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Flavored Tobacco Sales Prohibition (2009) and Noncigarette Tobacco Products in Retail Stores (2017), New York City

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ABSTRACT (ENGLISH)

Objectives. To assess explicit- (products clearly labeled flavored) and emergent concept- (products implying flavoring but not clearly labeled) flavored tobacco product availability following New York City's flavor restriction. Methods. We examined explicit- and concept-flavored tobacco product availability, with 2017 New York City Retailer Advertising of Tobacco Survey data (n = 1557 retailers). We assessed associations between block group-level demographic characteristics and product availability by using logistic regression. Results. Most retailers sold explicit-flavored (70.9%) or concept-flavored (69.3%) products. The proportion of non-Hispanic Black neighborhood residents predicted explicit- and concept-flavored product availability, as did having a high school within a retailer's block group for concept-flavored products. Conclusions. Explicit- and concept-flavored other tobacco products persisted throughout New York City, despite 2009 legislation restricting sales. Public Health Implications. Making local sales restrictions or federal production bans inclusive of all explicit and concept flavors would reduce retailer and industry evasion opportunities and protect the health of youths and others.

FULL TEXT

Headnote

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Conclusions. Explicit- and concept-flavored other tobacco products persisted throughout New York City, despite 2009 legislation restricting sales.

Public Health Implications. Making local sales restrictions or federal production bans inclusive of all explicit and concept flavors would reduce retailer and industry evasion opportunities and protect the health of youths and others.

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Flavored tobacco products are associated with youth smoking initiation and continued tobacco use.1 Recent evidence has also demonstrated that flavored tobacco products are popular with young adults, women, and Black smokers.2,3 Flavored cigars are particularly popular with youths and young adults, and the most commonly smoked type are cigarillos, which are generally shorter and narrower than larger cigars, usually do not include a filter, and feature a plastic or wooden tip.2,4,5

Federal, state, and local jurisdictions have taken legislative action to reduce youth access to these products. As part of the Family Smoking Prevention and Tobacco Control Act, in September 2009, Congress prohibited the production of flavored cigarettes, excluding menthol.6 In October 2009, New York City followed suit by prohibiting the sale ofnonmenthol flavored tobacco products other than cigarettes, excluding electronic cigarettes.6,7 Subsequently, jurisdictions across the country have passed various laws restricting sales of flavored tobacco products, including Providence, Rhode Island; Minneapolis, Minnesota; Chicago, Illinois; Boston, Massachusetts, and other Massachusetts towns; Oakland, Santa Clara, and San Francisco, California; and the state of Maine.8

Evaluations of restrictions on flavored cigarettes and other tobacco products (OTPs) have demonstrated effectiveness across several metrics, including low numbers of recorded violations from inspection data, declines in the sales of flavored products from retail sales data, and declines in self-reported use of flavored or any tobacco products from youth surveys.9-13 Yet the retail tobacco landscape remains rife with flavored products, despite laws prohibiting them.12,14-17 While some products are explicitly labeled as flavored, such as "vanilla," "strawberry," and "piña colada," an increasing variety of products are ambiguously named to imply product flavoring, including "ba-boom," "purple," and "tropical sunset."12,14-17 These "concept flavors" have established a foothold in the retail market.12,14-17 Chemical testing has shown that these concept-flavored products contain concentrations of chemical flavoring similar to those measured in explicit-flavored products.16

New York City's law restricting the sale of flavored OTPs has been enforced since November 2010. The city's enforcement protocol is focused on manufacturer statements, which are typically a label, name, or image on a product.18 For example, a cigar with a label that says "chocolate" is presumed to be flavored. Alternatively, if a cigar bears a picture of a blueberry, it is presumed to be flavored regardless ofthe text on the product. Early New York City evaluation findings drawn from retail store sales data through 2012 and January 2014 demonstrated significant declines in sales of flavored OTPs after implementation of the flavor law.9,13 Bodegas or corner stores, despite comprising more than half of New York City tobacco retailers, were excluded from these evaluations because of lack of retail sales data.9,13 The current analysis used data from the 2017 New York City Retailer Advertising of Tobacco Survey (RATS) to examine availability ofboth explicit- and concept-flavored OTPs, particularly large cigars and cigarillos, and neighborhood-level demographic predictors of flavored product availability. In this study, we used more recent data and expanded previous analyses to include conceptflavored OTPs.

METHODS

RATS is a point-of-sale advertising study to assess the tobacco retail environment and retailer compliance with tobacco-control policies in a cross-sectional sample oflicensed tobacco retailers citywide. As described in detail by Watson et al., a statewide version of this study was developed by RTI International and has been conducted annually from 2004 to 2015, with the exception of2013.19 Retailer types were defined as convenience (including those at gas stations), pharmacy, large grocery, small grocery, mass merchandizer, tobacco shop, or other. Small grocery stores included delicatessens and bodegas (corner stores) that often have a deli counter or hot food bar, while convenience stores sold a more limited line of food products (e.g., no raw meat), and included popular chains, such as 7-Eleven.

Sample

The 2015 New York State RATS included an oversample of New York City stores and stratified sampling by retailer type and geographic regions defined as the 5 boroughs that comprise New York City (Bronx, Brooklyn, Manhattan, Queens, and Staten Island; each borough corresponds to a county) and a single stratum for the rest of the state. In 2015, completed assessments were conducted for 79% of sampled retailers, resulting in data from 1745 retailers in New York City and 489 retailers from the rest of the state. The 2017 New York City RATS resurveyed New York City retailers with completed assessments in the 2015 RATS, with the goal ofassessing at least 300 retailers from each of the 5 boroughs. To achieve this, a minimum of 330 retailers were selected per borough from the 2015 sample; no retailers from outside ofNew York City were sampled in 2017. When the minimum number of retailers was not achieved from the matched 2015 sample, additional licensed tobacco retailers were randomly selected by borough (206 additional retailers total).

RATS data were collected with an audit instrument designed to assess availability of specific tobacco products and flavors, presence of interior and exterior point-of-sale advertising or price promotions for specific products, and compliance with tobaccocontrol policies, including cigarette price floors and the presence ofsignage stating the minimum legal cigarette purchase age. All survey items regarding concept- and explicitflavored products were collected for the first time in 2017. Professional data collectors were staffed from a professional data collection agency, and all underwent intensive, multiday training conducted by RTI, which included both classroom learning modules covering definitions and images of products and field training to gain practice identifying products in real-world settings and to standardize categorizations across data collectors.

Explicit-flavored tobacco products were defined as those that used pictures or description to invoke a smell or taste (e.g., products such as Swisher Sweets Grape and Zig Zag Peach). Concept-flavored products were defined as having ambiguous descriptors that did not invoke any particular smell or taste (e.g., jazz, blue, fusion, blue ocean mist), but have been established in the literature as conveying and containing flavors.12,14-17 Availability (yes or no) of each flavor category was recorded separately for specific tobacco products, including little cigars, large cigars or cigarillos (LaCCs), smokeless tobacco, shisha, e-cigarettes, and e-liquid.

Between June and August 2017, trained data collectors visited 1683 sampled retailers in New York City. A single data collector visited each retailer, and store owners and managers were not informed in advance of surveyors' visits. Assessments were completed for 1562 (92.8%) retailers, including 1375 that had been included in the 2015 cycle. Of the 121 retailers without completed assessments, nearly half (46%) were closed at the time that the data collector visited and approximately 30% did not sell tobacco. During 11 visits (9%), the store owner or manager asked the data collector to leave before any data were collected, and in another 11 instances (9%), the data collector noted that the store did not exist.

Retailer addresses were geocoded and linked to demographic characteristics from the 2012-2016 American Community Survey 5-year Summary File. For each retailer, we assessed the following demographic variables at the Census block group level: proportion of youths (aged <18 years), proportion of Hispanic residents (any race), proportion of non-Hispanic Black residents, and proportion of non-Hispanic Asian residents. We assessed proportion of residents below poverty thresholds, based on family income relative to family size and composition, at the census tract level, the smallest geographic unit for which information was available. Using New York City Department of City Planning's Facilities Explorer tool, we obtained and geocoded addresses of all city schools to determine the number of high schools in each retailer's block group; when multiple schools were colocated at a single address, they were considered 1 school. The minimum age to purchase tobacco in New York City was raised to 21 years in 2014; thus, we did not consider elementary or middle schools, as we hypothesized that these students were unlikely to be able to purchase tobacco autonomously.20 We excluded 2 retailers because their addresses were recorded too ambiguously to be geocoded. We excluded 3 additional retailers because they were located in block groups listed as having zero population in the American Community Survey.

Statistical Analysis

We examined bivariable associations between availability of explicit- and conceptflavored products separately, with block group-level demographic characteristics, using the C test to assess statistical significance at the a level of .05. The distributions of some neighborhood demographics were nonnormal (e.g., for proportion of Black residents: mean = 21.9%; median = 7.8%); therefore, neighborhood demographics are presented as quartiles. We dichotomized presence of a high school within a retailer's block group (any vs none). We estimated adjusted prevalence ratios (PRs) and 95% confidence intervals (CIs) for flavored product availability from logistic regression models by using the PREDMARG statement in SUDAAN's RLOGIST procedure. Models included presence of high school within a retailer's block group and all neighborhood demographic characteristics (in quartiles). In addition to models for any flavored product availability, we fit models for availability of explicit- and concept-flavored LaCCs as the outcomes.

We conducted analyses in SAS version 9.4 (SAS Institute, Cary, NC) and SAS-callable SUDAAN version 11.0.1 (Research Triangle Institute, Raleigh, NC). We used sampling weights calculated as the inverse probability of

selection within borough, with adjustment for eligibility, nonresponse, and borough population, in all analyses.

RESULTS

We included a total of 1557 tobacco retailers in main analyses, the majority ofwhich were small grocery stores or bodegas (n = 1044; 67.1%) or convenience or gas station stores (n = 270; 17.3%). There was little clustering of stores within block groups; approximately 80% of the 1209 block groups in our analysis contained a single retailer (mean = 1.29).

The proportions of retailers selling at least 1 explicit- or concept-flavored tobacco product were 70.9% and 69.3%, respectively (Table 1). Explicit- and concept-flavored LaCCs were available in a majority ofretailers (58.4% and 62.5%, respectively). Conversely, explicit- and concept-flavored little cigars (3.5% and 2.8%, respectively) and shisha (5.1% and 2.4%, respectively) were only available in a small proportion of retailers. While not considered a tobacco product in New York City, explicit-flavored ecigarettes were available in 35.7% of stores and concept-flavored e-cigarettes were available in 20.0% of stores.

In bivariable analyses, explicit-flavored product availability was associated with the proportion of Black residents in a retailer's neighborhood (e.g., top quartile = 80.1% vs bottom quartile = 63.5%; P< .001; Table 2). We observed significant associations between availability of concept-flavored tobacco products and proportion of residents aged younger than 18 years (e.g., top quartile = 73.8% vs bottom quartile = 62.7%; P = .01), proportion of Black residents (e.g., top quartile = 81.3% vs bottom quartile = 56.0%; P< .001), proportion of Asian residents (e.g., top quartile = 62.5% vs bottom quartile = 76.3%; P< .001), and presence of a high school in retailer's block group (no: 67.9% vs yes: 81.0%; P= .002).

In multivariable models, the proportion of Black residents in a retailer's block group was positively associated with availability of any explicit-flavored product (PR comparing top vs bottom quartile = 1.28; 95% CI = 1.14, 1.44; Table 3). Though not statistically significant, there was some evidence that availability of explicit-flavored products was higher in locations with more Hispanic residents (PR comparing top vs bottom quartile =1.12; 95% CI = 0.97, 1.29) and in retailers with at least 1 high school in their block group relative to those without (PR= 1.08; 95% CI = 0.98, 1.20). The proportion of Black residents was also a significant predictor of concept-flavored product availability (PR comparing top vs bottom quartile = 1.37; 95% CI = 1.19, 1.57). Retailers sharing a block group with at least 1 high school were also more likely to sell concept-flavored products than were retailers with no high schools in their block group (PR= 1.16; 95% CI= 1.05, 1.28). Results were largely unchanged when restricted to convenience stores (including those at gas stations) and small grocery stores or bodegas (n = 1334), though the association between concept-flavored product availability and high school proximity was attenuated (PR= 1.05; 95% CI = 0.95, 1.18; data not shown).

In multivariable analyses of LaCC availability specifically, the proportions of Black and Hispanic residents were positively associated with explicit-flavored LaCC availability (PR comparing top vs bottom quartile for proportion of Black residents = 1.50; 95% CI = 1.29, 1.74; for proportion of Hispanic residents PR = 1.22; 95% CI = 1.02, 1.46). Proportion of Black residents was also associated with concept-flavored LaCCs (PR comparing top vs bottom quartile = 1.46; 95% CI = 1.26, 1.70); there was also evidence that proportion of residents aged younger than 18 years was associated with availability of these products (PR comparing top vs bottom quartile = 1.16; 95% CI = 0.995, 1.35). Presence of a nearby high school was also associated with flavored LaCC availability (explicit-flavored LaCCs PR = 1.17; 95% CI = 1.02, 1.33; conceptflavored LaCCs PR =1.13; 95% CI = 1.005, 1.280).

DISCUSSION

Availability of explicit-flavored tobacco products persisted at tobacco retailers throughout New York City, despite local legislation restricting their sale. These compliance issues were in line with findings from other jurisdictions. An evaluation of Chicago's restriction on menthol cigarette sales within 500 feet ofschools demonstrated 57% compliance with the law.21

There may be multiple reasons why the initial New York City evaluations showed reductions of flavored OTP sales while the current study showed widespread retail store availability of explicit- and concept-flavored tobacco.9,13 Only 4% of tobacco retailer inspections conducted by the New York City Department of Consumer Affairs at all New

York City stores between 2010 and 2014 received a violation for selling explicitflavored products, suggesting limited availability ofthese products in New York City at that time.9 However, the literature has demonstrated an increase in the availability of concept-flavored products over time and a concomitant rise in the availability of explicit-flavored products, including in New York City.9,12-17 The more ambiguous concept-flavored products limit the ability of New York City inspectors to issue violations for these products. More education is needed to remind retailers which products are prohibited under the New York City flavored OTP sales law and of retailers' responsibility to adhere to this law. Alternatively, our findings may suggest willful noncompliance by retailers, or a combination of these 2 factors.

Concept flavors were not prevalent when New York City initially implemented the law prohibiting the sale of flavored OTPs, but rather have emerged over time as a likely result of industry response to local sales restrictions on explicit-flavored OTPs and recognition of the marketability of concept-flavored products.14,15,17 The availability of concept-flavored products presents a loophole for wholesalers who operate in New York City and surrounding areas.22 Approximately 120 wholesale dealers are licensed by New York City (New York City Administrative Code §11 - 1303) to supply tobacco products to more than 8000 New York City tobacco retail outlets, and each wholesaler must also have a New York State tobacco wholesale license (NY Tax Law §480).22 Dozens of these wholesalers are located outside of New York City and presumably supply tobacco products to retailers in other jurisdictions that do not have restrictions on flavored tobacco product sales. This incentivizes wholesalers to stock concept- and explicit-flavored tobacco products and creates availability of these products for New York City retailers. Once wholesalers possess concept-flavored tobacco products, they have a motive to sell them to New York City retailers. Although it is illegal for retailers to sell concept-flavored tobacco products, both retailers and inspectors may be challenged by ambiguity inherent in concept-flavored product names, which can further undermine compliance with the law.

LaCCs were more likely to be available as explicit- or concept-flavored products compared with other noncigarette tobacco products, including shisha, smokeless tobacco, and little cigars. LaCCs are often cheaper than cigarettes, encourage initiation and regular smoking, are marketed to youths and in neighborhoods with more Black residents, and are also often used to roll marijuana blunts.1,2,23 25 Trends in smoking habits among New York City high-school students have shifted over time, with declines in current cigarette use concurrent with increases in cigar use. 26

Our findings that explicit- and conceptflavored products-particularly LaCCs- were more widely available in neighborhoods with higher proportions of Black and Hispanic residents and with high schools, were not surprising. These findings parallel information from studies of tobacco industry documents that identify flavored tobacco products as a mechanism for targeting youths, as well as a national study showing that most tobacco retailers sold flavored cigars, and the odds of selling flavored cigars were more than twice as high in neighborhoods with more Black residents.27,28 Most New Yorkers live in racially segregated neighborhoods, which enables targeted marketing to specific racial/ethnic groups, including vulnerable populations.29,30 Targeted marketing of health-harming substances, like tobacco, has been established in the literature as one pathway by which racism harms health.27,29 32 Persistent and multipronged efforts are needed to eliminate the disparities accumulating from these historical patterns.27,29-32 New York City has been working toward this goal through multipronged efforts that include policy change and education. Multiple laws have been enacted to reduce the availability of cheap tobacco in all communities, including laws that raise prices of tobacco products and prohibit tobacco product discounts.32 New York City has also conducted educational campaigns and interventions to reach populations adversely impacted by targeted marketing and availability, with a focus on communities of color.32,33 These include hard-hitting media campaigns such as "Marie" and "Beth" that highlight the lasting health consequences of smoking and efforts to develop culturally appropriate cessation . . . •32-34 support strategies.

Limitations

This study does have limitations. We were unable to assess changes over time because availability of explicit- and conceptflavored tobacco products was first assessed in 2017. Data from New York City tobacco retailers may not be generalizable to other regions or nationally. The majority of tobacco retailers in New York City are bodegas, which

may differ from the distribution of tobacco retailers in other jurisdictions. Data collected were observational, based on presence of items at the retailer the day they were surveyed; data do not represent volume of sales or length of time products remain on shelves. In addition, we did not collect formal reliability statistics for items on the 2017 RATS audit instrument, so we were unable to quantify the consistency in observations made by our data collectors. However, our professional data collectors underwent rigorous training, which included examples of several common flavored products. Lastly, while analyses were conducted at the block group level, because of high retailer density and ease of travel, purchasing may occur across block groups.

Public Health Implications

Given tobacco industry efforts to circumvent flavor regulations through concept flavors,14-17 broader adoption by more jurisdictions of prohibitions on sales of flavored tobacco products would be valuable. Although local sales policies can achieve some success, retailers receive flavored OTPs from wholesalers, who typically do business in a range of jurisdictions, potentially including localities that do not have restrictions on sales of flavored tobacco. If the legal market for flavored tobacco products becomes smaller, the supply is also likely to diminish.

In addition, efforts to educate retailers about concept-flavored products could be initiated or expanded to improve compliance with policies. Moreover, local legislation may address concept flavors more effectively ifthe burden of proof is shifted to manufacturers who would be required to certify-with a protocol for enforcement oversight-that specific tobacco products are not flavored as a condition for selling them in a given jurisdiction. This would shift the enforcement burden from local agencies to manufacturers, who are more aware of their products' characteristics.

A federal manufacturing ban-which appears to be a US Food and Drug Administration (FDA) priority-would be sweeping and most impactful.35 The FDA could expand the ban on manufacture offlavored cigarettes to include flavored OTPs, and it could broaden the ban on flavors by eliminating the exception for menthol. Only the FDA can enact a law this strong; local jurisdictions do not have the authority to regulate ingredients in tobacco products. While the federal flavored cigarette ban led to declines in cigarette use, it appears to have encouraged substitution with menthol cigarettes, cigars, and pipes.11 An expanded law has the potential to substantially decrease youth and future adult smoking prevalence as the majority of youths and young adults initiate with flavored tobacco products.1

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CONTRIBUTORS

The study was designed by S. M. Farley, J. Sisti, and J. Jasek. The analyses were conducted by J. Sisti. AH authors drafted, edited, and reviewed the article.

CONFLICTS OF INTEREST

The authors have no conflict of interest to declare.

HUMAN PARTICIPANT PROTECTION

Institutional review board approval was not needed as this study did not meet the definition of human participant research.

Sidebar

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DETAILS

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The Occupational Safety and Health Act at 50-A Labor Perspective

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ABSTRACT (ENGLISH)

In 1970, Congress passed the Occupational Safety and Health Act (OSH Act), with the goal of providing workers a safe and healthful place to work. The law did not just happen-it took decades of struggles by unions and workers and only came following workplace and environmental tragedies, part of a wave of federal legislation to protect workers, the public, and the environment from harm. And like many of the laws enacted at the time, it was based upon a foundation of setting and enforcing protective standards, with the federal government-in this case the Department of Labor-given the responsibility to carry out the law in collaboration with the states. In addition, the OSH Act gave workers and their representatives important new rights, including filing complaints, requesting onsite inspections, accessing information, and seeking new protective standards.

The law has been described as radical and revolutionary, fundamentally changing the balance of power between the government and employers and between workers and employers on a central workplace issue. While the law established a framework and structure for the government to exercise authority and power to advance new protections and oversee compliance, it did not establish a framework and structure for safety and health in the workplace. There were no requirements for the establishment of workplace safety and health programs, safety and health committees, worker safety and health representatives, or basic core safety and health training for workers. That was left to collective bargaining between unions and employers and future regulatory efforts.

FULL TEXT

In 1970, Congress passed the Occupational Safety and Health Act (OSH Act), with the goal of providing workers a safe and healthful place to work. The law did not just happen-it took decades of struggles by unions and workers and only came following workplace and environmental tragedies, part of a wave of federal legislation to protect workers, the public, and the environment from harm. And like many of the laws enacted at the time, it was based upon a foundation of setting and enforcing protective standards, with the federal government-in this case the Department of Labor-given the responsibility to carry out the law in collaboration with the states. In addition, the OSH Act gave workers and their representatives important new rights, including filing complaints, requesting onsite inspections, accessing information, and seeking new protective standards.

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Thus, the success of the law has been tied largely to the commitment and actions of the government-both at the federal and state level-to support and advance stronger worker safety and health protections, and the effectiveness of unions and other safety and health advocates in pushing the government to act.

For the past 50 years, unions and allies have raised key safety and health issues and pushed for stronger standards, greater worker rights, and tougher enforcement of the law. Virtually all of the major standards issued by the Occupational Safety and Health Administration (OSHA)-asbestos, lead, hazard communication, silica, bloodborne pathogens, lockout or tagout, and confined space entry, to name a few-were the result of petitions, lawsuits, and direct action by workers, unions, and other safety and health advocates. Unions have sought increased funding and staffing for OSHA and the other job safety agencies. And unions and safety and health advocates have pushed to hold the agency accountable for its failures to act while at the same time defending the agency and the law against endless industry attacks aimed at weakening protections.

