Twyman, PhD, Liyuan Wang, MA, Jackie Jingyi Xu, MCG, Matthew Sargent, PhD, Thomas W. Valente, PhD, Emilio Ferrara, PhD, Janet Fulk, PhD, and Peter Monge, PhD

Amid the COVID-19 global pandemic, a highly troublesome influx of viral misinformation threatens to exacerbate the crisis through its deleterious effects on public health outcomes and health behavior decisions.

This "misinfodemic" has ignited a surge of ongoing research aimed at characterizing its content, identifying its sources, and documenting its effects. Noticeably absent as of yet is a cogent strategy to disrupt misinformation.

We start with the premise that the diffusion and persistence of COVID-19 misinformation are networked phenomena that require network interventions. To this end, we propose five classes of social network intervention to provide a roadmap of opportunities for disrupting misinformation dynamics during a global health crisis. Collectively, these strategies identify five distinct yet interdependent features of information environments that present viable opportunities for interventions. (*Am J Public Health*. 2021;111: 514–519. https://doi.org/10.2105/AJPH.2020.306063)

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Amid the chaos of the COVID-19 pandemic, an insidious epidemic of misinformation has emerged, which we hereafter refer to as a "misinfodemic."[1] Like the virus itself, the propagation of false information about COVID-19 is a networked phenomenon. Although the broadcast of misinformation does not always occur via online platforms,[2] its widespread dissemination and amplification is fueled by a networked communication environment that enables rapid peer-to-peer sharing of top-down and user-generated content. Coupled with mounting public uncertainty about the virus itself and frustration with occasionally inconsistent guidance and policies from national and local authorities (e.g., mask wearing),[3] this sociotechnical environment has become an incubator for the spread of misinformation. No matter its form—unverified (i.e., information that is unconfirmed), misleading (i.e., information that misrepresents or skews facts), or wholly fabricated (i.e., falsehoods)—COVID-19 misinformation has compounded the crisis through its deleterious effects on health behavior and policy decisions.

This situation has ignited a surge of ongoing research to characterize the content of this misinfodemic, to identify its sources, and to document its effects.[4–7] Although such research efforts are critical for sharpening our understanding of the misinfodemic, thus far proposals are missing cogent strategies to disrupt the misinfodemic. To this end, we take as our starting premise that network problems like this misinfodemic are best countered with network interventions. Network interventions are intentional and planned efforts to use social network mechanisms and structures to generate social influence, accelerate behavioral change, and achieve desirable outcomes among individuals, groups, organizations, and populations.[8] In what follows, we extend the seminal work of Valente[8] by proposing five classes of network-based interventions designed to disrupt the social and technological mechanisms of COVID-19 misinformation:

1. mobilizing champions,
2. segmenting people into groups,
3. inducing virality,
4. altering network dynamics, and
5. redesigning social network platforms.

We summarize these interventions in the box on page 515.

Network Intervention Strategies for Disrupting Misinfodemics

Network Intervention	Application to Misinformation	Strengths	Considerations	Example Intervention
Type I. Mobilizing champions	Identifies network influencers and mobilizes them to create a top-down flow of accurate information or desired behaviors	Maximizes spread of accurate, verified information; uses the influence of experts and public figures	Might not reach isolated individuals or insular groups who lack access to good information	Identifying key individuals or organizations to spread accurate COVID-19 information
Type II. Group segmentation	Identifies groups of individuals to change at the same time and tries to combat misinformation that emerges in these group settings	Acknowledges that susceptibility to misinformation can be related to group identity, norms, and decision-making	Can be resource intensive to identify a misinformation hub and find a trusted source to spread good information	Identifying groups who mistrust science and connecting them with local, trusted sources of accurate information
Type III. Inducing virality	Stimulates peer-to-peer interactions to spark bottom-up spread of accurate information or desired behaviors	Capitalizes on the trustworthiness and influence of peers and promotes active participation	Could require multiple attempts to successfully induce virality	Creating viral campaigns that promote a positive health behavior
Type IV. Altering network dynamics	Modifies communication networks to disrupt the spread of misinformation or hasten the spread of accurate information	Corrects for "problems" in the network infrastructure that undergird misinformation flow	Deleting information or accounts has ethical implications; could entrench views of mistrustful groups	Removing malicious bots from the network or adding "bots for good" to the network
Type V. Redesigning platforms	Changes the infrastructures or digital affordances that shape network formation and communication flow related to misinformation	Recognizes the blatant and latent effects that platform design can have on the flow of misinformation	Requires cooperation from social media companies; may cause unintended effects for information flow	Partnering with social media companies to add design buffers against misinformation spread