Nearly 50 years after the law went into effect and OSHA was created, there is no question that real progress has been made. Work-related deaths have declined dramatically-from 14000 in 1970 to 5250 deaths in 2018-with high-

hazard industries such as construction seeing the greatest reductions in the numbers and rate of fatalities. The same is true for work-related injuries and exposures to key toxic substances such as asbestos and benzene.
OSHA standards have dramatically changed norms and practices. Just think about how asbestos removal is handled today-with enclosures, full body personal protective equipment, and more-compared with decades ago when few control measures were employed and workers were provided little protection.
Similarly, OSHA enforcement has changed practice and improved conditions, both through emphasis programs that focus on high-hazard industries like meat packing and poultry processing and inspections at individual workplaces with high injury rates or in response to complaints. It is well documented that OSHA inspections improve conditions, reducing exposures and injuries.
When there has been strong leadership and commitment and OSHA has focused its efforts, the agency has made a real and lasting difference, even in the face of strong opposition from industry groups and their political allies.
But the fact is, over the decades, OSHA's ability to address major safety and health issues and problems has greatly diminished.
Federal OSHA and the state OSHA plans are responsible for overseeing the safety and health of 160 million workers at more than 8 million workplaces, twice as many as when the OSH Act was passed in 1970.1 But in fiscal year 2018, there were fewer than 1900 federal and state OSHA inspectors; federal OSHA had just 752 inspectors, the lowest number since the early 1970s when the agency began its work. Currently, federal OSHA is able to inspect workplaces under its jurisdiction on average only once every 165 years. The agency's budget, even with a small increase to $582 million in fiscal year 2020, is significantly less in real dollar terms than a decade ago.2
OSHA's ability to issue needed standards is also seriously constrained. In its 50-year history, federal OSHA has issued standards for 32 toxic substances. The standard-setting process has gotten harder and longer as layers of procedural and analytical requirements have been added, and industry and political opposition has intensified. Early on, it took OSHA one to three years to issue new standards for major hazards. The most recent standards-silica and beryllium issued during the Obama administration-took 20 years. For most hazards, standards are out of date or nonexistent. OSHA cannot address even long-recognized problems, let alone the emerging hazards, that put workers in danger, such as workplace violence.
Today's workplaces and workforce are much different than those in 1970. The service sector has grown significantly while manufacturing has declined. Women make up a much larger segment ofthe workforce, which is also much more diverse. Employment structures and relationships are more fissured and fragmented, making it more difficult to determine employer responsibility for compliance with safety requirements. Declines in unionization have resulted in fewer workers covered by the protection of a collective bargaining agreement, making them more vulnerable to retaliation for raisingjob safety concerns. Yet the OSH Act remains largely unchanged since 1970, and federal OSHA has struggled to keep up with these changes.
The OSH Act and OSHA program need to be strengthened and modernized building on what has been established. The Act must be extended to cover the millions of public employees who still lack legal protection; penalties must be strengthened, including making criminal offenses a felony instead of a misdemeanor; and whistleblower protections must be improved so workers can exercise their rights. The law should require all employers to establish a safety and health program, which fully involves workers and their representatives, to identify and fix hazards, whether the hazard is covered by a specific OSHA standard or not.
The law must also be brought into the 21st century, making all employers jointly responsible for safety and health at multiemployer worksites and by requiring active coordination and collaboration among employers to address safety and health issues. Permissible exposure limits for toxic chemicals must be updated to reflect currently recognized and recommended standards.
Like the passage of the OSH Act of 1970 and other safety and health gains, this will not just happen. It will require organizing and direct action by workers, their unions, and other safety and health activists and advocates to demand that the promise of safe jobs for all workers finally be fulfilled.
Margaret M. Seminario, MS

CONFLICTS OF INTEREST

The author has no conflicts of interest to declare.

Sidebar

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DETAILS

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Safety and Health at the Heart of the Past, Present, and Future of Work: A Perspective From the International Labour Organization

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ABSTRACT (ENGLISH)

Every year, 2.78 million workers die from occupational accidents and work-related diseases, and an additional 374 million workers suffer from nonfatal occupational accidents.1 Lost workdays represent almost 4% of the world's gross domestic product, rising to 6% in some countries.2

For centuries, the workplace has posed risks and hazards for workers. In emphasizing the essential role of social justice in achieving lasting peace, the International Labour Organization (ILO) constitution calls on member states to improve working conditions, including "the protection of the worker against sickness, disease and injury arising out of his employment."3

Although workers continued to experience risks to their safety and health, heightened global knowledge had a significant impact on how organizations such as the ILO tackled these challenges globally.4 Scientific and professional understanding ofthe nature of work and its relationship to the safety, health, and well-being of workers

opened a venue for progress in industrialized nations. Occupational hygiene, along with occupational medicine, toxicology, and epidemiology, continued to grow rapidly, as did disciplines associated with safety design and engineering.

FULL TEXT

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The exponential growth in the production ofnew substances from the mid-20th century onward generated an increased need for research into their possible harmful effects. Revelations concerning such effects, sometimes in relation to supposed harmless substances already in widespread use, such as vinyl chloride monomer, spurred the need for more research.5

Yet, the approach to controlling and regulating occupational safety and health (OSH) risks remained relatively the same, despite the burgeoning knowledge base concerning the science and engineering of prevention and control ofOSH. In most countries, prescriptive measures continued to impose duties based on established legal employment relationships, in relation either to identified hazards and harmful substances or to entire industries such as mining and construction. Although in some countries the evolution of social protection measures improved the availability of financial compensation for injury and illness arising from work, access to this financial assistance remains an issue.

In addition to its normative role, the ILO focused on the development of codes of practice and guidelines on OSH. They have provided OSH guidance for various economic sectors and for the recording and notification of occupational accidents and workrelated diseases. At the global level, the ILO also supported research into a range ofOSH issues. Consequently, the ILO introduced a program of technical assistance, providing capacity building to help deliverpolicies at the national level and support for the development of national institutions and labor inspection systems.

More recently, changes in global production, developing technologies, shifting patterns of work and industry, changes in labor market demographics, and major industrial disasters began to demand a different approach to OSH policy. National-level challenges for both employers and workers showed that the traditional regulation of single OSH risks or single economic sectors had become too narrow; recognition grew of the need to establish a more holistic approach that could address increasingly divergent OSH challenges.

The ILO adapted to these changes by shifting to a culture of prevention. In 1981, for example, the organization adopted the Occupational Safety and Health Convention, no. 155, which states:

Each Member shall, in the light of national conditions and practice, and in consultation with the most representative organisations of employers and workers, formulate, implement and periodically review a coherent national policy on occupational safety, occupational health and the working environment. (Art. 4.1)

This is to "prevent accidents and injury" at the workplace "by minimising, so far as is reasonably practicable, the causes of hazards inherent in the working environment" (Art. 4.2). This pioneering approach to promoting a safe and healthy workplace culture was followed quickly by the Occupational Health Services Convention (no. 161) in 1985.

These developments led to an increasing policy focus on more systematic approaches, with the identification, assessment, and control of risks featuring prominently, both in the safe management of major hazardous industries and in more generic guidance for workplace practices everywhere.

THE NEW MILLENNIUM

The ILO continued its emphasis on prevention as the new millennium began. In 2001, the ILO published the "Guidelines on Safety and Health Management Systems." These guidelines helped embed the systems-based approach to OSH management in global OSH policies at the national and workforce levels. In 2006, it adopted the "Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187)."

The increasingly globalized nature of trade, including the proliferation of global supply chains, has continued to present challenges to effective OSH management. In 2013, the Rana Plaza factory collapse in Dhaka, Bangladesh, in which more than 1100 workers lost their lives and 2500 more were injured, demonstrated the continuing urgency of addressing fundamental safety and health issues in global supply chains through strong partnerships. The ILO's flagship program, Safety + Health for All, brings a strategic compliance approach to global supply chains, including small and mediumsized enterprises. ILO programs such as Better Work and Sustaining Competitive and Responsible Enterprise, which both provide technical assistance to factories along the supply chain, aim in part to create a culture of prevention, relying on dialogue between workers and employers at the factory level. The Vision Zero Fund, an initiative ofthe G7 (Group of Seven) implemented by the ILO, seeks to create shared responsibility for safer supply chains.

With the rise in temporary and part-time work (such as zerohours contracts), the platform economy, and continued challenges to establishing adequate work-life balance, the ILO has paid increasing attention to the corresponding rise in psychosocial risks in the workplace. Noncommunicable diseases, such as occupational cancers, respiratory diseases, and workrelated mental health disorders, require sustained vigilance. These challenges also bring improved opportunities for strategic compliance, for example by applying new technologies to risk assessment and dangerous jobs and by reshaping working schedules to create a better work-life balance.

MOVING FORWARD

The ILO's centenary in 2019 presented an opportunity not only to reflect on the organization's accomplishments but also to address challenges for the Future of Work. In June of this year, delegates to the Centenary International Labor Conference adopted the ILO Centenary Declaration for the Future of Work. The Declaration recognizes that "safe and healthy working conditions are fundamental to decent work." Building on that recognition, delegates to the conference requested the ILO's governing body "to consider, as soon as possible, proposals for including safe and healthy working conditions in the ILO 's framework of fundamental principles and rights at work."6

Thus, although we have seen significant progress throughout the last century in advancing OSH, the need to create safe and healthy work for all remains pressing. New and emerging safety and health risks in an ever-changing world of work will create new challenges, as well as opportunities, for governments, employers, workers, and other key stakeholders to ensure safe and healthy working environments. Á¡PU

Deborah Greenfield, JD

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CONFLICTS OF INTEREST

The authordeclares no conflicts ofinterest.

Sidebar

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DETAILS

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Gonorrhea Prevalence Among Young Women and Men Entering the National Job Training Program, 2000–2017

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ABSTRACT (ENGLISH)

Objectives. To examine long-term gonorrhea prevalence trends from a sentinel surveillance population of young people at elevated risk for gonorrhea. Methods. We analyzed annual cross-sectional urogenital gonorrhea screening data from 191 991 women (2000-2017) and 224 348 men (2003-2017) 16 to 24 years of age entering the National Job Training Program, a US vocational training program. We estimated prevalence among women using an expectation-maximization algorithm incorporated into a logistic regression to account for increases in screening test sensitivity; log-binomial regression was used to estimate prevalence among men. Results. The adjusted gonorrhea

prevalence among women followed a U-shaped curve, falling from 2.9% to 1.6% from 2000 through 2011 before rising to 2.7% in 2017. The prevalence among men declined from 1.4% to 0.8% from 2003 through 2017. In the case of both women and men, the prevalence was highest across all study years among those who were Black or American Indian/Alaska Native and those who resided in the South or Midwest. Conclusions. Trends among National Job Training Program enrollees suggest that gonorrhea prevalence is rising among young women while remaining low and steady among young men. (Am J Public Health. 2020;110:710-717. doi:10.2105/AJPH.2019. 305559)

FULL TEXT

Headnote

Objectives. To examine long-term gonorrhea prevalence trends from a sentinel surveillance population of young people at elevated risk for gonorrhea.

Methods. We analyzed annual cross-sectional urogenital gonorrhea screening data from 191 991 women (2000-2017) and 224 348 men (2003-2017) 16 to 24 years of age entering the National Job Training Program, a US vocational training program. We estimated prevalence among women using an expectation-maximization algorithm incorporated into a logistic regression to account for increases in screening test sensitivity; log-binomial regression was used to estimate prevalence among men.

Results. The adjusted gonorrhea prevalence among women followed a U-shaped curve, falling from 2.9% to 1.6% from 2000 through 2011 before rising to 2.7% in 2017. The prevalence among men declined from 1.4% to 0.8% from 2003 through 2017. In the case of both women and men, the prevalence was highest across all study years among those who were Black or American Indian/Alaska Native and those who resided in the South or Midwest.

Conclusions. Trends among National Job Training Program enrollees suggest that gonorrhea prevalence is rising among young women while remaining low and steady among young men. (Am J Public Health. 2020;110:710-717. doi:10.2105/AJPH.2019. 305559)

Gonorrhea is the second most commonly reported sexually transmitted disease (STD) in the United States. Most infections are asymptomatic, and untreated infection may lead to severe reproductive sequelae, including pelvic inflammatory disease and infertility among women and epididymitis among men. The burden is highest among adolescents and young adults 15 to 24 years of age, non-Hispanic Blacks, and those residing in the South.1 3 Gonorrhea control programs, including those offering screening and treatment of asymptomatic infections, are important for reducing the risk of sequelae, as well as interrupting ongoing transmission and reducing prevalence and incidence.

National notifiable surveillance of reported gonorrhea cases is helpful in monitoring trends in diagnosed gonorrhea and assessing the impact ofcontrol programs over time. National gonorrhea case rates among adolescents and young adults have increased steadily since 2014, potentially indicating an increase in gonorrhea incidence.1 However, case rates may also increase as a result ofa number of biases. Case rates, which are estimated by dividing the total number of reported cases by the total population size, may rise because of increased screening coverage (including increased screening at extragenital sites); screening with newer, more sensitive tests; or improved reporting (e.g., electronic laboratory reporting). In addition, case rates are influenced by changes in the risk composition of those who are screened (i.e., case mix), as case counts will likely rise if an increasing proportion of high-risk individuals are screened.4 The influence of these potential biases on case rate trends is difficult to ascertain and complicates interpretation of trends.

Prevalence trends derived from sentinel surveillance can be a useful counterpart to case rate trends because prevalence (referring to cases in which all participants are screened) is not subject to bias resulting from screening coverage or reporting. One sentinel program for the surveillance of gonorrhea in the United States is the National Job Training Program (NJTP), a vocational training program for socioeconomically disadvantaged young adults run by the Department of Labor. The NJTP has included gonorrhea screening at program entry since 2000 for young women and 2003 for young men, and the program has maintained consistent eligibility criteria.5 NJTP entrants

represent a relatively stable population of economically disadvantaged young adults in which gonorrhea prevalence can be measured. Gonorrhea prevalence among women and men entering the NJTP between 2004 and 2009 declined modestly,6 but long-term trends accounting for potential bias due to changes in case mix and screening tests have not been reported.

We examined gonorrhea prevalence trends among young women entering the NJTP during 2000 to 2017 and young men entering the program during 2003 to 2017, accounting for potential bias associated with changes in screening tests and case mix, to provide minimally biased prevalence estimates over time in a sentinel population at elevated risk for gonorrhea.

METHODS

US residents 16 to 24 years of age who meet low-income criteria and face barriers to employment are eligible for the NJTP.5 The NJTP includes gonorrhea and chlamydia screening for all enrollees within 48 hours of entering the program. The majority of gonorrhea testing for the program is performed by a national contract laboratory, although NJTP centers may use local laboratories for testing; local testing data were not available for analysis. Treatment and follow-up care are provided by NJTP centers. We included non-Hispanic White, nonHispanic Black, Hispanic, and American Indian/Alaska Native (AI/AN) enrollees residing in the Northeast, South, Midwest, and West for whom gonorrhea screening test results and information on type of diagnostic test (women only) were available.

During 2000 to 2006, women entering the NJTP were screened with a cervical swab; the Gen-Probe PACE 2 DNA hybridization probe (Gen-Probe Inc, San Diego, CA) was used in this screening. After 2006, women were screened through either a vaginal swab or a urine sample via the BD ProbeTec ET strand displacement assay (Becton-Dickinson, Sparks, MD). Screening for men began in 2003. Most men were screened via a urine sample with the BD ProbeTec assay, although some were screened with the Gen-Probe PACE 2 probe in the early study years.

Evaluation of Possible Biases

Our methods closely followed those used to estimate chlamydia prevalence in the NJTP.7 We explored potential sources ofbias that might need to be addressed in analyses of prevalence trends. First, we examined possible bias resulting from missing gonorrhea test results, as only test results from the national laboratory were available for analysis. In addition, we did not have information on which centers used the national contract laboratory for gonorrhea testing. Because all chlamydia testing is performed by the national contract laboratory and reported as part of sentinel surveillance, a comparable number of chlamydia and gonorrhea test results would indicate that all gonorrhea screening was performed at the national contract laboratory rather than a local laboratory.

We compared the number of gonorrhea screening test results with the number of chlamydia screening test results per month as a proxy for completeness of data on gonorrhea and identified each center as being at least 50%, 75%, or 90% complete.6 We then examined gonorrhea positivity including centers at each level of completeness. We observed no meaningful differences by level of completeness (Figure A, available as a supplement to the online version of this article at http://www.ajph.org), and we present results from centers that tested at least 50% of enrollees for chlamydia and gonorrhea at the national laboratory.

Second, we investigated possible changes in case mix overtime. Gonorrhea prevalence and case rates vary by race/ethnicity and region, with young adults who are Black or living in the South having the highest burden.1,3 We examined potential bias due to case mix by assessing longitudinal changes in the demographic characteristics of NJTP enrollees. We examined stacked bar charts of race/ethnicity, region of residence, and age group (16-19 years and 20-24 years) to assess the relative proportion of each factor over time. We also modeled the proportion of each level of race/ethnicity, region, and age group over time using log-binomial models to assess trends. We observed no meaningful variations in the relative proportions ofrace/ ethnicity, region, or age group (Figures B and C, available as supplements to the online version of this article at http://www. ajph.org). The stable distribution of race/ ethnicity, region, and age suggested that potential case mix bias could be excluded from further consideration.

Finally, we sought to account for timevarying misclassification among women because the quality ofscreening tests for women improved over the study period. We generated pairs of sensitivity and specificity estimates for each screening test and sample type through targeted meta-analyses ofthe existing literature. We searched PubMed and

Scopus using medical subject heading terms and keywords related to gonorrhea screening and diagnostic accuracy. We included studies that reported the diagnostic accuracy of the Gen-Probe PACE 2 and BD ProbeTec ET among women and from which counts of true positive, true negative, false positive, and false negative tests could be extracted or calculated (Figure D, available as a supplement to the online version of this article at http://www.ajph.org). We used bivariate generalized linear mixed-effects models with a logit link to generate summary sensitivity and specificity estimates and 95% confidence intervals (CIs). We did not estimate sensitivity and specificity for men because nearly all men were screened with the BD ProbeTec ET, a highly sensitive and specific test.8,9

Gonorrhea Prevalence Trends

We analyzed annual cross-sectional gonorrhea screening data from female NJTP enrollees during 2000 to 2017 and male NJTP enrollees during 2003 to 2017. Data for 2014 were not available as a result ofadministrative challenges. Because screening is part of enrollment and coverage is high, test positivity at enrollment (number positive/number tested) was used as a proxy for prevalence.

We modeled gonorrhea prevalence trends among women using an expectationmaximization algorithm incorporated into a maximum-likelihood regression to account for misclassification due to imperfect screening test sensitivity and specificity (as calculated through our meta-analyses).10 In this approach, expectation maximization is used to estimate a logistic regression model when the outcome is measured with uncertainty; the approach allows test sensitivity and specificity to vary across observations according to the test type and sample type used for screening. Gonococcal infection status (positive or negative) was the dependent variable in our models, and study year (continuous) was the independent variable. Several variable year specifications were examined, and year was specified as restricted cubic spline terms with 4 knots placed at the 5th, 35th, 65th, and 95th percentiles based on the Akaike information criterion and visual inspection. We used logistic regression models rather than log binomial models because of problems with log binomial model convergence. Parameter estimates from logistic regression models were used to calculate predicted gonorrhea probability (prevalence). Ninety-five percent confidence intervals were obtained via bootstrapping (n = 200).

Gonorrhea prevalence and 95% confidence intervals among men were estimated through log binomial regression without correction for imperfect test sensitivity and specificity. The unadjusted prevalence among men was low, and men were overwhelmingly screened with the BD ProbeTec ET. Very few men were screened with the Gen-Probe PACE 2. Correcting for imperfect but highly sensitive and specific tests had a negligible influence on prevalence.

We estimated gonorrhea prevalence trends among all female and male NJTP entrants and examined trends by race/ethnicity, region, and age group (16-19 years and 20-24 years) to evaluate differences by subgroup.

Sensitivity Analyses

Substantial race/ethnicity data were missing for 2013 and the distribution of known race/ethnicity deviated from other years (Figures B and C), so we explored potential bias from missing data. We examined unadjusted prevalence trends without excluding observations with missing data on race/ethnicity and region and found no differences in the shape of prevalence trends (Figure E, available as a supplement to the online version of this article at http://www.ajph.org). We also explored the influence of random error in Gen-Probe PACE 2 and BD ProbeTec ET sensitivity and specificity estimates among women. To account for random error, we modeled gonorrhea prevalence using the upper and lower bounds of the 95% confidence intervals around the summary sensitivity and specificity estimates. Analyses were performed with Stata version 12 (StataCorp LLC, College Station, TX).

RESULTS

The sensitivity and specificity ofscreening tests among women increased over the study period as a result of improvements in test technology (Table A, available as a supplement to the online version of this article at http://www.ajph.org). Sensitivity was 88.4% (95% CI = 84.1, 91.6) for the Gen-Probe PACE 2, 89.6% (95% CI = 85.0,93.0) forBD ProbeTec ET urine samples, and 95.1% (95% CI = 89.3, 97.8) for BD ProbeTec ET vaginal swabs.

Gonorrhea Prevalence Among Women

During 2000 to 2017 (excluding 2014), 359 984 women were screened for gonorrhea or chlamydia (or both) by the national contract laboratory upon entering the NJTP. We excluded data from NJTP centers where less than 50% of

women who were screened for chlamydia had gonorrhea test results (n = 116 813; 32%) to minimize bias from missing gonorrhea results. We further excluded women with missing or other race/ ethnicity (n = 30 450; 13%) and missing data on region (n = 4677; 2%), test result (n = 13 440; 6%), or type of screening test (n = 2613; 1%). The final analytic sample included 191 991 women.

Most female entrants were Black (60%) and 16 to 19 years of age (66%). Almost half of women were from the South (44%), and few reported symptoms (1.5%). Approximately 18% of women were tested with the Gen-Probe PACE 2, and the remainder were tested with the BD ProbeTec ET via a urine sample (66%) or vaginal swab (16%). Unadjusted prevalence values were 2.6% with the Gen-Probe PACE 2, 2.1% with the BD ProbeTec ET for urine samples, and 2.5% with the BD ProbeTec ET for vaginal swabs (Table 1).

There was a U-shaped trend in modelestimated unadjusted and adjusted gonorrhea prevalence over the study period, and the prevalence was high overall. The unadjusted prevalence fell from 3.0% in 2000 to 1.8% in 2011 before rising to 2.9% in 2017 (Figure 1 and Figure F, available as a supplement to the online version of this article at http:// www.ajph.org). After misclassification associated with different screening tests had been taken into account, the adjusted prevalence was slightly lower than the unadjusted prevalence, falling from 2.9% in 2000 to 1.6% in 2011 before rising to 2.7% in 2017 (a relative increase of nearly 70%).

Gonorrhea prevalence trends among women varied by race/ethnicity, although the prevalence among all racial/ethnic groups rose steadily during 2011 to 2017. NonHispanic Black women had the highest gonorrhea prevalence across the study period, and the prevalence in this group followed a U-shaped curve. The adjusted prevalence among non-Hispanic Black women declined steadily from 4.9% to 2.5% during 2000 to 2011 and then rose steadily to 3.8% in 2017 (Figure 2). Adjusted prevalence trends among AI/AN women generally declined early on (reaching 0.4% in 2011) but climbed sharply after 2011 to 3.3% in 2017; however, estimates for these women were imprecise. The adjusted prevalence among Hispanic and non-Hispanic White women remained under 2% across all study years but began rising modestly in 2011.

There were regional differences in gonorrhea prevalence trends, with the prevalence being consistently higher among women residing in the South and Midwest than among those in the West and Northeast. The adjusted prevalence among women in the South and Midwest generally declined during 2000 to 2011 (from 4.4% to 2.3% in the South and from 2.9% to 2.1% in the Midwest) before increasing through 2017 (to 3.9% in the South and 3.2% in the Midwest; Figure 2). The adjusted prevalence among women in the Northeast and West was under 2% for most study years, although the adjusted prevalence in the Northeast declined sharply in early study years before leveling off.

Younger women 16 to 19 years of age had a higher prevalence of gonorrhea than did older women 20 to 24 years of age throughout the study period. During 2000 to 2011, the adjusted gonorrhea prevalence among younger women dropped from 3.4% to 1.9%, and the adjusted prevalence among older women dropped from 1.4% to 1.1% (Figure G, available as a supplement to the online version of this article at http:// www.ajph.org). The prevalence in both age groups increased after 2011, rising to 3.2% among younger women and 1.9% among older women in 2017.

Sensitivity analyses examining random error influences on screening test sensitivity and specificity estimates showed that the adjusted prevalence from 2000 to 2010 was relatively stable when modeled with the lower 95% confidence limits of sensitivity and specificity estimates (Figure H, available as a supplement to the online version ofthis article at http://www.ajph.org). The adjusted prevalence decreased from 2000 to 2010 when modeled with the upper limits. The adjusted prevalence increased during 2011 to 2017 when modeled with both the lower and upper limits.

Gonorrhea Prevalence Among Men

During 2003 to 2017 (excluding 2014), 479 279 men were screened for gonorrhea or chlamydia (or both) by the national contract laboratory upon entering the NJTP. We excluded data from NJTP centers where less than 50% of men who were screened for chlamydia had gonorrhea test results (n = 160 902; 34%) to minimize bias from missing gonorrhea results. We further excluded men with missing or other race/ ethnicity (n = 33 631; 11%) and missing data on region (n = 4515; 2%) and test result (n = 55 883; 20%). Our final sample included 224 348 men.

Most men were 16 to 19 years of age (66%), non-Hispanic Black (55%), and from the South (51%). Fewer than 1% reported symptoms. More than 99% of men were screened with the BD ProbeTec ET via a urine specimen (unadjusted prevalence: 1.1%), and the remainder (0.2%) were screened with the Gen-Probe PACE 2 (unadjusted prevalence: 5.6%). The prevalence among men decreased steadily over the study period, from 1.4% in 2003 to 0.8% in 2017 (Table 1, Figure 1, and Figure F).

There were differences in prevalence trends by race/ethnicity; non-Hispanic Black men had the highest prevalence throughout the study period. The prevalence among non-Hispanic Black men decreased from 2.3% to 1.4% during 2003 to 2017, the prevalence among AI/AN men increased from 0.3% to 0.7%, and the prevalence among Hispanic and non-Hispanic White men was steady at approximately 0.2% and 0.1%, respectively (Figure 3).

The prevalence among men also differed by region and was highest in the South and Midwest. The prevalence in the South declined from 1.7% to 1.0%, whereas the prevalence in the Midwest declined more modestly from 1.5% to 1.1%. The prevalence in the Northeast and West was stable over the study period (at approximately 0.6% and 0.3%, respectively; Figure 3).

Differences in gonorrhea prevalence trends among men by age group were minor. The prevalence among men 16 to 19 years of age decreased from 1.5% to 0.7% during 2003 to 2017, whereas the prevalence among men 20 to 24 years of age hovered around 1.0% throughout the study period (Figure I, available as a supplement to the online version of this article at http://www.ajph.org).

DISCUSSION

Long-term gonorrhea prevalence trends from sentinel surveillance of the NJTP augment national case rate trends, which can be difficult to interpret as a result ofbiases that are challenging to measure and control. After accounting for time-varying misclassification due to imperfect screening tests among women and ruling out bias attributable to case mix, we found that the gonorrhea prevalence among women entering the NJTP declined during 2000 to 2011 before rising steadily to near 2000 levels in 2017. The prevalence among men entering the NJTP declined modestly during 2003 to 2017. NonHispanic Black enrollees and enrollees residing in the South and Midwest had the highest prevalence of gonorrhea throughout the study period.

The rising gonorrhea prevalence among women in the second halfofour study period may point to a need for increased prevention efforts targeting economically disadvantaged young women. Increasing prevalence was observed among women overall and across race/ethnicity, region, and age categories. Increases among non-Hispanic Black and AI/AN women, women in the South and Midwest, and younger women are particularly concerning given that the prevalence in these groups is already high and the reproductive sequelae of gonorrhea can be severe for women. Continued monitoring of gonorrhea prevalence and the increasing trends in these groups will be important for understanding gonorrhea epidemiology among women, tailoring control efforts, and preventing adverse sequelae.

The gonorrhea prevalence among men was low and decreased over time. This low prevalence, particularly relative to women, is unsurprising because urogenital infections among men are more likely to be symptomatic and may have prompted men entering the NJTP to have sought treatment prior to enrollment. The decreasing trend among men appears to be driven by a declining prevalence among non-Hispanic Black men; the prevalence in this group was highest over the study period but decreased over time, whereas the prevalence in other racial/ethnic groups was lower but generally remained stable. The trend among nonHispanic Black men is encouraging but unexpected because case rates among Black men have increased in recent years.1

In addition, the prevalence among nonHispanic Black men was generally more than 10 times as high as the prevalence among non-Hispanic White men over the course of the study. This racial/ethnic disparity has been previously documented,1,2,6 but our results suggest a reduction in this disparity over time in the sentinel study population. Continued monitoring ofprevalence by race/ ethnicity within the NJTP and among other populations is needed to understand whether these trends will persist.

Our study is one of the first to our knowledge to examine long-term gonorrhea prevalence trends in the United States. Estimates from national probability surveys have been too imprecise and unstable as a result of small

sample sizes and low gonorrhea prevalence to draw meaningful conclusions about trends.2 The NJTP has a sufficient sample size and prevalence to examine trends, and previously estimated trends for women and men entering the NJTP showed a decline over a 5-year period.6 Our analysis, which spanned 18 years for women and 15 years for men, showed that the gonorrhea prevalence among men declined throughout the study period and that the prevalence among women declined and then subsequently increased.

We also carefully examined bias due to case mix by considering temporal trends in factors previously associated with gonorrhea, including race/ethnicity, socioeconomic status, age, and region of residence.1,3 The NJTP entrance criteria for socioeconomic status and age were unchanged over the course of the study period, and we did not observe meaningful longitudinal variation in race/ ethnicity or region. We could not assess whether other important characteristics, such as sexual behavior, changed over time.

Finally, we addressed outcome misclassification due to imperfect and changing screening tests separately for women and men to generate minimally biased prevalence estimates. For women, we conducted metaanalyses to estimate plausible screening test sensitivities and specificities. We used those estimates in an expectation-maximization algorithm incorporated into a logistic regression to account for misclassification. As a result, our prevalence estimates among women are slightly lower than were previously reported estimates.6 However, we were unable to account for any potential heterogeneity in sensitivity or specificity estimates by age. Misclassification among men was minimal and did not have a meaningful impact on point estimates or trend interpretations because nearly all men were screened with a highly accurate test.

Limitations

Our results are generalizable to young people of disadvantaged socioeconomic standing who may enter a job training program; however, our findings may not reflect trends in the general population. In addition, our study does not provide insight into why urogenital gonorrhea prevalence may be increasing among women or decreasing among men entering the NJTP. Sexual activity (e.g., age of sexual debut and condom use) and prevalence within one's sexual network may be important influential factors, but data on these factors were not collected. Both sexual activity and condom use among adolescents have generally declined over the past decade, which may have influenced trends among NJTP enrollees.11 Further research into the relative contribution of changes in sexual behaviors to prevalence trends could help inform prevention interventions.

Changes in structural factors such as health care access and use may also affect prevalence, as women and men who access care are more likely to be screened and treated than are those who do not access care and thus are less likely to have prevalent infections. For example, asymptomatic women may be screened for STDs during wellness or prenatal care visits, and factors that influence these visits (e.g., changes in cervical cancer screening guidelines and increased contraception uptake) may also influence STD screening rates. Such a relationship was observed among women enrolled in Medicaid; a slowed increasing trend in chlamydia screening rates among women from 2004 through 2013 corresponded to a decrease in Papanicolaou testing and adolescent pregnancy.12 Access to screening among women and men is also limited by reductions in public funding for STD clinics, which may result in reduced clinical services or increased patient copays.13 Examining multiple factors that influence gonorrhea screening and prevalence trends is an important area for continued study.

In addition, our prevalence estimates are based on urogenital test results. Gonococcal infections can also occur in the pharynx and rectum, and our estimates likely underestimate the true burden of infection. This may be particularly relevant among men. Other sentinel surveillance data that include information on all anatomic sites suggest increasing diagnoses beginning in 2011 among men, primarily gay, bisexual, and other men who have sex with men.1,14,15 Modestly decreasing or stable trends in urogenital infections observed among male NJTP enrollees may not fully reflect trends in the gonorrhea epidemic in this sentinel population. Data from programs that screen all anatomic sites and collect information on sexual behaviors would be useful to better characterize the overall burden of gonorrhea and inform interpretation of trends.

Public Health implications

Gonorrhea prevalence trends from sentinel surveillance may be subject to fewer biases than case rate trends,

allowing for improved interpretation and understanding of changes in gonorrhea epidemiology. We examined long-term gonorrhea prevalence trends among NJTP enrollees. Diverging trends among men and women suggest that screening and prevention efforts may be adequate for men but may need to be targeted and strengthened to reverse the increasing prevalence among women in this high-risk sentinel population. There were also racial/ethnic and regional disparities in the present study population. Continued monitoring of trends within the NJTP and other high-risk populations will be helpful for understanding whether trends will persist. ÂfPU

CONTRIBUTORS

E. R. Learner and E. A. Torrone designed the study and the analytic strategy. E. R. Learner carried out analyses and drafted the article. All of the authors reviewed and interpreted results and edited the article.

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The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

CONFLICTS OF INTEREST

The authors report no conflicts of interest.

HUMAN PARTICIPANT PROTECTION

No protocol approval was needed for this study because data collection was determined to be part ofroutine surveillance and not research.

Sidebar

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DETAILS

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The Occupational Safety and Health Administration at 50-the Failure to Improve Workers' Compensation

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ABSTRACT (ENGLISH)

In the 1950s and 1960s, it was widely recognized that workers' compensation was failing in its mission to provide economic security for injured workers. After decades of concern, Congress called for a formal review of these state-based programs in the Occupational Safety and Health Act of 1970. Congress gave this responsibility to the National Commission on State Workmen's Compensation Laws ("National Commission"). In 1970, 19 states did not require any employers to provide workers' compensation coverage. Other states mandated coverage for only a fraction of workers. Only about half the states provided benefits to cover two thirds of lost wages, and in most states the maximum weekly benefit was less than the national poverty level for a family of four. In addition, programs frequently did not cover all injuries and provided even less comprehensive coverage for occupational diseases.

FULL TEXT

In the 1950s and 1960s, it was widely recognized that workers' compensation was failing in its mission to provide economic security for injured workers. After decades of concern, Congress called for a formal review of these state-based programs in the Occupational Safety and Health Act of 1970. Congress gave this responsibility to the National Commission on State Workmen's Compensation Laws ("National Commission").

In 1970, 19 states did not require any employers to provide workers' compensation coverage. Other states mandated coverage for only a fraction of workers. Only about halfthe states provided benefits to cover two thirds of

lost wages, and in most states the maximum weekly benefit was less than the national poverty level for a family of four. In addition, programs frequently did not cover all injuries and provided even less comprehensive coverage for occupational diseases.

In its 1972 report, the National Commission concluded, "The protection furthered by workmen's [sic] compensation to American workers presently is, in general, inadequate and inequitable."1 It proposed five basic objectives for workers' compensation systems:

1. " Broad coverage of employees and of work-related injuries and diseases,"
2. "Substantial protection against interruption ofincome,"
3. "Provision of sufficient medical care and rehabilitation services,"
4. "Encouragement of safety," and
5. " An effective systemfor delivery of the benefits and services."

Based on these objectives, it made 84 recommendations, 19 of which it considered essential.

These essential recommendations became a benchmark for judging state workers' compensation systems. In the 1970s, in light of the National Commission's report, several bills were introduced in Congress to create federal minimum standards. These bills did not pass. But the National Commission's report, together with the threat of federal intervention, led many states to enact legislation that provided broader and more adequate benefits, expanding the number ofcovered workers and increasing levels of statutory benefits. Protection expanded in many states through the 1970s and 1980s.

These improvements, together with a sustained rise in medical costs, led to substantial increases in costs. Between 1984 and 1990, employers' average costs per $100 of payroll rose from $1.49 to $2.18, an increase of almost 50% (Figure 1). In addition, the workers' compensation insurance industry was unprofitable in every year from 1984 to 1992.2

This rise in employer costs and decline in insurance profitability led to a counterreformation. From 1990 on, employers and insurers made a concerted effort to push for legislation specifically designed to reduce employer costs. This push was typically framed as a mechanism to improve a state's attractiveness to employers compared with other (often nearby) states. This led to a workers' compensation "race to the bottom."

Over the past three decades, legislative efforts to reduce costs largely did not focus on improving safety or the efficiency of benefit delivery: they focused primarily on reducing both medical costs and cash benefits to injured workers.3 And many ofthe laws passed since 1990 reduced costs by making it harder for people with occupational injuries and illnesses to receive compensation.4

Here are some ofthe ways that states have attempted to reduce employer costs:

1. They have made it more difficult for workers to prove their case. In the past, many states gave workers the benefit of the doubt: the tie went to the worker. Some of these states have changed the standard to "preponderance ofthe evidence" or "clear and convincing evidence."
2. Some states have required "objective" medical evidence to sustain a worker's case. This is a substantial burden for some common injuries; lowback pain is a prime example.
3. Many states now use the American Medical Association's Guides to the Evaluation of Permanent Impairment to determine the degree of permanent partial disability. The guides are notoriously stingy. After California adopted these guides in 2005, physician disability ratings dropped more than 40%.5
4. States have substantially limited the range ofcompensable injuries. For example, they may rule out compensation for "diseases of aging." More broadly, they require that the job be the main cause of the injury. The tradition that employers "take their workers as they find them" has been eroded.
5. Other states, including California, require that payers apportion disability between work and nonwork causes, with benefits paid only for the work-related fraction of disability. This both reduces benefits for those injuries and increases the cost of demonstrating eligibility.
6. States have developed public antifraud campaigns targeting workers. These campaigns have stigmatized claim filing. This is despite evidence that worker fraud is rare and that employer and provider fraud involve much greater

sums than does worker fraud.
7. The "grand bargain" underlying workers' compensation provides benefits to workers on a no-fault basis and shields employers from tort liability because workers' compensation is the worker'sexclusive remedy. In recent decades, legislative "reforms" often have made it difficult or impossible for workers to qualify for workers' compensation benefits, but they nevertheless preclude workers from bringing tort suits against their employers.4
8.Finally, in recent years, there have been efforts to replace workers' compensation programs with employer-designed disability programs. These programs provide even lower and less-frequent benefits, limit which injuries and diseases are compensable, and yet still protect employers from tort liability. The Oklahoma legislature passed such a law, but it was struck down by the state's supreme court. Employers in other states have, however, continued to push for this approach.
Over the past 20 years, studies have demonstrated that many injured workers entitled to workers' compensation benefits do not receive them.4 They have also shown that the benefits provided do not come close to replacing two thirds of lost earnings,6 the standard codified by the National Commission.
The failure of workers' compensation means that the costs of occupational injuries and diseases are being transferred away from this dedicated system of social insurance and outward-to families, communities, and other social programs. Many families do not have the savings to cover the earnings lost following a workplace injury. In 2016, only 24% offamilies had liquid savings of $400 or more7; racial and ethnic minorities have less wealth than Whites. And other social programs, such as the Supplemental Nutrition Assistance Program, are currently under attack.
We need a new national commission. We need federal standards that state workers' compensation systems must meet. We need to end the race to the bottom (https://bit.ly/ 2MykOxV). ÂfPH
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CONFLICTS OF INTEREST
The author has no conflicts of interest.
Sidebar
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DETAILS

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The Future of Occupational Safety and Health Protection in a Fissured Economy

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ABSTRACT (ENGLISH)

There have been innumerable recent conferences, workshops, and convenings on the "future of work." These seances typically focus on issues such as robotics, artificial intelligence, and platform business models like Uber and Lyft. But these topics regarding the future of work affect a relatively small part of the workforce, and speculations on the impacts oftechnology usually prove wildly off the mark.

A focus on changes that have an impact on the present workplace and that will continue to do so is far more useful. Millions of workers in the United States have jobs that do not pay enough, provide few-if any-benefits, and lack opportunities for economic advancement. Germane to this Special Section, those jobs also expose workers to a wide variety of significant health and safety risks-often falling outside the boundaries of Occupational Safety and Health (OSH) Act protections.

These conditions arise in part because businesses have found myriad ways to maintain control over (and capture economic benefit from) services and products while shedding the messy role of employing workers to others. This change in both the present and future structure of work is what I have termed the "fissured workplace," a phrase that is meant to encompass outsourcing, contracting, and subcontracting; franchising in its many forms; and, most recently, platform business models.1 The fissured workplace model has allowed businesses to shift risks and responsibilities onto workers and incentivize the misclassification of employees as independent contractors.

FULL TEXT

There have been innumerable recent conferences, workshops, and convenings on the "future of work." These seances typically focus on issues such as robotics, artificial intelligence, and platform business models like Uber and Lyft. But these topics regarding the future of work affect a relatively small part of the workforce, and speculations on

the impacts oftechnology usually prove wildly off the mark.

A focus on changes that have an impact on the present workplace and that will continue to do so is far more useful. Millions of workers in the United States have jobs that do not pay enough, provide few-if any-benefits, and lack opportunities for economic advancement. Germane to this Special Section, those jobs also expose workers to a wide variety of significant health and safety risks-often falling outside the boundaries of Occupational Safety and Health (OSH) Act protections.

These conditions arise in part because businesses have found myriad ways to maintain control over (and capture economic benefit from) services and products while shedding the messy role of employing workers to others. This change in both the present and future structure of work is what I have termed the "fissured workplace," a phrase that is meant to encompass outsourcing, contracting, and subcontracting; franchising in its many forms; and, most recently, platform business models.1 The fissured workplace model has allowed businesses to shift risks and responsibilities onto workers and incentivize the misclassification of employees as independent contractors.

CONSEQUENCES OF THE FISSURED WORKPLACE

Having multiple parties with unclear responsibilities for health and safety can create a work environment in which the likelihood of injuries or fatalities increases. This was the case in the mid-2000s as the explosion of cell phone use spurred by the iPhone led to the rapid expansion of cell tower networks. Major companies such as AT&T and Verizon drew on a highly subcontracted system to undertake that work.

In that period, the fatality rate among cell tower workers- often those at the bottom of multileveled subcontracting-was three times that facing underground coal miners.2

Workers who are hired on a temporary or conditional basis often do not know whom to report safety problems to at the work site or, more often, are reluctant to exercise their right to complain about unsafe conditions because of fear of reprisal. And the prevalence of misclassification of workers as independent contractors in already dangerous work settings like construction, logistics, and transportation can further increase fatality risks. Analysis of the Census of Fatal Occupational Injuries found that, in 2017, about 12% of fatal workplace injuries were experienced by independent workers (defined as workers with short-term jobs that involve a discrete task and have no guarantee of future work). This represents a disproportionally higher propensity of injury or death attributable to a workplace incident than that experienced by their employee counterparts.3

Health and safety risks arising from fissured relationships can also spill over to other parties, such as the finding that outsourcing hospital cleaners increases the spread of health care-associated infections.4 Women and workers of color make up a disproportionate share of the low-wage workforce in industries including temporary help services, security guards and patrol services, home health care, hospitality, and logistics. This means that increased health and safety risks disproportionately affect workers already subject to higher injury and fatality rates.

REALIGNING RESPONSIBILITY AND PROTECTIONS

The OSH Act, like many of our fundamental workplace laws, provides its protections via employment. Erosion of employment therefore undermines protections and requires a new framing for health and safety policy. One way to do so is to make the provision of a safe workplace basic to work itself rather than specifically attached to employment. This would entail broadly extending aspects of the Occupational Safety and Health Administration's (OSHA's) mandate already applied in some sectors.

Congress recognized in passing the OSH Act the importance of "assur[ing] so far as possible every working man and woman in the Nation safe and healthful (ProQuest: ... denotes text stops here in original.)