MOBILIZING CHAMPIONS (TYPE I)

The most intuitive network-based intervention mobilizes influential network actors (i.e., people or organizations) to champion an intended message or behavior the way a social influencer does for brands. Champions are often identified on the basis of their network positions (i.e., where they are vis-à-vis other network members) or on the basis of characteristics they share with members who are identified as structurally important. For example, actors with many network connections (e.g., LeBron James's millions of Twitter followers) act as "hubs" who can broadcast information widely and have considerable influence over the norms, attitudes, and behaviors of others.

In the context of public health, although scientific experts such as Anthony Fauci, director of the National Institute of Allergy and Infectious Diseases, play integral advocacy and education roles, their influence is not ubiquitous or guaranteed, particularly in communities that distrust elite institutions and scientific authorities.[9] For this reason, governments have made concerted efforts to enlist less polarizing and more culturally relevant hubs from platforms such as Facebook, Instagram, and YouTube to catalyze accurate news about COVID-19 or to model preventive behaviors. For example, the UK Department for International Development, the World Health Organization (WHO), and the Bangladesh government made formal arrangements with social media influencers (e.g., Filipino television host and popular YouTuber Bianca Gonzalez,[10] Instagram influencer Knox Frost[11]) to serve as champions of COVID-19 prevention.

These champions directed their younger audiences to official sources of public health information and modeled behaviors such as handwashing and physical distancing in their posts. There are countless other social media influencers who are spontaneously doing the same without these institutional arrangements. The power of COVID-19–prevention champions like these lies not in their scientific expertise but in their broad appeal and their ability to promote easy, yet essential, behaviors.

Meanwhile, there is also evidence that network "bridges" (i.e., actors who connect otherwise nonconnected or loosely connected groups) have a critical role to play as COVID-19–prevention champions. Although bridges may not have the mass audience that hubs have, their brokerage of disparate groups makes them optimal gatekeepers for facilitating or disrupting the spread of information across community boundaries. Health professionals may be well suited for this role, given their status in both scientific and civic circles. A noteworthy example is Francis Collins, director of the National Institutes of Health; he has used his

scientific expertise and his personal standing in the faith-based community to encourage people of faith to take the virus seriously and to follow public health guidelines.[12]

GROUP SEGMENTATION (TYPE II)

As a meaningful and functional organizing unit, groups create a shared context that gives members a sense of identity and belonging while fostering social norms and decision-making. Consequently, segmentation interventions (i.e., those that engage connected groups or communities to change at the same time)[8] are ideal when acceptance of new information or behaviors requires collective buy-in. In the network infrastructure that undergirds any social media platform, meaningfully connected subgroups can be identified a priori on the basis of collective goals (i.e., communities of practice), common interests, or geographic location (e.g., neighborhoods). The creation and popularity of formal groups and communities on platforms such as Facebook and Reddit have made this type of collective increasingly identifiable. Additionally, community-detection algorithms can be used to identify groups of densely connected individuals whose shared pattern of friendships indicates their probable social milieu.[8]

In the context of COVID-19, there are notable ideological communities on social media that seed doubt and confusion about COVID-19. For example, people who are vaccine hesitant (i.e., who delay or refuse vaccines despite the availability of vaccination services)[13] have created communities on popular social media platforms such as Facebook and YouTube. Ideologues from these circles are using members' complex concerns over the efficacy and safety of vaccines to heighten a collective skepticism about the source and nature of COVID-19 and to promote discredited claims.[14] Similarly, members of some far right communities are propagating COVID-19 conspiracy theories in their circles.[15]

As difficult as it is for health information campaigns to change such fervent beliefs, there are disciplined ways to limit the influence of the ideologues on those who are more susceptible to their claims. For example, trusted champions in ideological communities could help dispel myths and relay accurate information about the virus, as an evangelical public health expert has done on YouTube for members of her spiritual community[16] and, in some ways, as Fox News' Tucker Carlson may have done for some viewers when he advocated taking seriously the COVID-19 threat.[17] And, as more people contract the virus, one could also imagine recruiting COVID-19 survivors from an ideological community who were formerly skeptical of the virus and its severity. These survivors could use their COVID-19 infection as a way to encourage their like-minded peers to take the virus seriously.