Sidebar

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Fifty Years of Influenza A(H3N2) Following the Pandemic of 1968

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ABSTRACT (ENGLISH)

In 2018, the world commemorated the centennial of the 1918 influenza A(H1N1) pandemic, the deadliest pandemic in recorded history; however, little mention was made of the 50th anniversary of the 1968 A(H3N2) pandemic. Although pandemic morbidity and mortality were much lower in 1968 than in 1918, influenza A(H3N2) virus infections have become the leading cause of seasonal influenza illness and death over the last 50 years, with more than twice the number of hospitalizations from A(H3N2) as from A(H1N1) during the past six seasons. We review the emergence, progression, clinical course, etiology, epidemiology, and treatment of the 1968 pandemic and highlight the short- and long-term impact associated with A(H3N2) viruses. The 1968 H3N2 pandemic and its ongoing sequelae underscore the need for improved seasonal and pandemic influenza prevention, control, preparedness, and response efforts. (Am J Public Health. 2020;110:669-676. doi: 10.2105/ AJPH.2019.305557)

FULL TEXT

Headnote

In 2018, the world commemorated the centennial of the 1918 influenza A(H1N1) pandemic, the deadliest pandemic in recorded history; however, little mention was made of the 50th anniversary of the 1968 A(H3N2) pandemic. Although pandemic morbidity and mortality were much lower in 1968 than in 1918, influenza A(H3N2) virus infections have become the leading cause of seasonal influenza illness and death over the last 50 years, with more than twice the number of hospitalizations from A(H3N2) as from A(H1N1) during the past six seasons. We review the emergence, progression, clinical course, etiology, epidemiology, and treatment of the 1968 pandemic and highlight the short- and long-term impact associated with A(H3N2) viruses. The 1968 H3N2 pandemic and its ongoing sequelae underscore the need for improved seasonal and pandemic influenza prevention, control, preparedness, and response efforts. (Am J Public Health. 2020;110:669-676. doi: 10.2105/ AJPH.2019.305557)

In the United States, 1968 is remembered for the military conflict in Vietnam, assassinations of prominent leaders, and widespread public demonstrations, as well as significant scientific achievements such as heart transplant surgeries and manned space flights. Remembered less frequently is the 1968 H3N2 pandemic. Although the estimated morbidity and mortality of this pandemic was only a small fraction of that associated with the 1918 H1N1 pandemic, the ongoing impact of influenza A(H3N2) virus on public health has been profound. The A(H3N2) subtype virus that emerged in 1968 was associated with increased influenza morbidity and mortality globally through 1972. Since then, this subtype has circulated as a seasonal influenza A virus associated with more severe annual

epidemics than those caused by influenza A(H1N1) and influenza B viruses. In this review, we reflect on the 1968 H3N2 pandemic, the continuing public health challenges from A(H3N2) virus, and the need for better prevention and control of seasonal and pandemic influenza.

THE 1968 PANDEMIC

There are typically two influenza seasons in Hong Kong- January through March or April and July through August- but an unusual and sudden increase of patients with influenza-like illness (ILI) presented to government clinics there on July 13, 1968.1 With 500000 ILI cases in July, the outbreak was the largest in Hong Kong since the 1957 H2N2 pandemic.2 The National Influenza Center at the University of Hong Kong isolated the new influenza A(H3N2) virus on July 17 and sent it immediately to the World Influenza Center in London. Additional specimens were sent to the International Influenza Center for the Americas in Atlanta, Georgia (a component of the National Communicable Disease Center, now the US Centers for Disease Control and Prevention [CDC]). Confirmation that the virus strain was a distinct antigenic variant of contemporary influenza viruses prompted a World Health Organization (WHO) warning on August 16.3 At this time, the virus became available to research and vaccine production laboratories.4 Spread was confirmed in August when isolates of the same virus were identified in Singapore, Taiwan, the Philippines,Vietnam, and Malaysia. Thailand, India, the Northern Territory of Australia, and Iran experienced outbreaks in September.5 Air travel by an estimated 160 million persons during the pandemic6 facilitated rapid transmission worldwide.

On September 2, a respiratory specimen from a Marine who had just returned to San Diego, California, from Vietnam produced the first US isolate.7 Before leavingVietnam, the Marine had shared a bunker with a friend recently returned from Hong Kong. An additional 22 ILI cases occurred in San Diego among students and contacts from the Marine Corps Drill Instructors School, with the A(H3N2) virus isolated from 9 of 21 respiratory specimens. Concurrently, military physicians reported outbreaks in Hawaii and Alaska among personnel recently returned from southeast Asia. On September 6, National Communicable Disease Center officials requested cooperation from all state health officers, epidemiologists, and laboratory directors for "monitoring the importation of the virus and in conducting surveillance for influenza."8

Public health investigations reported in the Morbidity and Mortality Weekly Report identified influenza A2/Hong Kong virus (subsequently referred to as influenza A(H3N2) virus) in travelers to the United States from Asia.9 Increased surveillance in the United States continued over the next year, expanding upon systems implemented for the 1957 pandemic and including reports on school and workplace absenteeism, school closings, hospital admissions, and outpatient visits, as well as reported cases and outbreaks. Initially, cases occurred primarily among persons returning from Asia.10

US influenza activity increased dramatically in October. The first reported civilian outbreak in the continental United States was identified in Needles, California, with more than one third of its population reporting ILI. ILI reports in Colorado increased from 62 cases for the week ending November 2 to 670 for the week ending November 9,11 a week in which other western states and Hawaii also reported outbreaks.12 The first outbreaks in eastern states occurred the next week. All 50 states experienced increased school absenteeism during the pandemic; 23 faced school and college closures and 31 saw elevated worker absenteeism. The peak week of influenza activity for most states fell between December 14 and January 11, with pandemic activity generally starting in the western United States and moving eastward13 (Figure 1).

Newspaper articles chronicled the widespread college closures, slowdowns in business and industry, and threats to Christmas mail deliveries. In December, the Apollo 8 astronauts were vaccinated to protect them from pandemic influenza in advance of their December 21 moon- orbiting flight, and President Johnson was hospitalized with a respiratory infection that his aides said "could be called the flu." National concerns were reflected in a December 19 New York Times editorial describing the pandemic as "one of the worst in the nation's history," bemoaning the "amount of discomfort and distress suffered by the millions who have already been hit," and the potential for "billions of dollars" associated with treatment and lost productivity.14

A second, less severe pandemic wave of illness in the United States occurred late in the following season (1969-

1970). Over these two seasons, 70% of excess pneumonia and pandemic influenza deaths in the United States occurred during 1968-1969 season. This was unlike the experience in most countries, where the initial 1968 wave tended to be less severe but was followed by an increasingly severe wave in 1969-1970.15

CLINICAL COURSE

The majority of A(H3N2) virus infections resulted in clinically mild, uncomplicated upper respiratory tract disease. Predominant findings among uncomplicated pandemic cases included malaise, fever, myalgia, cough, headache, coryza, and sore throat. During the initial outbreak in Hong Kong, symptoms were mostly mild without observable excess mortality.16 In a British Royal Air Force study, half of those with serological evidence of infection had no recorded illness.17 All 965 cases reported by the University of Singapore Health Service had a mild clinical course with no hospitalizations, although some experienced atypical symptoms including severe anorexia, nausea, and ocular pain.18 A survey of nearly 7000 US high school students indicated that the median duration of illness was five days,19 although cough and prostration in some cases persisted as long as three weeks.20

However, severe disease did occur. Among pediatric inpatients and outpatients in Washington, DC, influenza A virus infections occurred more frequently during A(H3N2) activity (1968-1976) than during influenza A(H2N2) virus circulation (1957-1968) and were associated with more hospitalizations for pneumonia, bronchiolitis, bronchitis, and croup.21 Some outbreak areas reported complications including pneumonia, myocarditis, and pericarditis. Pulmonary complications in adults included localized primary viral or secondary bacterial pneumonia, or diffuse bilateral pneumonia, occurring early or late in the clinical course, mostly among persons with underlying comorbid conditions.22 Grady Hospital in Atlanta, Georgia reported a threefold increase in staphylococcal pneumonia admissions during the pandemic compared with the previous season. Hospital admissions began increasing in December 1968, and 74% of pneumonia patients hospitalized between January 1 and 5, 1969, had serological evidence of pandemic virus infection.23 Autopsy findings in fatal cases included acute bronchopneumonia, diffuse hemorrhagic or necrotizing pneumonitis, bronchitis, or bronchiolitis; in some cases, bacterial cultures of sputum or lung samples yielded Staphylococcus aureus, Pseudomonas aeruginosa, or other bacterial pathogens.24

ETIOLOGY

The 1968 pandemic was caused by influenza A/Hong Kong/1968 (H3N2) virus. This pandemic virus contained two genes derived from a lowpathogenicity avian influenza A virus and six genes from the A(H2N2) virus that had been circulating among people since its emergence to cause the 1957 H2N2 pandemic.25 The hemagglutinin (HA) gene contained two mutations in its receptor binding site from the closest avian viruses, altering its receptor binding specificity, from preferential binding for a2,3linked sialic acids (viral receptors predominant in birds) to a2,6linked sialic acids (viral receptors predominant in humans).26 However, studies suggest that these binding preferences alone do not determine influenza A entry to human airway cells.27 Additional changes identified in the HA1 subunit of the HA, based on their location, may have affected the HA receptorbinding and fusion activities28 and facilitated human-to-human transmission, enabling the virus to spread quickly.

EPIDEMIOLOGY

The clinical attack rate varied. Milwaukee, Wisconsin, public health authorities reported an overall illness attack rate of 43%.29 A study among inmates of Georgia State Prison chronicled a 40% illness attack rate, and a study of residents of a California retirement community revealed that 10% were symptomatic.30 This may have reflected some preexisting immunity in older age groups, suggested by serological studies revealing antibodies to the virus prior to the pandemic in large percentages of adults aged older than 65 years.31 However, unlike the 1957 H2N2 pandemic, in which 86% of index cases were school age, index cases in 1968 were equally divided among school-aged children and adults.32 Overall, children aged 10 to 14 years comprised the age group with the highest clinical attack rate (40%).33 In 2010, Jackson et al. used a variety of published data sets to estimate that the first-wave basic reproduction number (R0) was between 1.06 and 2.06 and the second-wave R0 was between 1.21 and 3.58.34 A subsequent 2014 meta-analysis of R0 studies revealed an overall median point estimate of 1.8 for the 1968 pandemic H3N2 virus.35 Complications and exacerbation of underlying disease conditions, such as diabetes, cardiac failure, and chronic obstructive pulmonary disease, contributed to excess mortality.36 In the United States,

the pandemic resulted in an estimated 100 000 deaths.37 As with other 20th-century pandemics, large proportions (half in 1968) of pneumonia and influenza deaths occurred in persons younger than 65 years.38

COUNTERMEASURES

Medical advances in the 1960s, primarily the advent of antiviral medications and expansion of influenza vaccine options, provided a stronger arsenal to combat this pandemic than had been available during the 1957 pandemic.

ANTIVIRALS

The first opportunity to assess the effect of antiviral use during a pandemic occurred in 1968. In 1966, the Food and Drug Administration had approved amantadine for chemoprophylaxis of influenza A virus infection-a controversial decision both criticized39 and supported.40 Studies had shown that amantadine inhibited infections of group A influenza viruses by blocking or slowing virus entry into cells.41 The prophylactic effectiveness of amantadine had been demonstrated in some double-blinded randomized controlled trials with experimentally induced influenza and during naturally occurring influenza outbreaks. However, sample sizes in these studies tended to be small and study results were unconvincing to some.42 Studies assessing the effects of amantadine treatment also produced inconsistent results. Clinical findings in some showed amantadine to be effective in reducing the severity and duration of illness when given within 48 hours of symptom development of influenza A, whereas others failed to demonstrate effectiveness. During the pandemic, a multicenter doubleblinded randomized controlled trial in Japan demonstrated a statistically significant reduction in fever duration among laboratory-confirmed pandemic influenza patients treated with amantadine.43 Also, in a study of prison inmates, all indicators of a therapeutic effect of amantadine approached or achieved statistical significance.44

A 1983 Mayo Clinic Symposium on Antimicrobial Agents affirmed the use of amantadine for influenza, reporting prophylactic effectiveness as well as "some" therapeutic effect when amantadine was used early in the course of influenza A virus infection.45 A subsequent Clinical Evidence review46 reported that amantadine was likely to be beneficial in reducing the duration of symptoms when used in early treatment of influenza A in adults. During the 2005-2006 influenza season, high prevalence of amantadine resistance among circulating influenza A viruses prompted changes in recommendations for its use,47 and amantadine has not been recommended for treatment or chemoprophylaxis of influenza A virus infections since then.

Despite the controversies around influenza prophylaxis and treatment during the pandemic, researchers identified a remarkable remission of Parkinson's symptoms in a woman being treated with amantadine to prevent influenza in 1969. This prompted studies that demonstrated significant improvement in Parkinson's symptoms with amantadine use,48 and amantadine has been used to treat Parkinson's disease since that time.

VACCINE

The Division of Biologics Standards of the National Institutes of Health provided the A/Hong Kong/1968 (H3N2) vaccine virus to manufacturers in August 1968. However, before manufacturers had completed studies to determine its feasibility for producing a pandemic vaccine, a new vaccine virus became available. This virus, the Aichi strain from Japan, demonstrated superior vaccine production potential and was supplied to manufacturers on September 9, 1968, 49 and incorporated into a monovalent pandemic influenza vaccine.

Vaccine manufacturers released a first lot of 110 000 pandemic vaccine doses on November 15, 1968. Subsequently, 15 million doses became available by the pandemic's peak50 in January 196951 (Figure 2). After the peak, vaccine demand waned. For most of the population, the pandemic vaccine was "too little and too late,"52 and the effect of the vaccine on reducing pandemic spread was questionable. In January 1969, manufacturers began to phase out production, and unused vaccine remained. Some vaccine became available for use in the southern hemisphere.53

Virologists had been actively exploring methods to improve influenza vaccine technology since the 1957 influenza pandemic, and the 1968 pandemic provided an opportunity to assess these technologies. For example, a split vaccine utilizing only those components of the virus essential to stimulate humoral immunity was authorized in the United States54; it performed comparably to whole virus vaccines, with fewer adverse reactions in adults55 and children.56 The principle of reassortment, a process in which two or more influenza A viruses exchange genetic

material, had been established in 1960 with the combination of a low-yielding A(A2) strain and a standard laboratory strain (A/Puerto Rico[PR]/8).57 In 1968, successful reassortment of the Aichi strain with a standard laboratory strain (A/PR/8) by simultaneous inoculation of chick embryos produced a combined virus with the desired antigenicity of a pandemic virus and the growth characteristics of the standard laboratory strain.58 Reassortment using the A/PR/8 strain has since become standard practice and is used in current vaccine preparation.

To evaluate pandemic H3N2 vaccine effectiveness, officials used a variety of methods. One study compared respiratory illness rates in two Michigan communities.59 Schoolchildren in one community received pandemic vaccine while the other served as an unvaccinated comparison community. Throughout the study, respiratory illness rates in the vaccinated community remained considerably lower than in the comparison community. During the 10 weeks of the season when the Hong Kong A(H3N2) virus was isolated from community residents, the excess rate of self-reported respiratory illness in the unvaccinated community was triple that of the vaccinated community. The authors concluded that vaccination of school-age children resulted in a markedly lower rate of respiratory illness in the entire community. However, Glezen et al. reached a much different conclusion after vaccinating infants and children with the pandemic vaccine. Their results demonstrated that although the vaccine was safe and acceptable for children, there was no evidence that a single dose provided adequate protection.60

In another study of the pandemic vaccine's efficacy, researchers concluded that the attack rate in persons receiving high doses of the pandemic vaccine was at least 50% lower than in those who received the seasonal A(H2) vaccine. In addition, high-dose vaccine recipients who did become ill experienced milder illness, with fewer and shorter fevers and less need for bed rest.61 However, the authors cautioned that the standard dose of the pandemic vaccine was not effective, and multiple doses were not feasible given the timing of the pandemic and existing production parameters. A 2007 Cochrane review of influenza vaccines concluded that onedose or two-dose monovalent pandemic vaccines used in 1968 demonstrated 65% protection against ILI, 93% protection against illness from influenza A(H3N2) virus infection, and 65% protection against hospitalizations.62 However, their review used a solitary study to assess all outcomes except for ILI, which was assessed using four studies, limiting generalizability of the results.

AFTER THE PANDEMIC

Walter Dowdle, who in 1968 was director of the National Communicable Disease Center Laboratory Program in the WHO International Influenza Center for the Americas, declared that all that had been learned since the 1957 H2N2 pandemic had been applied to the 1968 H3N2 pandemic.63 For example, in 1968, the US Advisory Committee on Immunization Practices published recommendations for pandemic vaccine use in August, well before the United States experienced increased pandemic influenza activity, identifying priority vaccination groups to be targeted when pandemic vaccine became available.64 During the 1957 pandemic, priority vaccination groups were identified only after widespread outbreaks.65 The 1968 pandemic also demonstrated the utility of communication networks and US surveillance systems that provided several large study populations for vaccine trials.66

However, the 1968 pandemic also highlighted areas for improvement. Specifically, the 1968 pandemic showed the need for WHO to incorporate a better influenza forecasting system and to pursue further research to improve prevention and control of influenza.67 Precise virological information had been promptly shared during the pandemic, but epidemiological data varied widely between countries in both quantity and quality, because of diverse reporting methods, systems of medical care, and availability and use of laboratory diagnostic services. This prompted WHO officials to introduce a standard surveillance reporting form for National Influenza Centers, which had been implemented by many and had begun to work well by the fall of 1969.68 Global collaboration was also highlighted in October 1969, when the National Communicable Disease Center, WHO, and Emory University hosted an international working conference on Hong Kong pandemic influenza.69 At the conference, Alexander Langmuir, director of epidemiology at the National Communicable Disease Center, emphasized the need for improved influenza surveillance, specifically the collection of more quantitative data regarding disease incidence, age- and sexspecific attack rates, character and severity of complications, socioeconomic factors influencing mortality, and vaccine distribution and use.70

For the past 50 years, the CDC has worked toward these goals; many improvements, particularly in surveillance, have been achieved and were used during the 2009 H1N1 pandemic. US influenza surveillance now collects data from an extensive surveillance network of outpatient and inpatient care settings, as well as virological characterization using nextgeneration sequencing of all viruses received at the CDC. Surveillance systems now also monitor mortality and influenza vaccination coverage. Pediatric influenza deaths are currently included in the Council of State and Territorial Epidemiologists list of nationally notifiable conditions to be reported to the CDC. A wide range of seasonal influenza vaccines is available. Influenza diagnostic tests and antiviral medications with different mechanisms of action and routes of administration are now available in many clinical settings for the diagnosis and treatment of seasonal influenza.

The illnesses and deaths in 1968-1969 were notable but did not approximate the impact of the A(H1N1) virus that emerged in 1918. However, the cumulative impact of A(H3N2) virus infections over the last 50 years has been substantial. The average estimated number of annual hospitalizations during the past six seasons for A(H3N2) virus (675 000) was more than twice that of A(H1N1)pdm09 virus (330 000).71 The 2017-2018 H3N2-predominant influenza season was particularly severe, with record hospitalization rates recorded. On the basis of data from the National Center for Health Statistics (NCHS), the proportion of deaths attributed to pneumonia and influenza that season peaked at 10.8%, the highest percentage recorded since NCHS data were first used for routine influenza surveillance.72

Whereas A(H1N1) virus was the scourge in the early part of the 20th century, A(H3N2) virus has been the predominant cause of influenza disease burden in the early 21st century.

Several factors have contributed to the higher impact of A(H3N2) viruses over the last 50 years. First, A(H3N2) viruses have undergone antigenic change at a much higher rate than influenza A(H1N1) viruses.73 Frequent changes to the hemagglutinin protein have allowed A(H3N2) viruses to evade human immune responses both through (1) conformational changes around important antigenic sites, notably the receptor binding pocket, and (2) increased glycosylation of the hemagglutinin protein shielding the antigenic sites of the virus from antibody binding.74

Secondly, A(H3N2) virus has had a disproportionate impact on older adults. Persons aged 65 years and older have a higher rate of comorbidities that increase their risk for influenza complications, and this group experiences higher mean hospitalization rates during influenza seasons in which H3 viruses predominate than in seasons in which H1 viruses predominate.75 Contributing factors may include waning immunity and decline in vaccine-derived immune protection.76 In addition, older adults may respond less effectively to A(H3N2) virus infections because of immunological imprinting, also referred to as "original antigenic sin."77 This suggests that persons first infected by A(H1N1) virus (i.e., 1918-1957) are protected from severe H1N1 disease but are less protected against severe illness with A(H3N2) virus infection.

Third, when A(H3N2) viruses are propagated in eggs, they change conformation and can lose sites of glycosylation, causing them to differ from the circulating A(H3N2) viruses. This likely contributes to the lower vaccine effectiveness observed for A(H3N2) viruses, especially in older adults,78 highlighting the need for improving the effectiveness of seasonal influenza vaccines through increased antigen content, addition of adjuvants, and ultimately through development of more broadly protective and longer lasting "universal" vaccines.

Since their emergence, influenza A(H3N2) viruses have caused substantial cumulative morbidity and mortality worldwide during seasonal influenza epidemics, greatly exceeding their impact in the first years of the pandemic beginning in 1968. More than 50 years later, A(H3N2) continues to adapt to evade host immunity and cause higher numbers of hospitalizations and deaths than influenza A(H1N1) and B viruses. New therapies and vaccine technologies have been developed, but further improvements in the prevention and control of influenza are still needed and will be critical in preparing for the next influenza pandemic. ÂfPU

CONTRIBUTORS

All of the authors contributed equally to this article.

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Note. For further reading, please see the list of additional references, available as a supplement to the online version of this article at http://www.ajph.org.
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Sidebar
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Footnote
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DETAILS

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The Occupational Safety and Health Act at 50: Introduction to the Special Section

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ABSTRACT (ENGLISH)

This special section of AJPH commemorates the 50th anniversary of the OSH Act by reviewing the past, assessing the present, and proposing the future direction of occupational safety and health regulation. It features an incomparable group of experts presenting their views on a range of important issues. The OSH Act is a public health law, an employment law, and an environmental law. It has unprecedented scope by setting minimum safety and health standards for substantially all private sector workplaces. The OSH Act prescribes notice and comment rulemaking for new standards, requires preinspection compliance by employers, authorizes the secretary of labor to assess civil monetary penalties and impose abatement orders for noncompliance, and establishes administrative adjudications of contested enforcement proceedings by an independent agency of commissioners and administrative law judges.

FULL TEXT

The year 1970 was an especially turbulent one in the United States. The Vietnam War still raged (it would last another five years), sparking continued protests on college campuses and in the streets. The pioneering civil rights legislation of the 1960s led to, among other things, calls for greater women's rights, disability rights, gay rights, and workers' rights. The first Earth Day (April 22, 1970) and the establishment of the Environmental Protection Agency (December 2, 1970) are examples of and responses to public demands for safe and healthful air, water, consumer products, and workplaces.

Even in such a dynamic historical setting, the Occupational Safety and Health Act of 1970 (OSH Act), signed into law on December 29, 1970, was groundbreaking. Its purpose, as proclaimed in section 2(b), is "to assure so far as possible every working man and woman in the Nation safe and healthful working conditions and to preserve our human resources." The task was urgent and daunting, as Congress received testimony that each year an estimated 14 500 workers died in workplace accidents and there were 390 000 new cases of occupational disease.1

The OSH Act is a public health law, an employment law, and an environmental law. It has unprecedented scope by setting minimum safety and health standards for substantially all private sector workplaces. The OSH Act prescribes notice and comment rulemaking for new standards, requires preinspection compliance by employers, authorizes the secretary of labor to assess civil monetary penalties and impose abatement orders for noncompliance, and establishes administrative adjudications of contested enforcement proceedings by an independent agency of commissioners and administrative law judges.2

Early on, those charged with implementing the OSH Act realized the practical difficulties of attaining the lofty goals of the statute. To begin with, there were too few occupational safety and health professionals, including safety engineers and industrial hygienists. Next, many of the interim safety and health standards adopted under section 6(a) (standards originally promulgated under other federal laws with limited applicability and privately developed national consensus standards) were outdated, confusing, or inadequate. Finally, many businesses strongly opposed the federal government's enforcement role, especially unannounced inspections and government-mandated changes to their work processes.

During the past five decades, structural deficiencies of the statute, such as the contentious, resource draining, and glacial process for promulgating new standards, limited the effectiveness of the law. Nevertheless, the OSH Act has had a significant symbolic and normative effect. The OSH Act declares a national policy of safe and healthful workplaces, sets minimum standards, and facilitates beneficial interventions by safety and health professionals, state Occupational Safety and Health Administration (OSHA) plans, safety-conscious employers, unions, and other interested parties.

This special section of AJPH commemorates the 50th anniversary of the OSH Act by reviewing the past, assessing the present, and proposing the future direction of occupational safety and health regulation. It features an incomparable group of experts presenting their views on a range of important issues.

It begins with historians David K. Rosner and Gerald Markowitz (p. 622) exploring the history ofoccupational safety and health from the Civil War to the present. They note that struggles over working conditions featured prominently in labor-management conflict throughout the 20th century.

The OSH Act established the National Institute for Occupational Safety and Health (NIOSH), part ofthe Centers for Disease Control and Prevention, to research workplace hazards. John Howard (p. 629), director of NIOSH, discusses the activities of his agency in each ofthe past five decades. Significantly, in addition to traditional hazards, NIOSH also has studied and issued guidance documents on newer and emerging issues, including ergonomic hazards, secondhand smoke, and workplace violence.

David Michaels, former head of OSHA, and Jordan Barab contributed an analytic essay (p. 631) to assess the regulation of workplace safety and health, including the effects ofnew hazards and differing roles of employer and employee. Among their proposals are extending OSH Act coverage to all workers, including public sector employees and workers on small farms, streamlining the standards-promulgation process, and enhancing protections for whistleblowers.

The OSH Act increased the demand for occupational medical services, for example OSHAmandated medical examinations of workers exposed to toxic substances. Beth A. Baker et al. (p. 636) discuss the changing roles of occupational physicians as the economy has moved from a manufacturing to a service base. Today, occupational physicians are less likely to work in corporate medical departments and more likely to work in clinical settings to prevent and treat occupational injury and illness.

The OSH Act also established the National Commission on State Workmen's Compensation Laws. Leslie I. Boden (p. 638) reviews the record of the commission and notes that states adopted many of the recommendations from its 1972 report, thereby improving state workers' compensation systems. He urges the establishment of another national workers' compensation body to address the "race to the bottom" characterizing many inadequate state programs.

A common theme of several articles in the special section is the effect of new hazards and new work arrangements. David Weil (p. 640) uses the term "fissured workplace" to encompass outsourcing, contracting and subcontracting, franchising, and platform business models. These relationships often limit employer duties and contribute to unsafe working conditions. He recommends extending the obligations of a "controlling employer" beyond general contractors on a construction site to all comparable employers.

Margaret Seminario (p. 642), giving the labor perspective, applauds the tremendous reduction in workplace fatalities, especially in hazardous industries. Yet, she contends that the OSH Act's emphasis on OSHA and employers often excludes workers from safety and health activities. She asserts that the OSH Act "should require all employers to establish a safety and health program, which fully involves workers and their representatives, to identify and fix hazards, whether the hazard is covered by a specific OSHA standard or not."

Richard E. Fairfax (p. 644) provides the employer perspective. He notes that the OSH Act led to increased membership in safety and health professional organizations and the development of many safety and health products. Interestingly, he also advocates requiring all employers to establish a basic safety and health program "that would include management leadership, employee involvement, training, hazard recognition and assessment, and hazard prevention and control/mitigation."

Interdependent global economies create occupational safety and health concerns along supply chains and among trading partners. Deborah Greenfield (p. 646) of the International Labour Organization observes that even as the focus in developed countries has shifted to new hazards and work practices, some developing countries still suffer horrific workplace events, such as the factory collapse in Bangladesh in 2013 that killed more than 1100 workers and injured more than 2500.

Overall, the articles in this special section underscore the need to update the provisions of the OSH Act and its

standards to reflect new scientific evidence, technological developments, and economic realities in contemporary workplaces. Although the essential legal foundation of the OSH Act was established 50 years ago, the task of ensuring workers a safe and healthful workplace in light of current conditions remains ongoing. .4JPI-I

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CONFLICTS OF INTEREST

The author has no conflicts of interest to declare.

Sidebar

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Influenza Vaccination Coverage of Health Care Personnel in Los Angeles County Hospitals, 2016–2017

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ABSTRACT (ENGLISH)

The objective of the Los Angeles County, California (LAC), health care personnel (HCP) influenza vaccination improvement intervention was to increase HCP influenza vaccination coverage during the 2016-2017 influenza season via targeted outreach to LAC acute care hospitals. We selected 13 facilities for intervention and received tailored recommendations from a menu of evidence-based practices. Following the season, each hospital in the

intervention group experienced a significant increase in vaccination coverage, which increased the LAC countywide average for all hospitals by 5%, from 74% to 79%. (Am J Public Health. 2020;110:693-695. doi:10.2105/AJPH.2019.305555)

FULL TEXT

Headnote

The objective of the Los Angeles County, California (LAC), health care personnel (HCP) influenza vaccination improvement intervention was to increase HCP influenza vaccination coverage during the 2016-2017 influenza season via targeted outreach to LAC acute care hospitals. We selected 13 facilities for intervention and received tailored recommendations from a menu of evidence-based practices. Following the season, each hospital in the intervention group experienced a significant increase in vaccination coverage, which increased the LAC countywide average for all hospitals by 5%, from 74% to 79%. (Am J Public Health. 2020;110:693-695. doi:10.2105/AJPH.2019.305555)

Vaccination of health care personnel (HCP) has been demonstrated to be an effective approach for protecting patients from health care-associated influenza infections in acute care settings.1 Healthy People 2020 established the national goal that 90% of HCP receive annual influenza vaccination.2

INTERVENTION

After years oflow vaccination coverage among its HCP, Los Angeles County, California (LAC), enacted a health officer order in 2013 mandating that HCP in acute care hospitals either be vaccinated for seasonal influenza or wear a mask during the influenza season. Despite these efforts, the effect on vaccination coverage has varied, and many facilities remained short of the 90% goal.3 Our objective was to increase HCP influenza vaccination in LAC via targeted outreach to acute care hospitals identified as having suboptimal HCP influenza vaccination coverage.

PLACE AND TIME

The LAC Department of Public Health (DPH) developed the intervention in July 2016 and conducted it from September 2016 through April 2017 in LAC.

PERSON

The Centers for Disease Control and Prevention's (CDC's) National Healthcare Safety Network (NHSN) data were used to characterize HCP influenza vaccination coverage among the 97 acute care hospitals in LAC during the 2015-2016 influenza season. Facilities with vaccination coverage within the lowest quartile in LAC for the 2015-2016 season were approached to participate, with an emphasis on those with the lowest coverage. Thirteen facilities volunteered for the intervention, with approximately 30 000 HCP affected by the intervention. Vaccination coverage was defined as the percentage of HCP-including employees, licensed independent practitioners, adult students/trainees and volunteers, and other contract personnel-who received their influenza vaccination on site at the hospital or elsewhere during the influenza season.

PURPOSE

The purpose of the intervention was to improve HCP influenza vaccination rates among acute care hospitals in LAC. Improvement opportunities were identified through an audit tool, and evidence-based recommendations were provided on the basis of the audit tool findings.

Nationally, 79% of HCP reported receiving an influenza vaccination for the 2015-2016 season; in LAC, the average HCP influenza vaccination coverage among acute care facilities was 73%, and coverage at 15 facilities (16%) was below 60%.4 Increasing HCP influenza vaccination coverage can decrease nosocomial influenza, a condition that can lead to severe complications and increased costs for vulnerable patients.

IMPLEMENTATION

The intervention was implemented over three steps. First, the DPH sent recruitment letters to the chief executive officers at the 24 lowest-quartile facilities before the 2016-2017 season. The letters explained the importance of HCP vaccination, their hospital's vaccination coverage for the previous season and ranking among hospitals in LAC, and the opportunity to voluntarily participate in the HCP influenza vaccination improvement intervention. Thirteen

facilities chose to voluntarily participate in the intervention, aiming to increase the vaccination coverage in their facilities.

Second, the DPH held one in-person and two telephone meetings with infection preventionists and employee health directors at each intervention hospital before and during the 2016-2017 influenza season. A standardized assessment tool was created to evaluate the hospital's 2015-2016 vaccination campaign strategies and to determine facility needs for the upcoming season. This DPH-produced tool was developed by using evidence-based practices from the US Department of Health and Human Services, the Advisory Committee on Immunization Practices, and published literature (Figure A, available as a supplement to the online version ofthis article at http://www.ajph.org). Examples of assessed topics included use of mobile carts and education campaigns, and perceived barriers to increased vaccination coverage.7 On the basis of assessment results, the DPH provided customized evidencebased recommendations for each hospital's 2016-2017 vaccination campaign. The DPH also provided materials to intervention hospitals, including posters, flyers, forms to document vaccine acceptance or declination, a tracking log sheet, and prototype e-mail messages. Facilities implemented the provided recommendations by delegating staff to vaccinate HCP throughout the facility, provided visible vaccination of leadership, and adopted new ways of tracking HCP influenza coverage within their facility.

Lastly, after the 2016-2017 season, the DPH conducted a postintervention assessment with each intervention hospital to gather feedback and information on improvements achieved during the hospital's vaccination campaign. The postintervention assessment identified newly implemented campaign strategies for the 13 hospitals and found themes in barriers and successes.

EVALUATION

We obtained HCP vaccination data from the NHSN at the end of the 2016-2017 season. We compared changes in vaccination coverage between influenza seasons for each facility via McNemar's tests. We compared intervention and nonintervention facilities' mean coverages via the Mann-Whitney U test. We performed all analyses using SAS Version 9.4 (SAS Institute, Cary, NC). The intervention achieved its goal of increasing influenza vaccination in the 2016-2017 season among HCP in acute care hospitals with the lowest vaccination coverage in LAC. Each hospital in the intervention group experienced a significant increase in vaccination coverage (Table 1).

Intervention facilities had a mean vaccination coverage of 77.8% (range = 63.8%-92.5%) in the 2016-2017 season, compared with 55.4% (range = 38.2%66.0%) in the 2015-2016 season. Countywide vaccination coverage increased from 74% in the 2015-2016 season to 79% in the 2016-2017 season. Mean increase in pre- and postintervention vaccination coverage was significantly higher among intervention hospitals (22.6%; range = 4.3%46.1%) versus all others in LAC (1.3%; range = -15.8% to 26.6%; n = 77), although the ultimate mean vaccination rate was similar to that of the nonintervention hospitals. Of note, the intervention facilities had a substantially lower mean vaccination rate than nonintervention facilities dating back to the 2012-2013 season (Figure 1).

ADVERSE EFFECTS

The postintervention evaluation identified persistent barriers to implementation of the strategies. Hospital employee health directors might not always have the power to change individual vaccination decisions. Vaccination campaign strategies occasionally required additional hospital staff time and resources, in addition to managing a high turnover of employee health staff during the influenza season. Although hospitals' costs were unknown to the DPH, additional costs and supplementary resources could have been required to implement the recommended strategies.

SUSTAINABILITY

Implementation of this intervention required limited resources. The DPH used the existing evidence base of successful vaccination strategies in the assessment tool to craft recommendations. Minimal staff time was needed for the initial assessment, to provide facilities with campaign recommendations and to conduct the postintervention assessment. Data from the postintervention assessment showed that successful strategies were implemented to increase HCP influenza vaccination coverage, including leadership support and tracking unit-based vaccination rates. Participating hospital stakeholders found the intervention to be helpful in analyzing their data and making improvements to their vaccination campaign. LAC has implemented the intervention in the continued influenza

seasons with a new subset of facilities targeted from the bottom quartile of LAC hospitals. Countywide vaccination coverage has increased to 83% for the 2018-2019 season.

PUBLIC HEALTH SIGNIFICANCE

This intervention was ultimately associated with an increase in influenza vaccination of HCP, an important factor for decreasing influenza-related morbidity in acute care hospitals. We have demonstrated that public health departments can serve as hubs to disseminate best practices for HCP influenza vaccination campaigns to community health care partners. By enacting targeted strategies in hospitals, vaccination coverage has increased and moved the entire region closer to the Healthy People 2020 goal of 90% coverage.

CONTRIBUTORS

T. Kamali was responsible for implementing the program. All authors contributed to the analysis of the of the influenza project and to the writing and revisions of the article.

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CONFLICTS OF INTEREST

The authors report no conflicts ofinterests.

HUMAN PARTICIPANT PROTECTION

This project was conducted as part of routine public health activity. It did not involve the collection or analysis of data from human participants and therefore did not require institutional review board approval.

Sidebar

ABOUT THE AUTHORS

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DETAILS

Subject:	Public health; Health care; Seasons; Medical personnel; Influenza; Hospitals; Evidence-based practice; Immunization; Intervention; Personnel; Health services; Vaccination; Disease control; Kindergarten students
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My Year With AJPH: Insights From a Student Editor

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FULL TEXT

Many readers of AJPH may not know that tucked away in the journal's masthead immediately after the table of contents is the name ofthe student editor, a PhD student who has been afforded the opportunity to learn from seasoned journal editors and to help mold the content you see before you each month. For the past year, I have been that student, and this is my reflection on my time with AJPH.

The fellowship began with an in-person meeting of AJPH editors and AJPH Editorial Board members in Washington, DC. Although I was intimidated by the collective public health pedigree gathered in the AJPH offices, my trepidation was quickly dissipated by warm greetings from the editors. The meeting served both to reflect on submissions and published articles in the past year and to brainstorm content for future special sections and supplements of thejournal. This was my first hint ofthe scale at which journal staff operate: AJPH received 3404 submissions in 2019, with an average of 1.5 months from submission to decision, and has a presence beyond the digital and print magazine that includes a Twitter feed (@AMJPublicHealth), a Student Think Tank (@AJPHThinkTank) comprising masters and doctoral students from across the United States who advise on journal content, and both English- and Chineselanguage podcasts (https://soundcloud.com/alfredomorabia) ranging in topic from "Public Health Workforce: Threatened by Mass Extinction" (http:// bit.ly/2OPKOpi) to "Institutional Racism and the Health Gap Plaguing the Nation" (http://bit.ly/ 38qV4MI).

In addition to expanding my understanding of journal operations, the fellowship has provided me with hands-on experience and mentorship from journal editors. I worked with Editor-in-Chief Alfredo Morabia to identify editorialists for more than 170 articles accepted for publication and in doing so have been exposed to the varied forms that public health research can take: from articles on the economic vulnerability of female health care workers and the impact ofpolitical economy on population health to special sections of the journal dedicated to gun violence and water rights. I also worked with Deputy Editor Farzana Kapadia and several associate editors to review submitted manuscripts to determine their relevance to the AJPH audience. With the safety net ofthe editors' guidance, I was able to work with authors to refine and publish their study findings, and felt pride in shepherding high-quality

research into the evidence base.
While I expected the fellowship to hone my ability to review and edit, the most impressive aspect extended beyond professional development and illuminated the role of AJPH in society at large. WhileIhadbeentrainedto considerajournal'simpact factor as a hallmark ofprestige, journal staffseemed to place more emphasis on (and pride in) contributing to public dialogue. During the annual editors' meeting, we reviewed AJPH articles that featured prominently in news and popular media stories, including a New York Times article on the health threat of ageism (https://nyti.ms/37pHQ1x) and a Huffington Post article on suicide among queer youths (http://bit.ly/ 2wgGRDR). AJPHs role in shaping social discourse has shifted my view ofpublishing, from a necessity of academia to an essential mouthpiece for our collective science, and perhaps offers a more salient indication of journal impact.
The end of the fellowship in March 2020 will also mark my final academic quarter of doctoral course work. I look forward to entering my dissertation experience with a more nuanced view of public health research and publishing afforded by this opportunity and thank the editors for their support and guidance. For doctoral students interested in assuming the mantle of student editor, the next fellowship announcement will be circulated through the schools and programs of public health in January 2021. JfPU
11 Years Ago
OSHA as a Landmark
The OSHA Act of 1970 was landmark legislation, straddling the border between labor law and public health. It expressed a stunning set of principles, notably that every working man and woman is entitled to safe and healthful working conditions, and that employers are responsible for work being free from all recognized hazards.The full realization of Congress's vision will be beyond reach without significant new steps.... [T]hese include the following. a requirement that business owners certify that their workplaces have passed an annual inspection for OSHA compliance .. .; a requirement that employers have safety and health management systems that effectively find and fix recognized hazards ...; increased public understanding that workplace safety is part of America's promise of fairness, justice, and human rights.
From AJPH, March 2008, p. 421
44 Years Ago
Workers' Health
Likewise, OSHA has been opposed from the outset by political forces.The worst example of thisopposition istheuseofOSHAasacampaign tool by the Nixon-Ford Administrations, both in 1972 and in the upcoming Presidentialelection. The Watergate investigations uncovered a 1972 memo from Assistant Secretary of Labor George C. Guenther, then in charge of OSHA, to Under Secretary Lawrence Silberman, suggesting OSHA as a means of raising money and support from industry for PresidentNixon's election campaign by assuring that no highly controversial new occupational health or safety standards would be proposed. Since few new standards have been promulgated by OSHA, one is forced to conclude that such campaign promises were made-and kept.
From AJPH, June 1976, p. 529

DETAILS

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Cumulative Prevalence of Confirmed Maltreatment and Foster Care Placement for US Children by Race/Ethnicity, 2011–2016

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ABSTRACT (ENGLISH)

Objectives. To estimate the cumulative prevalence of confirmed child maltreatment and foster care placement for US children and changes in prevalence between 2011 and 2016. Methods. We used synthetic cohort life tables and data from the Adoption and Foster Care Analysis and Reporting System and the National Child Abuse and Neglect Data System and population counts from the Centers for Disease Control and Prevention. Results. US children's cumulative prevalence of confirmed maltreatment remained stable between 2011 and 2016 at about 11.7% (95% confidence interval [CI] = 11.6%, 11.7%) of the population and increased by roughly 11% for foster care placement from 4.8% (95% CI = 4.8%, 4.8%) to 5.3% (95% CI = 5.3%, 5.4%). American Indian/Alaska Native children experienced the largest change, an 18.0% increase in confirmed maltreatment risk from 13.4% (95% CI = 13.1%, 13.6%) to 15.8% (95% CI = 15.6%, 16.1%) and a 21% increase in foster care placement risk from 9.4% (95% CI = 9.2%, 9.6%) to 11.4% (95% CI = 11.2%, 11.6%). Conclusions. Confirmed child maltreatment and foster care placement continued to be experienced at high rates in the United States in 2012 through 2016, with especially high risks for American Indian/Alaska Native children. Rates of foster care have increased, whereas rates of confirmed maltreatment have remained stable. (Am J Public Health. 2020;110:704-709. doi:10.2105/AJPH.2019.305554)

FULL TEXT

Headnote

Objectives. To estimate the cumulative prevalence of confirmed child maltreatment and foster care placement for US children and changes in prevalence between 2011 and 2016.

Methods. We used synthetic cohort life tables and data from the Adoption and Foster Care Analysis and Reporting System and the National Child Abuse and Neglect Data System and population counts from the Centers for Disease Control and Prevention.

Results. US children's cumulative prevalence of confirmed maltreatment remained stable between 2011 and 2016 at about 11.7% (95% confidence interval [CI] = 11.6%, 11.7%) of the population and increased by roughly 11% for foster care placement from 4.8% (95% CI = 4.8%, 4.8%) to 5.3% (95% CI = 5.3%, 5.4%). American Indian/Alaska Native children experienced the largest change, an 18.0% increase in confirmed maltreatment risk from 13.4% (95% CI = 13.1%, 13.6%) to 15.8% (95% CI = 15.6%, 16.1%) and a 21% increase in foster care placement risk from 9.4% (95% CI = 9.2%, 9.6%) to 11.4% (95% CI = 11.2%, 11.6%).