INDUCING VIRALITY (TYPE III)

Induction interventions stimulate peer-to-peer communication and content sharing to induce the spread of factual information or a desirable behavior. In a competitive information environment that is rampant with misinformation, it is critical that accurate, credible, and verified information capture peoples' attention. To these ends, viral campaigns capitalize on well-known heuristic cues such as source familiarity and trustworthiness[18] by using the influence of known contacts, as information received from friends, family, co-workers, and peers is more likely to be trusted and accepted.[19]

Inducing virality is proving to be a useful campaign strategy for rallying the public around essential COVID-19 preventive measures. The #GhenCoVyChallenge is a standout example. Started by a Vietnamese musician and choreographer in partnership with the Vietnamese government, the #GhenCoVyChallenge puts a song and dance spin on promoting proper handwashing techniques and other behavioral precautions. With more than two million followers, the TikTok campaign has gone viral, inspiring countless shares and dance renditions. But induction interventions need not be spectacular, or expensive. Subtler inducements can also be used, for example, prompting users to use particular hashtags that offer beneficial narratives, such as #Saferathome.

ALTERING NETWORK DYNAMICS (TYPE IV)

The previous interventions are designed to work within the bounds of an established network, but proactively disrupting misinformation flows may require creating network changes. Alteration interventions manipulate the network structure itself by adding or removing network actors or the ties between them. Networks can also be altered by rewiring ties to minimize the flow of misinformation or to facilitate the flow of accurate information. Platform algorithms can even be used to motivate rewiring by recommending new connections (e.g., Facebook's People You May Know friends recommender). Manipulating networks of human social media users is understandably controversial, especially if that manipulation is

perceived as censorship. Given the link between conspiracy beliefs and suspicions of sinister motivations by others,[20] even just the perception of being censored among actors who contribute to misinformation has the potential to undermine the intention of this type of intervention.

However, with the advent of bots (i.e., social media accounts controlled by software rather than humans) to propagate COVID-19 and other types of misinformation, social media companies are facing heightened pressure to remove malicious accounts from the information environment. Nevertheless, bots are simply tools, which means they can also be programmed to promote beneficial narratives and behaviors. Experimental work shows that "bots for good" can be used to trigger good behaviors, such as getting a flu shot.[21] Therefore, introducing bots for good into portions of a network with little or dubious COVID-19 information is a promising network alteration. Preliminary findings from a recent analysis of COVID-19–related tweets suggest that this may already be happening, particularly as a means of civic journalism. Twitter accounts flagged as probable bots were responsible for surfacing information from English-speaking Twitter accounts that would have otherwise been censored in China.[4]

Finally, new information pathways can also be created to build bridges across information gulfs and integrate siloed or insular communities. In the midst of shelter in place policies, neighborhood groups on social-networking sites such as Facebook and Nextdoor created new opportunities for otherwise unconnected community members to share information and to be linked to needed resources, such as face coverings, hand sanitizer, and local food delivery assistance.[22] However, without reliable moderators and editors in these settings, misinformation will still be shared.

REDESIGNING PLATFORMS (TYPE V)

Given that social-networking technologies can shape network dynamics, we extend Valente's framework to include platform interventions. Platform interventions address the overt and underlying technical infrastructures that shape network formation and communication flow. For example, to combat misinformation, platform interventions can manipulate user-facing features (e.g., adding flags for disputed content) or the platform's backbone (e.g., applying algorithms that limit the effects of misinformation in the larger flow of information).