Conclusions. Confirmed child maltreatment and foster care placement continued to be experienced at high rates in the United States in 2012 through 2016, with especially high risks for American Indian/Alaska Native children. Rates of foster care have increased, whereas rates of confirmed maltreatment have remained stable. (Am J Public Health. 2020;110:704-709. doi:10.2105/AJPH.2019.305554)

Children who suffer maltreatment and foster care placement are a vulnerable population at high risk of poor mental and physical health throughout the life course.1-3 The prevalence of confirmed maltreatment and foster care placement are traditionally calculated based on point-in-time estimates,4 which provide limited insight into the number ofchildren who will ever experience these events. Earlier research also using synthetic cohort life tables5 and data from the National Child Abuse and Neglect Data System (NCANDS)6 and Adoption and Foster Care Analysis and Reporting System (AFCARS)7 demonstrated that the cumulative prevalence of confirmed maltreatment8 and foster care placement9 for US children tells a very different story than do annual estimates, with 12% of US children ever having a confirmed maltreatment case8 and 6% ofUS children ever being placed in foster

care.9 For Black and American Indian/Alaska Native children, these risks were higher. Black children had cumulative risks ofapproximately 20% for a case of substantiated or confirmed child maltreatment through the child welfare system8 and 10% for foster care placement.9 The cumulative prevalence of foster care placement for American Indian/Alaska Native children has been as high as 15%.9

Although more recent estimates of the cumulative prevalence of experiencing a maltreatment investigation are available,10 estimates of the cumulative prevalence of confirmed maltreatment and foster care placement have not been produced since 2011. We sought to provide updated estimates of these risks for all children in the United States and to examine race/ethnicityspecific risks of these events from 2012 onward, using the most recent data available.

METHODS

We used 2004 to 2016 data from the NCANDS Child Files and AFCARS Foster Care Files, which allowed us to report on confirmed maltreatment and foster placements, respectively, and we used 2004 to 2016 total population counts from the Centers for Disease Control and Prevention's bridged-race population estimates. These data include information on all 47 732 097 investigated maltreatment reports and all 9 210 542 foster care child-years between 2004 and 2016. The AFCARS data include annual data on all children in state or local foster care systems, with national data available from 2000 to the present.

The NCANDS data records child caselevel information on reports of child abuse or neglect that receive a response from a state or local child welfare agency. They do not include cases in which a report was filed but the agency did not respond (screened-out cases). Current NCANDS files include all states; however, reporting in the NCANDS system is voluntary, and some states failed to report data earlier in the time series (Table A [available as a supplement to the online version of this article at http://www. ajph.org]). We adjusted for the varying inclusion of states in the NCANDS file by adjusting joining state-level NCANDS data to state-level population data, ensuring that our population denominators adjusted for NCANDS nonreporting.

Our period life table method depended on 3 inputs: (1) counts of children who experienced a first report of child abuse or neglect that was confirmed by a child welfare agency by child age and reported race/ ethnicity, (2) counts of children experiencing a first foster care placement by child age and reported race/ethnicity, and (3) the state-level population of children by age and race/ethnicity. We defined confirmed maltreatment as a reported case of maltreatment that was received by child protective services; investigated; and, ultimately, confirmed, indicated, or directed to alternative response. We retained the first episode of confirmed maltreatment for each unique child identifier in NCANDS and then constructed state-year counts by child age and race/ethnicity.

We followed a parallel method for foster care: we obtained the first episode in which a child was removed from her or his home and placed in foster care by unique child ID and then constructed state-year counts by age and race/ethnicity. We preserved state-level totals to ensure that we obtained the appropriate population denominator when joining to age- and race/ethnicity-specific population data provided in the US population data compiled by the Surveillance, Epidemiology and End-Results Program of the National Cancer Institute, as adapted from US Census Population Estimates Program data.

We defined a child's race/ethnicity with the following set of mutually exclusive categories: non-Hispanic White, nonHispanic Black, Hispanic (and not American Indian or Alaska Native), non-Hispanic Asian or Pacific Islander, and American Indian or Alaska Native (Hispanic or non-Hispanic). Rates of missingness on children s racial/ethnic group are low in the AFCARS, with an average of 1.9% of cases missing race/ethnicity in each state-year file. In the NCANDS, missingness on racial/ethnic information is more variable. We relied on multiple imputations of missing race/ethnicity data estimated using multiple imputation via chained equations for both the AFCARS and NCANDS.11 We adjusted reported SEs and confidence intervals (CIs) to include between-imputation variance.

We used synthetic cohort life table analysis to estimate US cumulative risks of confirmed maltreatment and foster care placement before age 18 years, the same method as previous research estimating these quantities through 2011.8,9 Briefly, synthetic cohort life tables use aggregate counts of an age-specific incidence of an event of interest (in our study, confirmed maltreatment and foster care placement) to estimate risks of experiencing the event

conditional on survival or nonevent to each age interval. The age interval we examined was 1-year age intervals spanning childhood, from age 0 through 17 years.

The synthetic cohort life table models what a hypothetical cohort would experience ifit were to experience the age-specific risks of the 2 events of interest we calculated during the 2004 to 2016 period. In the absence of population-level longitudinal data on child welfare system involvement in the United States, the synthetic cohort life table serves as an appropriate tool for this investigation. We focused on the cumulative risks of ever experiencing confirmed maltreatment and foster care placement by age 18 years rather than age-specific risks or cumulative risks at earlier points in the life course, as presented in Figures 1 and 2 and Tables 1 and 2. All risk estimates are accompanied by 95% CIs, and all code we used in the analysis is available in a replication 12 repository.

RESULTS

Figure 1 and Table 1 present the annual cumulative prevalence of confirmed maltreatment by age 18 years for 2004 to 2016. The 2004 to 2011 estimates confirmed that maltreatment prevalence is slightly lower (~5%) than published estimates9 because of recent data updates. The most recent data before our estimates report a cumulative risk of confirmed maltreatment of 12% for all US children. Since then, between 2011 and2016, the cumulative prevalence of confirmed maltreatment for all children remained relatively stable. Meanwhile, as shown in Figure 2 and Table 2, the cumulative risk offoster care placement increased: according to 2016 estimates, 5.3% (95% CI = 5.3%, 5.4%) of all children will ever be placed in foster care by age 18 years, a 10% higher risk than in 2011 (4.8%; 95% CI = 4.8%, 4.8%).

There is substantial racial ethnic variation in the risks of experiencing these events. Black children have the highest risk of confirmed maltreatment at 18.4% (95% CI = 18.3'%, I 8.5%). The second highest group-specific cumulative risk of this event is 15.8% (95% CI= 15.6%, 16.1%) for American Indian/Alaska Native children. Hispanic and White children have the next highest risks, at 11.0% (95% CI = 19.0%, 11.1%) and 10.5% (95% CI = 10.5%, 10.5%), respectively. Finally, children who are Asian Pacific Islanderare notable in their comparatively low risk of confirmed maltreatment (3.5%; 95% CI = 3.5%, 3.6%). Black children also have a high risk of foster care placement, at 9.1% (95% CI = 9.0%, 9.2%), but American Indian/Alaska Native children have the highest risk of experiencing this event at 11.4% (95% CI = 11.2%, 11.6%). Asian Pacific Islander children have the lowest risk of foster care placement, with 1.5% (95% CI = 1.4%, 1.5%) of children in this group ever removed from the home. White and Hispanic children again fall between the 2 extremes.

The direction and magnitude of change in risks of confirmed maltreatment vary across racial/ethnic groups, as shown in Figure 1 and Table 1. Risks of confirmed maltreatment remained relatively stable from 2011 to 2016 for White (from 10.1% in 2011 [95% CI = 10.1%, 10.2%] to 10.5% in 2016 CI = 10.5'%, 10.5%i|), Black (from 18.7% in 2011 [95% CI = 18.6%, 18.8%] to 18.4%in2016 [95% CI = 18.3%, 18.5%]), and Asian/Pacific Islander children (from 3.8% in 2011 [95% CI = 3.7%, 3.8%] to 3.5% in 2016 |95% CI = 3.5%, 3.6%|). However, they changed more substantially and in opposite directions for children who are Hispanic (-1.1 percentage points; from 12.1% in 2011 [95% CI = 12.1%, 12.2%] to 11.0% in 2016 [95% CI = 10.9'%, 11.1%]) or American Indian Alaska Native (2.4 percentage points; from 13.4% in 2011 [95% CI = 13.1%, 13.6%] to 15.8% in 2016 [95% CI = 15.6%, 16.1%]). American Indian/Alaska Native children also experienced the greatest percentage point increase in cumulative risk of foster care placement (2.0 percentage points; from 9.4% in 2011 [95% CI = 9.2%, 9.6%] to 11.4% [95% CI = 11.2%, 11.6%]; Figure 2 and Table 2). Changes in cumulative risks of foster care placement for all other racial ethnic groups were less than 1 percentage point in magnitude and positive for White and Black children and negative for children of Hispanic ethnicity (from 4.4'% in 20 1 1 [95% CI = 4.4%, 4.4%] to 3.8% in 2016 [95% CI = 3.7%e 3.8%]). The risk of foster care placement remained unchanged between 2011 and 2016 for Asian/Pacific Islander children (1.5% in 20 1 1 |95% CI = 1.4%, 1.5%] and 2016 [95% CI = 1.4%, 1.5%]).

DISCUSSION

We used 20 12 to 20 16 data to update earlier estimates of the risk of confirmed maltreatment8 and foster care placement9 for US children. Our results support 5 key conclusions. First, since 20 1 1, the cumulative prevalence of confirmed maltreatment has remained stable and increased modestly for foster care placement. Second, children of

Hispanic ethnicity were the only group to experience a decline of greater than 1 percentage point in confirmed maltreatment risk. Third, American Indian/Alaska Native children experienced comparatively large increases in their risks of both confirmed maltreatment and foster care placement by age 18 years. Fourth, children of other racial ethnic groups experienced smaller changes, with 2016 risks for other groups generally falling within 1 percentage point of risks in 2011. Fifth, trends in confirmed maltreatment and foster care placement risks did not necessarily move in parallel. For example, although for American Indian/Alaska Native children and those of Hispanic ethnicity cumulative risks of confirmed maltreatment and foster care placement both increased (among American Indiana/ Alaska Native children) or declined (among Hispanic children) over the period, among Black children, these trends diverged, with confirmed maltreatment risks declining and foster care placements increasing.

Limitations

Our analyses were limited in 4 ways. First, child identifiers in the NCANDS and AFCARS used to capture first events in our synthetic cohort analysis are unique within a state child welfare system but not across states.8,9 This may positively bias estimates if many children have experienced confirmed maltreatment or foster care entry in multiple states.

Second, the NCANDS data include only cases of reported maltreatment; children are likely to experience maltreatment that goes unreported and undetected by child protective services, leading to underestimates of actual maltreatment. Child welfare systems may also confirm maltreatment in cases that may not meet thresholds accepted by medical or public health scholars. Because NCANDS records only child welfare system investigations and processes, caution should be exercised in interpreting these estimates as objective estimates of child maltreatment. Underreporting, overreporting, and bias in system processes may all affect estimates.

Third, as illustrated in Tables A and B (available as a supplement to the online version of this article at http:/www.ajph.org), there is some missingracial ethnic information in both data sets. Although multiple imputation may partially address this, it remains a concern.

Fourth, our descriptive analyses provide no insight into how policy shocks such as changes in immigrant detention and parental imprisonment, broader contexts such as the opioid crisis, and shifts in child maltreatment and the child welfare system shape the prevalence of child protective services contact.

Public Health Implications

Confirmed child maltreatment risks are similar and foster care placement risks slightly higher compared with 5 years ago.8,9 Since 2004, trends in these risks have moved in varying ways for different groups. Combined, these results highlight the importance of additional investigation of the mechanisms explaining these trends and their variation across racial/ethnic groups. They also highlight the need for broader public health and social service interventions for vulnerable populations, who disproportionately suffer from poor health in childhood and beyond, not restricted to confirmed maltreatment, which is itself a public health issue.1-3 Â1PU

CONTRIBUTORS

Y. Yi c >i unbilled io the design and produeuon ol tables and figures and drafted the article. F. R. Edwards led the analysis and produced the figures. C. Wildeman conceptualized the study and coordinated data acquisition. All authors contributed to the analysis and revised the article.

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Note. Neither the collector of the original data, the funding agency, nor the NDACAN bears any responsibility for the analyses or interpretations we have presented.

CONFLICTS OF INTEREST

C. Wildeman is the director of the National Data Archive on Child Abuse and Neglect. The remaining authors have no conflicts of interest to report.

HUMAN PARTICIPANT PROTECTION

This research was considered exempt by Cornell University's institutional review board.

Sidebar

ABOUT THE AUTHORS

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DETAILS

Subject:	Foster care; Population; Adoption; Pacific Islander people; Minority &ethnic groups; Public health; Investigations; Estimates; Disease control; Children; Child welfare; Ethnicity; Prevention; Placement; Age; Confidence intervals; Native North Americans; Life tables; Child abuse &neglect; Race; Hispanic people; Disease prevention; American Indians; Child placement; Foster children; Adopted children
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DEBUNKING MYTHS WHILE UNDERSTANDING LIMITATIONS

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FULL TEXT

Health insurance claims have been used for many years by academia and industry for health-related research. Cozad et al.1 importantly noted that these data are often underused in public health research. We agree that myths should be debunked, but in our experience conducting comparative effectiveness research with claims data, we caution that limitations must be considered.2

The first myth is that relevant outcomes are not measured. What is relevant depends on the research question being asked. For some questions, claims data will have sufficient diagnosis or procedure codes. However, the outcomes may not be available for all questions (e.g., disease severity or progression). Proxy variables have been used but often are not validated or fail to meet quality standards.3 Therefore, variables in a database must be evaluated to determine whether the work is feasible before conducting the research, because gaps in data could lead to incorrect conclusions.

The second myth is that evidence is unreliable. Claims data can indeed be used reliably for clinical and drug development decision-making. However, both researchers and practitioners should be aware that merging claims data with electronic medical records or US Census Bureau records is extremely challenging. When only a subset of the population can be linked, both sample size (and, hence, statistical power) and generalizability of the study are reduced. Therefore, we recommend that when key variables for the research question are missing from a data set, alternative data solutions should be fully investigated to better answer the research question before risking sample size and generalizability because of incomplete linkages.

The third myth is that claims data lack insight into practice. We believe that this is a strength of claims data. These data reflect routine clinical practice. However, one must conduct the research in accordance with accepted standards to reduce the risk of incorrect conclusions resulting from flawed study design. If claims data are used for public health investigations, we recommend that the research follow accepted best practice standards to minimize risk of error.4

In summary, we support the overall tenet of Cozad et al.1 to increase the use of administrative claims for research aimed to improve the nation's health. However, we believe that this cannot be stated without acknowledging the limitations of claims data and without stating the need to adhere to accepted standards of research to minimize risk to study quality. Â1PU

Sidebar

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All authors contributed equally to this letter.

CONFLICTS OF INTEREST

L. M. Hess, K. B. Winfree, C. E. Muehlenbein, Y. E. Zhu, A. B. Oton, and H. Aggarwal are employees of Eli Lilly and Company and hold stocks in the company. N. Princic is an employee of IBM Watson Health. The authors have no other conflicts of interest to disclose.

EDITOR'S NOTE

Cozad et al. declined to respond.

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Health Implications of Housing Assignments for Incarcerated Transgender Women

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ABSTRACT (ENGLISH)

Transgender women (i.e., persons who were assigned male sex at birth but who live and identify as female) experience forms of discrimination that limit their access to stable housing and contribute to high rates of incarceration; once incarcerated, the approaches used to assign them housing within the jail or prison place them at risk for abuse, rape, and other outcomes. Yet, a paucity of studies explores the implications of carceral housing assignments for transgender women. Whether the approaches used to assign housing in jails and prisons violate the

rights of incarcerated transgender persons has been argued before the US federal courts under Section 1983 of the US Constitution, which allows persons who were raped while incarcerated to claim a violation of their Eighth Amendment rights. Reforms and policy recommendations have been attempted; however, the results have been mixed and the public health implications have received limited attention.

FULL TEXT

Headnote

Transgender women (i.e., persons who were assigned male sex at birth but who live and identify as female) experience forms of discrimination that limit their access to stable housing and contribute to high rates of incarceration; once incarcerated, the approaches used to assign them housing within the jail or prison place them at risk for abuse, rape, and other outcomes. Yet, a paucity of studies explores the implications of carceral housing assignments for transgender women.

Whether the approaches used to assign housing in jails and prisons violate the rights of incarcerated transgender persons has been argued before the US federal courts under Section 1983 of the US Constitution, which allows persons who were raped while incarcerated to claim a violation of their Eighth Amendment rights.

Reforms and policy recommendations have been attempted; however, the results have been mixed and the public health implications have received limited attention. (Am J Public Health. 2020;110:650-654. doi:10.2105/AJPH.2020.305565)

In 2018, Bacak et al. called for the field of public health to begin addressing the disproportionate incarceration of lesbian, gay, bisexual, transgender, and queer (LGBTQ) persons.1 Rates of incarceration are highest among transgender women (i.e., persons who were assigned male sex at birth but live and identify as female), who are disproportionately impacted by forms of discrimination (e.g., employment discrimination) that increase their risk ofboth housing instability and incarceration.2 4 Housing is widely considered a social determinant of health; from an equity perspective, everyone deserves a safe and healthy place to live.5 This need for safe housing exists not only in community settings, where several reforms (e.g., changes to antidiscrimination policies) have already began to improve access to safe housing for transgender women, but it also extends to the carceralsettings (i.e.,jails, prisons) where a disproportionate number of transgender women will spend some portion of their lives.6 Because transgender women are at high risk for sexual assault and other forms of violence while incarcerated, where and how they are housed during periods of incarceration has serious implications for their physical and mental health.7 Yet, how housing assignments in carceral settings affect this population has received limited attention.

Precise estimates of the prevalence of incarceration among transgender women vary. In a San Francisco, California, study, an estimated 65% (335 of 515) of transgender women had histories of incarceration.8 In another study, however, only 19.3% (748 of 3878) did.9

The elevated rates of incarceration increase the risk of ever experiencing physical or sexual abuse. According to the 2011- 2012 National Inmate Survey, 12.2% of incarcerated persons who identified as lesbian, gay, bisexual, or other (non-heterosexual) orientation reported being sexually victimized by another incarcerated person; an additional 5.4% reported being victimized by staff.By contrast, only 1.2% of heterosexual incarcerated persons reported being sexually victimized by another incarcerated person and 2.1% by staff.10

Estimates ofviolence in prison are difficult to obtain. The available estimates likely underreport exposures to violence. An estimated 30% of persons incarcerated in a Texas prison did not report sexual assault because of embarrassment, 29% because of retaliation, 21% because of fear of harassment by other incarcerated persons, and 7% because they did not want to be sent to protective custody.11,12 Before the implementation of various rape shield laws across the country, it was permissible to use victims' sexual history or previous allegations of violence to cast doubt on their moral character and thus discredit their allegations of sexual assault. This tactic dissuaded victims from reporting sexual assault cases.13 To better protect witnesses, all 50 states, the federal government, and the District of Columbia passed different versions of the rape shield laws in the 1970s and 1980s; however, they do not protect victims fully. For instance, in California, the rape shield law does not apply if the rape occurs in a local

detention or state jail or in prison.13 The repercussions for transgender survivors of sexual assault is notable as many have histories of sex work.

Besides sexual victimization, transgender persons are also at higher risk for HIV and other sexually transmitted infections, mental health issues, suicide, and substance abuse,14 which can be exacerbated behind bars depending on housing assignment. In this article, we respond to the call by Bacak et al.1 by addressing the treatment of carceral housing assignments for transgender women as a public health issue.

HOUSING IN COMMUNITY AND CARCERAL SETTINGS

For transgender women, the threats to physical and mental health associated with housing assignments begin with arrest, and they are tied to both the type of facility to which one is assigned (male vs female) and the unit within the facility where they will reside. Despite medical advances that treat transgender women based on the fluidity of gender identity14 and court decisions affirming their civil rights,15 prisons andjails continue to rely primarily on one's genitalia or their sex assigned at birth to decide where to house persons, including transgender persons, entering jail or prison.16 Typically, officials make the determination about a detainee's sex as male or female upon arrest. Based on this approach, transgender women are routinely assigned to facilities designated for men.

They are also frequently placed in solitary confinement units known as administrative segregation or "ad-seg," even though such units are usually reserved for people who either were convicted of violent crimes or who committed an offense while incarcerated. Prison abolitionists consider such units a form of torture, because people assigned to them have minimal interactions with other human beings and no access to jobs, treatment programs, or basic privileges such as phone use.17 The resulting isolation and alienation adversely affect mental health.18

ATTEMPTS AT LEGAL INTERVENTIONS

Whether the approaches used to assign transgender persons housing in carceral settings are safe and legal has been argued before US federal courts based on Section 1983 of the US Constitution, which states, "Excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted" (US Const. amend. VIII). Thus, transgender persons raped while incarcerated may allege a violation of their Eighth Amendment rights.19,20 To prove the violation, the incarcerated person must meet 2 prongs. The first, an objective prong, requires proof of a serious medical need or of the seriousness of deprivation. The second, a subjective one, requires incarcerated persons to prove prison administrators acted with deliberate indifference. Courts have interpreted the rulings from the cases as setting forth humane conditions for confinement that ensure incarcerated persons receive adequate food, clothing, shelter, and medical care.

In a 1995 case filed in the US District Court of California, Bianca Lucrecia, who was born male, sued the regional director of the Federal Bureau of Prisons, Samuel Samples, after being transferred to an all-male prison in Boron, California.19 Before incarceration, she had begun female hormone therapy, developed breasts, and had her testicles removed. Nevertheless, upon incarceration, she was housed in a cell with 3 cis (i.e., nontransgender) men, forbidden to wear female undergarments, and instructed to dress in a manner that would conceal her female physical characteristics. Incarcerated persons and prison staff harassed, abused, and degraded Lucrecia because of her feminine appearance. Prison guards physically assaulted, strip-searched, and fondled her. Lucrecia's requests to be treated as a female were denied by prison officials on the grounds that her pre-sentence report identified her as a 32-year-old White male. In a similar case, Kelly McAllister received threats and slurs based on her transgender identity, but she was nevertheless assigned to share a cell with a cis male who raped her brutally.21

Cases involving transgender women arrested while still undergoing medical transitions from male to female highlight unique considerations for health care. In a case heard by the US Court of Appeals, Michelle Kosilek sued the commissioner ofthe Massachusetts Department of Corrections, Luis S. Spencer, for refusing to provide sex reassignment surgery (SRS) to treat her gender dysphoria,20 which the American Psychiatric Association defines as a conflict between a person's physical or assigned gender and the gender with which they identify. Kosilek argued that SRS was medically necessary.22 Federal courts have upheld the rights of transgender persons to receive genderaffirming care, including in the case of Kosilek.23 In 2012, the District of Massachusetts Court ordered the Massachusetts Department of Corrections to provide SRS for Kosilek. As we have shown, violations of the Eighth

Amendment rights oftransgender women also have public health implications. Dee Farmer, who had undergone considerable physical transformation but whose surgery to remove her testicles was unsuccessful was transferred to an allmale penitentiary in Terre Haute, Indiana, where she was forcibly raped and sexually assaulted.21
Challenges and barriers arise for transgender women trying to meet both prongs as needed to establish a violation ofthe Eighth Amendment. For example, what constitutes medical need may be contested. For a condition to be considered a medical need, either a physician must mandate treatment or the need for treatment must be obvious, even to a layperson. In Kosilek's case, the Department of Corrections requested multiple opinions regarding the medical necessity of SRS asserting that the provision of other ameliorative treatments, such as antidepressants, gender-appropriate clothing, electrolysis, and hormonal treatment should suffice to treat her gender dysphoria. However, an independent evaluation of the case conducted by the Fenway Institute, a leading organization dedicated to addressing the health and health care needs of the LGBTQ population, found that these affirmatives were not comparable to SRS. Kosilek was so significantly distressed by her male genitalia that she had attempted self-castration and twice attempted suicide. The Fenway report concluded she might attempt suicide again ifher request for SRS were denied.20
Establishing a medical necessity can also be difficult for those whose sexual identity or gender expression requires no psychological, hormonal, or surgical treatment.24 As with all medical care, treatment of gender dysphoria and related conditions should be individualized given some transgender persons may not wish to undergo surgical procedures. Cruel and unusual punishment is not limited to the physical and sexual abuse that incarcerated persons may suffer; it also encompasses the mental and emotional damage that comes from the denial of medical treatments and the failure to recognize incarcerated persons according to their gender identity.
Meeting the subjective prong is challenged by the burden placed on the plaintiff to prove that prison officials knew their actions might cause harm, and that they acted with deliberate indifference or wanton disregard for the transgender plaintiffs. Proving this is further challenged by the qualified immunity prison administrators have, which is intended to shield them from liability (i.e., if acting in accordance with penological objectives, such as maintaining order and safety, they are shielded from liability).
The process ofmaking a claim is challenging, and the high burden of proof needed to win a case likely prevents many transgender women from pursuing any legal action. Indeed, such complaints rarely reach a court.13 Incarcerated persons must first meet the exhaustion requirement of the 1996 Prison Litigation Reform Act, which requires them to submit their claims through all the sequential administrative channels of the jail or prison. If a claim does reach the court, then prison officials may challenge the allegations by asserting that they did not know their decisions could inflict harm. While prison officials have substantial leeway in contesting the claims, incarcerated persons are not permitted access to prison records that might support their case.
The ramifications of housing assignments go beyond the potential for immediate physical and sexual abuse. Some transgender persons are diagnosed with gender dysphoria while incarcerated.25 Gender dysphoria can lead to severe psychological distress and intense emotional pain that if left untreated can result in dysfunction, debilitating depression, suicidality, and even death.24,26 Being placed in a housing unit that does not align with an individual's gender identity exacerbates these issues by limiting access to gender-affirming sources and other support. In addition, the strip searches that are routinely performed on all incarcerated persons, especially those performed before other incarcerated persons or prison staff, expose transgender persons to humiliation, ridicule, sexual harassment, and violence.8
Transgender women, like others, prefer to define their identity for themselves and have it be accepted and validated by others. By relying on genitalia and sex at birth to classify incarcerated persons, the criminal system directly undermines one's ability to define her identity for herself. It is not uncommon for transgender women to resort to self-harm, substance abuse, and risky sexual behavior in attempts to reclaim their identities.27 Dixen et al. reported that 9.4% of transgender women sex reassignment applicants reported self-mutilation.28 Suicide and suicide attempts are also prevalent among transgender persons, especially among those diagnosed with gender dysphoria. Clements-Nolle et al. documented depression among 62% of 392 transgender women, 32% of whom had attempted

suicide.29 De Cuypere et al. reported a lifetime prevalence of attempted suicide of 55% in this population with recent studies supporting similar figures.30-32

The Minority Stress Model, a theoretical framework for understanding the complex web of factors influencing the health of LGBTQ people, suggests the need for social support may be particularly strong for members of this population because they experience multiple, compounded layers of social stigma, isolation, and stress.33

Some individuals might turn to substance abuse as a way to cope with the discrimination, stigma, and social marginalization. The Transgender Community Health Project survey conducted in 1997 in San Francisco observed that 34% of transgender women had a history of injection drug use.34 Substance abuse can also lead to engaging in risky sexual behavior, which increases the risk of HIV/AIDS. Transgender women tend to be more sexually active than other incarcerated persons, not only because ofrape and coerced sex but also because of coerced prostitution while incarcerated and the need to exchange sex for protection.21 According to Harawa et al., 13% of formerly incarcerated transgender women traded sex for money, protection, food, or other goods, with transgender women more likely to report this practice than cis men (28% vs 10%).35

POTENTIAL SOLUTIONS

There are no easy solutions to these problems. The movement to abolish the prison industrial complex offers the most farreaching and permanent solution by eliminating the need to decide where to house any incarcerated persons, including transgender women.36 The extremely high incarceration rates and extreme forms ofviolence associated with it make this an urgent public health issue requiring immediate reforms and policy. We offer the following recommendations.

Gender Identity Instead of Sex

Replace approaches based on one's genitalia or sex assigned at birth with flexible, selfidentification systems instead. Reforms implemented in at least 2 cities illustrate how shifting from genitalia-based criteria to gender identity better accounts for the health, safety, and selfidentification of transgender incarcerated persons.18 In both Washington, DC, and Denver, Colorado, an implementing committee or review board now decides on a case-by-case basis whether each transgender person entering prison should go to a male versus female facility and which type of housing unit within the prison would be safest. Washington's transgender committee includes a medical practitioner, mental health clinician, correctional supervisor, chiefcase manager, and Department of Corrections-approved volunteer from the transgender community.18 In addition to addressing the housing-related issues, the Denver review board also addresses strip searches and health care needs. Although it does not have a permanent member ofthe LGBTQ community, an incarcerated person may request that a representative from the LGBTQ community be present during their hearing. The review board also allows prison staff to consult with community members for assistance, though this raises several ethical questions, including privacy rights.

Federal reforms also emphasize the need to evaluate physical safety and health care needs on a case-by-case basis. For instance, one reform limits how long transgender persons can be held in administrative segregation to 72 hours (usually).18 More recently, however, the US Department of Justice has begun rolling back policies aimed at protecting gay and transgender incarcerated persons. Furthermore, the US Bureau of Prisons continues to rely primarily on an incarcerated person's biological sex when determining housing designation as evidenced by their policy change in the Bureau's Transgender Offender Manual.37

Separate Units for Gay or Transgender Persons

A second potential reform is to house incarcerated persons who identify as gay or transgender in a separate unit within the facility, similar to the K6G unit created by the Los Angeles Men's Central Jail in response to a 1985 American Civil Liberties Union lawsuit. Several important drawbacks constrain this approach. First, to make the housing available to all intended incarcerated persons, the criteria used to classify someone as gay or transgender must strike a balance between recognizing the variety ofdiverse identities that exist in the population versus establishing discrete, unambiguous categories.21 To be assigned to an LGBTQ unit may also "out" LGBTQ people to other incarcerated persons, family members, and members of their home community. Finally, the segregation of units may impose a financial hardship to institutions with few transgender incarcerated persons.

Female Facilities

A third potential reform is to house transgender women in female jails or prisons. This approach might reduce risk but not eliminate risk of sexual assault as studies have shown female incarcerated persons as having perpetrated half of all incidents of sexual abuse upon other female incarcerated persons.23 In addition, the inaccurate, stigmatizing, and transphobic trope of transgender women as "predators" exists behind bars as it does in society; therefore, prison staff and other incarcerated persons may continue to perceive transgender women housed on the basis of their gender identity as threats to the safety of female incarcerated 23 persons.

Local Guidance

Local policy recommendations have also been made. For instance, a Transgender Working Group established following a forum the Los Angeles Police Department (LAPD) hosted for the transgender community urges the codification of policies and procedures to guide how the police treat transgender persons, "including appropriate name and pronoun usage, proper arrest procedures and housing in LAPD jails."38(p5) One of the goals of the Transgender Working Group was to help the LAPD formally adopt a written housing policy that acknowledges individuals' gender identity and ensures their safety while in LAPD custody. The Transgender Working Group recommends developing segregated units for nonviolent transgender women in female facilities; revising the sex and gender categories used on LAPD forms and reports to accommodate the population's diversity while improving the accuracy of data about it; and mandating that invasive searches, such as strip searches, be conducted by officers of the sex requested by the transgender person and that they be conducted in private in the presence of relevant personnel only. Policies such as these may help reduce inappropriate conduct by staff, such as conducting pat-downs to determine the "real" sex of the incarcerated person, and the humiliation of transgender persons in front of other incarcerated persons. Finally, the Transgender Working Group recommends that transgender persons be allowed to keep personal items (e.g., undergarments, wigs, make-up, binders) that reflect their gender identity.

IMPLICATIONS FOR PUBLIC HEALTH PRACTICE

Poor access to housing and employment in community settings leads many transgender women to engage in behaviors that increase their likelihood of incarceration.9,17 Once incarcerated, the housing assignments they receive often increase their risk ofexposure to extreme levels of sexual and physical violence, which contributes, in turn, to adverse physical and mental health sequelae.7 Inappropriate housing assignment during incarceration can also exacerbate isolation, psychological distress, risky behavior, and sexual abuse, and it may culminate in suicide.3,7,27,31,32 Upon release, having a history of incarceration makes it harder for individuals to qualify for public housing, often leading to a cycle of reincarceration.39 Cases argued before the courts highlight the need not only for legal reforms but also for public health professionals to treat housing assignments in prison as a public health problem. Public health can help by, for instance, expanding the definition of "medical necessity," documenting links between the social determinants of health (e.g., housing) and adverse health outcomes in this population and setting, illuminating the challenges transgender women face, and affirming their assessments of their lived experiences.

In addition, interventions addressing cultural and clinical competence can increase willingness to provide gender-affirming care among health care providers working in prisons.40 While the optimal public health intervention would eliminate the disproportionate incarceration of transgender women by eradicating the root causes, the devastating impacts on this community underscore the need for immediate action in prisons and other settings, including immigration and detention centers.

CONCLUSION

The nation's legal, correctional, and public health sectors have an obligation-as well as a unique opportunity-to cocreate the policies and practices needed to support the safety and well-being of transgender persons while they are in the custody of the state. Failure to do so implicates the nation and our field in contributing to the social, psychological, and health-related consequences of our collective inaction. ,4jPH

CONTRIBUTORS

E. Ledesma was responsible for idea conceptualization and literature review and led the writing. C. L. Ford assisted

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This review ofthe literature did not involve human participants. Institutional review board approval was not needed.

Sidebar

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DETAILS

Subject:	Public health; Housing; Assaults; Gender; Rape; Women; Transgender persons; Violence; Prisons; Constitution-US; Sex crimes; Abuse; Discrimination; Imprisonment; Jails; Gays &lesbians; Victimization; Mental health; Sexual assault; Reforms; Testes
Business indexing term:	Industry: 62422 : Community Housing Services
Location:	United States--US; Massachusetts; California
Classification:	62422: Community Housing Services
Publication title:	American Journal of Public Health; Washington
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US Hospitals Stepping Up to End Youth Violence

Barna, Mark

FULL TEXT

Across the United States hospital-based violence intervention programs are working to interrupt the cycle of violence among high-risk youths. Such programs, which are growing in popularity, partner with community organizations with experience working with adolescents in disadvantaged neighborhoods where shootings and other violent acts routinely take place.

The programs are an effective way to prevent gun violence, research shows. In fact, they were cited as one of the policies that work by the American Public Health Association and the Bloomberg American Health Initiative at the Johns Hopkins Bloomberg School of Public Health during a September forum on gun violence prevention.

The hospital-based programs are important because of the high rates of injury recidivism among adolescents in disadvantaged neighborhoods. Injured youths are 25% to 60% more likely to suffer another assaultrelated trauma, according to a 2018 study in Annals of Emergency Medicine.

Adolescents in disadvantaged urban neighborhoods are most at risk of experiencing intentional violence, according to a 2019 study in the Journal of Surgical Research. Contributing to the violence are social determinants, such as

poverty, a failing school system, housing issues, and a lack of adequate health care. Home violence and child abuse also contribute, the study said.

Exploring social determinants and ways to prevent youth violence led to the rapid growth of hospital-based intervention programs. In 1995, only two programs existed. Today there are more than 40 in the United States, with more than a dozen preparing to launch, Fatimah Loren Muhammad, executive director of the Health Alliance for Violence Intervention, told The Nation's Health.

-Mark Barna

Read the full article in The Nation's Health at http://thenationshealth.aphapublications.org/ content/50/1/1.2.

DETAILS

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Occupational and Environmental Medicine: Public Health and Medicine in the Workplace

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ABSTRACT (ENGLISH)

Occupational medicine is unique in medicine because it focuses on the interface of the workplace and health. Occupational medicine physicians combine individual patient care with prevention and a population-based health approach and may be engaged in all aspects of workers' health and the workplace. They may spend more time addressing issues in healthy workers, workers' groups, employers, or companies because only 45% of their time is used to address injured or ill patient issues.1 Important occupational health issues that need to be addressed worldwide include working conditions; the built environment; and chemical, biological, physical, and psychosocial hazards.2 Today, the specialty encompasses workers' wellness, disease prevention, and environmental issues in addition to occupational injury and illness care.

FULL TEXT

Occupational medicine is unique in medicine because it focuses on the interface of the workplace and health. Occupational medicine physicians combine individual patient care with prevention and a populationbased health approach and may be engaged in all aspects of workers' health and the workplace. They may spend more time addressing issues in healthy workers, workers' groups, employers, or companies because only 45% of their time is used to address injured or ill patient issues.1 Important occupational health issues that need to be addressed worldwide include working conditions; the built environment; and chemical, biological, physical, and psychosocial hazards.2 Today, the specialty encompasses workers' wellness, disease prevention, and environmental issues in

addition to occupational injury and illness care.

HISTORY

Even before becoming one of the three preventive medicine specialties established for board certification in 1953, occupational medicine had a long and rich history. It developed first as "industrial medicine and surgery" in response to the Industrial Revolution and the introduction of the first governmentsponsored program of social insurance (i.e., workers' compensation) and to the need for helping workers and their families achieve better health through education and prevention. It has evolved to include toxicology and hazard recognition, driven by technology and continually emerging new hazards, maturing through epidemiology driven by the need to recognize and quantify the effect of occupational illness and disease. Over time, the specialty emphasized its relevance in environmental issues by reframing itselfas "occupational and environmental medicine" (OEM). OEM physicians recognize the need to minimize or prevent health effects from a variety of bothworkplace and environmental hazardous exposures and coordinate practices that improve workplace and environmental health.

OEM practice has advanced significantly in the past 50 years, even though the core foundation remains clinical medicine, including musculoskeletal injury care, preplacement and surveillance evaluations, and fitness-forduty evaluations. OEM practice expanded in the wake of the Occupational Safety and Health Act of 1970, which brought improved prevention and detection of work-related injuries and illnesses resulting from enforceable permissible exposure limits and medical surveillance requirements for designated exposures. Although some Occupational Safety and Health Act standards (e.g., lead) have not been updated to reflect current medical evidence, the National Institute for Occupational Safety and Health may provide exposure limits that reflect more current medical evidence. The Americans With Disabilities Act of 1990 and subsequent amendments emphasized the need to put workers with disabilities on a more equal and fair footing. It has improved OEM physicians' ability to base fitness-to-work decisions on essential job functions and bring employees back to work or keep them at work, which is increasingly important given our aging and diverse workforce. The critical nature of safe and early return to work or stay at work is a basic principle of caring for the injured worker within OEM.

OEM has always existed in dualities as both a clinical specialty for injured workers and a population-based practice for health management, with work injury care financed primarily by workers' compensation. This sense of always facing in two directions is reflected in the history of the specialty, which at times has been a powerful engine for progressive reform and workers' rights and at other times may have reflected paternalistic and potentially repressive policies of some employers.

PRESENT DAY

Increasing awareness that the OEM physician can affect overall worker health, workers' families, and their environment has resulted in an expanded breadthof this medical specialty. The National Institute for Occupational Safety and Health recently established a program, Total Worker Health, which promotes a comprehensive approach to worker well-being by protecting safety and enhancing health and productivity for the benefit of workers, employers, and the nation.3 OEM physicians are increasingly asked to optimize all aspects of workers' health. The World Health Organization also advocates for safe, healthy, and decent work for all workers and for the protection of their families from loss. The World Health Organization stresses the importance of a healthier and safer workplace to prevent disease and as a prerequisite to attain some of their Sustainable Development Goals such as ensuring healthy lives and promoting well-being, sustainable economic growth, and decent work for all.

The American College of Occupational and Environmental Medicine (ACOEM) represents OEM specialists who champion the health of workers, safety of workplaces, and quality of environment even as the workplace changes. Increased use of automation and a shift from manufacturing to service-based workers have coincided with downsizing of traditional corporate medical departments.4 Recently, only 15% to 26% of ACOEM members listed corporations as their primary work setting (American College of Occupational and Environmental Medicine, unpublished membership data, October 22, 2019).4 Most OEM physicians work in clinical settings (52%- 57%), whereas others work in government jobs (9%), academic settings (7%-9%), consulting (5%-11%), and other settings.1,4 ACOEM physician members are highly trained with 43% to 47% board certified in occupational medicine

and 65% to 71% board certified in another specialty (American College of Occupational and Environmental Medicine, unpublished membership data, October 22, 2019).4 ACOEM publishes numerous guidance documents, position statements, and evidence-based guidelines including guidance for treatment and evaluation of law enforcement officers. ACOEM also creates evidence-based guidelines (MD Guidelines; https://acoem.org/PracticeResources/Practice-GuidelinesCenter/MDGuidelines%C2% AE) addressing treatment of a variety ofwork-related conditions.

Over the years, OEM training has mirrored the balance of individual and population practice, but maintaining residency programs has been a challenge, primarily because of inconsistent funding. In the United States, 25 accredited OEM residency programs currently exist; at least 18 occupational medicine programs have closed since 2000, although this trend seems to have leveled. Changes within the last three years to OEM training requirements allow programs to include a Postgraduate Year One training year to facilitate the entrance of medical school graduates and provides the option for midcareer physicians to transition to OEM with advanced standing.5 Residents usually have completed another residency program or have had significant clinical work experiences, a benefit to OEM. Although many practicing OEM physicians have not completed an OEM residency program, they provide a significant amount of clinical OEM care in the United States at a high level of competency. ACOEM has educational programs to help these and all practitioners improve their competency in occupational health.

In 2019, the National Academy of Medicine recommended adopting work system changes that create healthy, positive work environments for health care workers to lessen burnout.6 This could serve as a model for managing the workplace going forward, and OEM physicians are well suited to lead the way based on their training, experience, and expertise.

FUTURE

The continuous emergence of new chemical, infectious, and environmental hazards; advances in manufacturing and technology; pollution; climate change; substance use issues; and other events that affect the environment and workplace have increased the need for trained OEM physicians who can meet these demands. OEM practice continues to respond to new technology, to work organization changes such as the increased use of artificial intelligence and automation, to changing regulations, and to demographic trends such as the aging of the workforce. As OEM physicians respond to future challenges, the specialty will need to keep up with new developments and continue to be the champions at the forefront of worker health and the environment. OEM practice will continue to expand its scope in prevention while maintaining its role in the care of injured workers. ÂfPU

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CONTRIBUTORS

All authors provided discussion and input on the elements within the editorial. B. Baker provided significant contributions regarding the current state of occupational and environmental medicine, to include American College of Occupational and Environmental Medicine information. D. Kesler provided significant contributions regarding occupational and environmental medicine competencies and residency training. T. Guidotti provided significant contributions regarding the history and the legal elements of occupational medicine.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to disclose.

Sidebar

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DETAILS

Subject:	Medical education; Injury prevention; Demographics; Climate change; Medicine; Health care; Occupational safety; Occupational health; Public health; Preventive medicine; Physicians; Environmental health; Workplaces; Disease prevention; Workers; Employers; Urban environments; Working conditions; Disease control; Built environment; Prevention; Urban areas; Patients; Automation; Workers compensation; Illnesses; Health surveillance; Surveillance; Americans with Disabilities Act 1990-US
Business indexing term:	Subject: Occupational health Occupational safety Employers Automation Workers compensation Americans with Disabilities Act 1990-US; Industry: 62111 : Offices of Physicians
Location:	United States--US; New Mexico
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New Systematic Therapies and Trends in Cutaneous Melanoma Deaths Among US Whites, 1986–2016

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ProQuest document link

ABSTRACT (ENGLISH)

Objectives. To determine the effect of new therapies and trends toward reduced mortality rates of melanoma. Methods. We reviewed melanoma incidence and mortality among Whites (the group most affected by melanoma) in 9 US Surveillance, Epidemiology, and End Results registry areas that recorded data between 1986 and 2016.