Popular social media sites are implementing tactics to combat COVID-19 misinformation. For example, Twitter and Facebook recently announced that they would ban the conspiracy group QAnon across all their platforms. However, solutions like these are often reactions to existing misinformation and bypass the mechanisms of content sharing that bring structure to a communication network. Furthermore, such attempts may backfire; for example, Twitter experimented with flagging inaccurate content posted by President Trump on his personal account, but, again, some critics perceived this strategy as censorship,[23] which led to more entrenched views.

For this reason, more preventive strategies may be needed. For example, experimental research shows that "nudging" people to consider the accuracy of information improves their judgments of what to share and not to share with peers.[24] That experiment makes apparent that there are social media users who may be inclined to share spurious claims out of compulsivity rather than out of deeply held convictions about the content's truth. As this type of user may be easier to influence, collaborations between social media companies and researchers are needed that operationalize experimental findings like this into manifest platform features. Built-in truth discernment prompts and other features designed to encourage critical consumption of content can then begin to stem the spread of misinformation in real time.

CHALLENGES AND CONCLUSIONS

Misinfodemics and the networks that enable them are complex systems that include the human, organizational, and technological agents that seed misinformation, the misinformation itself and competing information, and the communication ties that facilitate diffusion. Each of the five intervention strategies we have described is designed to use one or more dimensions of this system with the goal of disrupting misinformation flows and enabling verified information to flow more effectively.

These strategies, however, are not without their challenges. Champions (type I) are influential only among their followers, leaving peripheral individuals or insular groups outside their range of influence. Further, the need for social media influencers to maintain their online status may in fact serve as a disincentive for them to advocate behaviors that are perceived as unpopular or controversial among their followers. Segmentation interventions (type II) are time and resource intensive, as they require the ability to identify key subcommunities who are most susceptible

to misinformation and to earn members' collective buy-in. Achieving virality (type III) is difficult and may require multiple attempts to capture users' attention. Altering network dynamics (type IV) to disrupt misinformation flow is controversial and difficult to achieve, as sources of misinformation are both pervasive and persistent. And, finally, platform interventions (type V) require difficult-to-obtain transparency from social media companies and, when implemented, could have unintended consequences. For example, some platform reforms may be perceived as censorship in communities who create and spread misinformation, which could lead to more entrenched beliefs about the sinister intentions of powerful elites.

The ramifications of allowing COVID-19 misinformation to continue to spread are dire, however. In social isolation, people are eager for reliable guidance, making them more susceptible to false claims and, consequently, to taking actions that may be detrimental to their own and others' health and safety. Accordingly, the WHO has made responding to COVID-19 misinformation one of its top priorities. However, its plan for action—to refute identified myths and rumors with evidence-based information—runs the risk of being ineffective given the complex network dynamics that facilitate and reinforce the spread of misinformation and the equally complex ways some people cognitively manage logically contradictory claims.[25] Further, although each of the proposed network interventions comes with its own challenges, each intervention also provides a focused solution for different aspects of the networked misinfodemic problem. When implemented strategically and in parallel, these interventions provide both defensive and offensive means to combat misinformation flow and promote public health. Although not a cure for misinfodemics, network intervention strategies offer an actionable framework for identifying distinct yet interdependent components of misinformation systems that demand attention from research and public health communities. AJPH

ABOUT THE AUTHORS

Lindsay E. Young, Emily Sidnam-Mauch, Marlon Twyman, Liyuan Wang, Jackie Jingyi Xu, Emilio Ferrara, Janet Fulk, and Peter Monge are with the Annenberg School for Communication and Journalism, University of Southern California, Los Angeles. Thomas W. Valente is with the Department of Preventive Medicine, Keck School of Medicine, University of Southern California. Matthew Sargent is with the RAND Corporation, Santa Monica, CA.

CORRESPONDENCE

Correspondence should be sent to Lindsay E. Young, 3502 Watt Way, Los Angeles, CA 90089 (e-mail: lindsay.young@usc.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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CONTRIBUTORS

L. E. Young supervised the study. L. E. Young, E. Sidnam-Mauch, M. Twyman, L. Wang, J. J. Xu, and M. Sargent wrote the first draft of the article. All authors conceptualized, wrote, reviewed, and edited the article.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

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