Results. From 1986 to 2013, overall mortality rates increased by 7.5%. Beginning in 2011, the US Food and Drug Administration approved 10 new treatments for metastatic melanoma. From 2013 to 2016, overall mortality decreased by 17.9% (annual percent change [APC]= -6.2%; 95% confidence interval [CI]= -8.7%, -3.7%) with sharp declines among men aged 50 years or older (APC = -8.3%; 95% CI= -12.2%, -4.1%) starting in 2014. This recent, multiyear decline is the largest and most sustained improvement in melanoma mortality ever observed and is unprecedented in cancer medicine. Conclusions. The introduction of new therapies for metastatic melanoma was associated with a significant reduction in population-level mortality. Future research should focus on developing even more effective treatments, identifying biomarkers to select patients most likely to benefit, and renewing emphasis on public health approaches to reduce the number of patients with advanced disease. (Am J Public Health. 2020;110: 731-733. doi:10.2105/AJPH.2020.305567)

FULL TEXT

Headnote

Objectives. To determine the effect of new therapies and trends toward reduced mortality rates of melanoma. Methods. We reviewed melanoma incidence and mortality among Whites (the group most affected by melanoma) in 9 US Surveillance, Epidemiology, and End Results registry areas that recorded data between 1986 and 2016. Results. From 1986 to 2013, overall mortality rates increased by 7.5%. Beginning in 2011, the US Food and Drug Administration approved 10 new treatments for metastatic melanoma. From 2013 to 2016, overall mortality decreased by 17.9% (annual percent change [APC]= -6.2%; 95% confidence interval [CI]= -8.7%, -3.7%) with sharp declines among men aged 50 years or older (APC = -8.3%; 95% CI= -12.2%, -4.1%) starting in 2014. This recent, multiyear decline is the largest and most sustained improvement in melanoma mortality ever observed and is unprecedented in cancer medicine.

Conclusions. The introduction of new therapies for metastatic melanoma was associated with a significant reduction in population-level mortality. Future research should focus on developing even more effective treatments, identifying biomarkers to select patients most likely to benefit, and renewing emphasis on public health approaches to reduce the number of patients with advanced disease. (Am J Public Health. 2020;110: 731-733. doi:10.2105/AJPH.2020.305567)

Mortality rates for many cancers have declined gradually since the early 1990s, but the overall melanoma mortality rate had been rising. Increases in melanoma mortality were highest among older individuals, particularly men.1 Since 2011, the US Food and Drug Administration (FDA) approved 10 new therapies for the treatment ofmetastatic melanoma, including first- and secondgeneration immune checkpoint blocking antibodies (anti-CTLA-4 [T-lymphocyte-associated protein 4] and anti-PD-1 [programmed death protein 1], respectively) and B-RAF protooncogene (BRAF) and mitogen-activated protein kinase kinase (MEK) inhibitors, as well as talimogene laherparepvec.2 We investigated whether these drugs may have had an effect on population-level mortality data because 6 of these 10 agents were approved between 2011 and 2014.

METHODS

We examined the most recent melanoma incidence and mortality data from the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) program. We used SEER·Stat Version 3.8.53 to collect incidence data from the 9 US SEER registry areas (Atlanta, GA; Connecticut; Detroit, MI; Hawaii; Iowa; New Mexico; San Francisco-Oakland, CA; Seattle-Puget Sound, WA; and Utah) that recorded data between 1986 and 2016, the most recent year available, covering approximately 9.4% of the US population. We limited our analysis of incidence data to White individuals, because more than 90% of melanoma in the United States occurs among this population.1 We coded incident melanomas ofthe skin according to the International Classification of Diseases for Oncology, Third Edition (ICD-O-3; Geneva, Switzerland: World Health Organization; 2000), histological tumor classification. We obtained overall age-adjusted incidence rates for men and women aged 20 years or older stratified into 10-year increments (melanoma is rare among individuals younger than 20 years). We used SEER·Stat to collect mortality data from the National Center for Health Statistics national database of death certificates.4 We selected melanoma

of the skin as cause of death, which was determined by the ICD codes and rules in use at the time of death.5 The mortality analysis was limited to White persons, stratified by age and sex, from 1986 to 2016, the most recent year available. We also used SEER's Incidence-Based Mortality database to examine stage at diagnosis of fatal melanomas in those aged 20 years or older. Stage at diagnosis was stratified by localized, regional, and distant disease via the SEER historic stage A recode. Cases were selected by the melanoma of the skin ICD-O-3 site recode and cause of death.

We used the Joinpoint Regression Program 4.5.01 to analyze incidence and mortality trends. The software generated joined linear segments on a log scale. We set the maximum number of possible joinpoints to 5, based on the number of data points in the series.6 A permutation test was used to determine the location of the joinpoints, when the change in trend was statistically significant.7 The slope of each line was recorded as the annual percent change (APC) with 95% confidence intervals (CIs). APCs were considered statistically significantly different from zero when P values were less than .05.

RESULTS

Between 1986 and 2016, incidence rates of melanoma for the White population aged 20 years or older increased by 108.0% with an APC of 2.7% (95% CI = 2.5%, 2.9%). Incidence rates increased in men aged 50 years or olderby 178.4% with an APC of 3.4% (95% CI = 3.2%, 3.7%) and in women aged 50 years or older by 142.1% with an APC of 3.2% (95% CI = 3.0%, 3.5%). Since 2005, the overall age-adjusted APC declined slightly, from 3.2% to 1.7% (Figure A, available as a supplement to the online version of this article at http://www.ajph.org).

For cutaneous melanoma mortality, we found 2 distinct trends over the past 30 or more years. Between 1986 and 2013, overall mortality increased by 7.5% with an APC of 0.2% (95% CI = 0.1%, 0.3%). Between 1986 and 2014, mortality among men aged 50 years or older increased by 35.4% with 2 statistically significant APC increases of 1.9% (95% CI = 1.5%, 2.3%) and 1.7% (95% CI = 1.1%, 2.2%) over most of the period. Between 1986 and 2013, mortality among women aged 50 years or older increased by 4.2% with an APC of 0.2% (95% CI = 0.1%, 0.4%).

By contrast, between 2013 and 2016, overall mortality rates declined sharply by 17.9%. The APC decreased by 6.2% in the general population (95% CI = -8.7%, -3.7%; Figure 1), 8.3% among men aged 50 years or older (starting in 2014; 95% CI = -12.2%, -4.1%), and 5.8% among women aged 50 years or older (95% CI = -8.9%, -2.5%). The decrease between 2013 and 2016 was seen in nearly every 10-year age subset (Figure B, available as a supplement to the online version of this article at http://www.ajph.org) despite an overall incidence rate that rose slightly and decreased for patients initially diagnosed with local, regional, or distant disease (Figure C, available as a supplement to the online version of this article at http:// www.ajph.org).

DISCUSSION

Our analysis of more than 30 years of US cancer data suggests that the long-term trend of increasing melanoma mortality has reversed. The decline was driven by substantial decreases in mortality among men aged 50 years or older beginning in 2014 and among women aged 50 years or older beginning in 2013. This 4-year decline in melanoma mortality of 17.9% surpasses the most pronounced 4-year declines for 4 other major cancers: prostate (14%), breast (8%), lung (8%), and colon cancer (5%).4

At least 2 possible reasons account for this decline: improved treatments for advanced disease and education and early detection resulting in migration toward earlier-stage melanomas with a greater chance of surgical cure. For the latter, SEER data indicated that the median tumor thickness decreased from 0.73 millimeters to 0.58 millimeters between 1989 and 2009, likely reflecting improved education and early detection by the public and professionals.8 This small decrease is not associated with changes in prognosis, so it is unlikely to be driving the mortality reduction.

The dramatic multiyear decline in mortality coincided with the introduction of multiple new and efficacious treatments for metastatic melanoma. Currently, 5-year survival ranges between 30% and 50% compared with historical estimates ofless than 10%.9 11 Given the increased incidence of melanoma throughout this period (19862016) and the lack of stage migration, these data strongly suggest that the mortality decline was the result of the extended survival associated with these treatments. This conclusion was supported by Dobry et al.,12 who identified a 31% relative improvement in overall survival of 17 975 hospital-based metastatic melanoma patients who presented for

treatment after the FDA's initial approvals, compared with before 2011. However, during the last year those data were available (2015), only 37% of those stage IV patients received advanced therapies. Determining a true count ofindividuals who go untreated is vital to public health planning to ensure that access to new treatments is more widely available.

This analysis had limitations. Although mortality data were reported for all 50 states, only the original 9 SEER sites provided incidence data for the full 30 or more years. Use ofpopulation-based statistics does not provide patient-level treatment details, so the proportion of melanoma patients who actually received the new treatments is unknown. We also lacked tumor thickness data, which could have provided better information on recent trends in stage migration.

PUBLIC HEALTH IMPLICATIONS

To our knowledge, this is the first report of a statistically significant, multiyear reduction in the mortality rate of cutaneous melanoma across an entire nation. It shows progress in translating clinical trial survival data into improvements in population-level mortality. To accelerate these trends and improve overall patient outcomes, continued investment in medical and public health research should focus on (1) developing even more effective treatments; (2) identifying biomarkers to select patients most likely to benefit from particular therapies, while sparing others the risk of the potentially severe toxicities and high costs of treatment; and (3) renewing emphasis on public health approaches, such as raising public and professional awareness of melanoma and its early warning signs, especially in adults aged 50 years or older, to reduce the number of patients who require treatment of advanced disease. /4JPI-I

CONTRIBUTORS

D. Polsky and A. C. Geller contributed equally to this article. J. Berk-Krauss, D. Polsky, and A. C. Geller designed the study and collaborated on the first draft ofthe article. J. Berk-Krauss performed the statistical analysis. D. Polsky and A. C. Geller assisted J. Berk-Krauss with refining the analysis and interpreting results. All of the authors assisted with editing the article.

CONFLICTS OF INTEREST

D. Polsky has the following potential conflicts of interest to disclose: in-kind laboratory services and support from Bio-Rad Laboratories and contract research with Novartis. J. Weber has the following potential conflicts ofinterest to disclose: consultant to Merck, GSK, Genentech, BMS, Astra Zeneca, Incyte, Celldex, CytoMx, Takeda, and Sellas; equity in Altor, CytoMx, Protean, and Biond; named on a PD1 patent by Biodesix; and named on a CTLA4 patent by Moffitt Cancer Center.

HUMAN PARTICIPANT PROTECTION

Because the study involved only cancer registry data, it did not require institutional review board approval.

Sidebar

Correspondence should be sent to Alan C. Geller, MPH, RN, Harvard TH Chan School of Public Health, 677 Huntington Ave, Boston, MA 02115 (e-mail: ageller@hsph.harvard.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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DETAILS

Subject:	Public health; Surveillance; Epidemiology; Trends; Mortality; Cancer; Metastases; Mortality rates; Melanoma; Kinases; Food; Confidence intervals; Biomarkers; Patients; Adenomatous polyposis coli; FDA approval; White people
Business indexing term:	Subject: FDA approval
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Company / organization:	Name: Food &Drug Administration--FDA; NAICS: 926150
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Global News

Kingsbury, Diana [1] ; Puac-Polanco, Victor [2] ; Dávila, Mila González [2] [1] Kent State University, Kent, OH [2] Columbia University, New York, NY

FULL TEXT

Mixed Method Evaluation of the Saving Mothers Project in Tanzania

Postpartum hemorrhage and sepsis are main contributors to the high maternal mortality in Tanzania. Oral misoprostol, an oral prostaglandin, has been recommended as an alternative to injectable medications for

postpartum hemorrhage prevention. Between 2015 and 2017, the Saving Mothers Project trained community health workers in the Bunda and Tarime districts to distribute clean birth kits with misoprostol among pregnant women and educate them on safe birthing and the use of health care facilities. To evaluate this project, 2406 women were interviewed on their experiences at the time of childbirth. Almost all women used components of the kit, and 83% used misoprostol after delivery. Among those who did not use misoprostol, almost all received an oxytocin injection. Also, deliveries at health care facilities were high among participants (83%).

Citation. Webber GC, Chirangi BM, Magatti NJ. Challenges and successes of distributing birth kits with misoprostol to reduce maternal mortality in rural Tanzania. Afr J Reprod Health. 2019;23(3):68-78.

Occupational Heat Stress and Chronic Kidney Disease

Starting in 1970, an epidemic of chronic kidney disease of nontraditional origin (CKDnt) has altered the health of young male agricultural workers on the Pacific coasts of Mesoamerica. Wesseling et al. examined more than 20 studies assessing the role of occupational heat stress on CKDnt; other occupational, pesticide, metal, and infectious agents; and nonoccupational risk factors. Heavy manual work in hot agricultural regions along the Pacific coast was associated with CKDnt onset. Other environmental and nonoccupational factors were not consistently associated with CKDnt. Occupational heat stress is a significant risk factor for kidney dysfunction in agricultural workers.

Citation. Wesseling C, Glaser J, Rodríguez-Guzmán J, et al. Chronic kidney disease of non-traditional origin in Mesoamerica: a disease primarily driven by occupational heat stress. Rev Panam Salud Publica. 2020;44:e15.

The Impact of Tobacco Control Policies on Smoking Initiation

Palali and van Ours explored whether tobacco control policies in 11 European countries affected smoking initiation. The smoking data of individuals aged 15 years and older showed that increasing tobacco prices leads to decreased smoking initiation among males only, with no effect for females. Advertising bans, smoking cessation programs, and health warnings do not appear to affect smoking rates at a statistically significant level for males or females. The efficacy of tobacco control policies in limiting tobacco use among young people needs to be revisited, as not all strategies appear to be effective in curbing tobacco use.

Citation. Palali A, van Ours JC. The impact of tobacco control policies on smoking initiation in eleven European countries. Eur J Health Econ. 2019;20(9):1287-1301.

Sex-Specific Initiation Rates of Tobacco Smoking

Between 1999 and 2011, there has been an increase in the prevalence of current smoking among adult men and women living in Tehran, Iran, compared to national estimates. Parizadeh et al. examined population data from the Tehran Lipid and Glucose Study, collected between 1999 and 2018, to assess initiation rates and predictors of smoking among Tehran adults. The ageand sex-adjusted smoking initiation rate was 13.77 (95% confidence interval = 12.59, 14.94) per 1000 person-years. Up to 78% of the initiation rate was attributed to waterpipe use. The initiation rate was higher among men than women. Intermediate-level education and passive smoking were significant predictors of smoking initiation in both genders.

Citation. Parizadeh D, Moazzeni SS, Hasheminia M, et al. Sex-specific initiation rates of tobacco smoking and its determinants among adults from a Middle Eastern population: a cohort study. Int J Public Health. 2019;64(9):1345-1354.

DETAILS

Subject:	Epidemics; Pesticides; Womens health; Kidneys; Misoprostol; Kidney diseases; Agriculture; Pregnancy; Heat stress; Health facilities; Risk analysis; Farmworkers; Health care facilities; Workers; Smoking; Heat tolerance; Risk factors; Disease; Tobacco; Maternal mortality; Males; Health risks; Districts; Occupational exposure; Public health

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Census Count Implications for Public Health

Krisberg, Kim

FULL TEXT

With crucial funding and data on the line, work is under way to make sure the 2020 census count is accurate. Among those that will be affected by its outcomes is public health. The US Census Bureau officially launched the 2020 census count in January, with the first enumeration in the remote town of Toksook Bay, Alaska. The majority of US households will receive letters with instructions on how to participate by mid-March.

Data from the census-which occurs every 10 years and is the single largest civilian governmental undertaking in the United States-inform countless decisions across private and public sectors, including how to disseminate federal funds and apportion congressional seats and where to build roads, schools, and businesses. For example, in fiscal year 2017, according to researchers at the George Washington University, more than 300 federal spending programs relied on 2010 census data to distribute about $1.5 trillion to state and local governments, nonprofits, businesses, and households, accounting for nearly 8% of the country's gross domestic product.

For public health agencies, census data underlie just about every aspect of work, including research, surveillance, funding levels, and policymaking. The data also affect many of the programs that target social determinants of health, such as funding for Medicaid, low-income housing vouchers, and food assistance. According to a study published in February 2019 in AJPH, an inaccurate 2020 count could hinder public health planning efforts, impede work to eliminate disparities, and make it more difficult to respond to novel and emerging public health threats.

For example, New York City public health workers used census tract data on the density of childbearing-aged women born in countries with active Zika transmission to find local communities at higher risk for travelrelated infections during the 2015-2016 Zika outbreak, said study coauthor Gregory Cohen, MPhil, MSW, a statistical analyst at Boston University School of Public Health. Workers used the results to more precisely target their prevention messaging. "The census really allows us to understand how to distribute resources according to need" he told The Nation's Health.

-Kim Krisberg

Read the full article in The Nation's Health at http://thenationshealth.aphapublications.org/ content/50/1/1.1.

DETAILS

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Community Health Worker Intervention in Subsidized Housing: New York City, 2016–2017

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ABSTRACT (ENGLISH)

From April 2016 to June 2017, the Health + Housing Project employed four community health workers who engaged residents of two subsidized housing buildings in New York City to address individuals' broadly defined health needs, including social and economic risk factors. Following the intervention, we observed significant improvements in residents' food security, ability to pay rent, and connection to primary care. No immediate change was seen in acute health care use or more narrowly defined health outcomes. (Am J Public Health. 2020; 110: 689-692. doi:10.2105/AJPH. 2019.305544)

FULL TEXT

Headnote

From April 2016 to June 2017, the Health + Housing Project employed four community health workers who engaged residents of two subsidized housing buildings in New York City to address individuals' broadly defined health needs, including social and economic risk factors. Following the intervention, we observed significant improvements in residents' food security, ability to pay rent, and connection to primary care. No immediate change was seen in acute health care use or more narrowly defined health outcomes. (Am J Public Health. 2020; 110: 689-692. doi:10.2105/AJPH. 2019.305544)

There has been significant attention to the effect of community health worker (CHW) interventions on chronic disease management and access to care. Less attention has been paid to the potential for CHWs to address patients' more broadly defined health. Place-based CHW interventions may provide an effective means of reaching vulnerable populations with a range of health, social, and economic needs.

INTERVENTION

The Health + Housing Project, a CHW intervention located in subsidized housing in New York City, aimed to address residents' self-identified healthrelated needs, including social and economic risk factors.1 Intervention design and process outcomes (e.g., average number of CHW contacts) have been previously described.1

PLACE AND TIME

The project took place from April 2016 to June 2017 in one privately owned Section 8 and one public housing building in the Lower East Side of Manhattan.

PERSON

All adult building residents were eligible to participate. Although additional emphasis was placed on engaging "frequent users," defined as three or more emergency department visits or one or more hospitalizations in the past year, CHWs attempted to engage all building residents.

PURPOSE

As health care organizations are challenged to shift their approach from treating patients on a fee-for-service basis to valuebased payment models, identifying salient social determinants of health and social risk factors is of increasing interest to many health care delivery systems.2 Until recently, however, little attention has focused on understanding what types of upstream interventions are most likely to have a positive effect on downstream health outcomes.3

US health care systems have increasingly incorporated CHWs and other lay health workers into patient care and engagement efforts.4 Although most CHW programs have focused on traditional care coordination activities for patients already engaged in health care, CHWs are also well positioned to reach a broader population and to intervene in social risk factors because they generally share cultural, linguistic, and life experience backgrounds with the people with whom they work.5

Subsidized, low-income housing is a promising setting for place-based CHW interventions. Despite the benefits of having access to affordable housing, subsidized housing residents have a disproportionate number of physical and mental health conditions.6 The concentration of people with high health need presents an opportunity to deliver interventions efficiently and tailor them to a given building's population. CHWs deployed in housing meet residents in their homes and community spaces, where they have access to a more complete picture of the range of factors affecting residents' health. To date, however, there has been scant research examining the effectiveness of housing-

based CHW interventions.7 The goal of the Health + Housing Project was to expand CHW models by designating subsidized housing as the site of recruitment and intervention, inviting building residents to participate regardless of disease status or age, and addressing broadly defined health needs, including social risk factors for poor health.

IMPLEMENTATION

We partnered with a local community-based organization, Henry Street Settlement, to implement the intervention and serve as a primary service provider for referrals.

CHWs, who were employed by Henry Street Settlement, engaged residents with an initial intake visit, followed by a goalsetting activity and the creation of an individualized action plan. CHWs used motivational interviewing and referrals to Henry Street Settlement case managers and services and other community resources to assist with goal completion. For example, for participants experiencing food insecurity, CHWs helped gather documents needed for Supplemental Nutrition Assistance Program applications, made referrals to Meals on Wheels home-based meal delivery, and accompanied participants to neighborhood food pantries. They referred participants with rent arrears to Henry Street Settlement case managers who helped them apply for emergency rental assistance. CHWs also facilitated outpatient medical care for participants by scheduling appointments, arranging transportation, and escorting them to appointments.

EVALUATION

We administered baseline and postintervention surveys to adult residents in the three months before and after the intervention. Surveyors (not CHWs) recruited residents at various times of the day and week and conducted surveys in person in Spanish, Chinese, and English. Complete evaluation methods are provided in the Appendix (available as a supplement to the online version of this article at http://www. ajph.°rg).

Of the 819 estimated adult building residents, 390 (48%) completed a baseline survey. Of those, 226 (58% of survey takers) completed an intake with a CHW. Most intervention participants were female (61%) and Latinx (69%), 28% were aged 65 years or older, 63% had a household income less than $20 000, and many reported having chronic diseases. Of the 226 participants, 172 (76%) completed both baseline and postintervention surveys and were included in the outcome analysis (Figure A, available as a supplement to the online version of this article at http://www. ajph.org). No significant differences were found between participants who completed both surveys and those who completed only a baseline survey (Table A, available as a supplement to the online version ofthis article at http://www.ajph.org).

Table 1 shows differences between preintervention and postintervention survey responses. Compared with baseline, we observed a significant decrease in the percentage of participants who reported food insecurity and inability to pay rent on time after the intervention. In addition, significantly fewer participants reported needing and being unable to access food, a place to exercise, job training or employment placement programs, and education.

More participants reported having a personal doctor on the postintervention survey than at baseline, but fewer reported seeing their personal doctor in the past six months. There was a significant change from baseline in the number of outpatient visits in the past six months, with more participants reporting four or more visits. No significant change from baseline was seen in selfreported emergency department visits or hospitalizations in the past year, although in a small subgroup analysis, we observed heterogeneity by prior use frequency (with some suggestion of reductions in emergency department visits among frequent users of the emergency department and increases among nonfrequent users; FigureB, available as a supplement to the online version of this article at http:// www.ajph.org). This finding may have reflected regression to the mean. No change from baseline occurred in participants' self-reported general or mental health status or health behaviors. Evaluation limitations include the small sample size, short time frame, and lack of a comparison group.

ADVERSE EFFECTS

We did not observe any adverse effects from the intervention.

SUSTAINABILITY

The CHW intervention was funded by a foundation grant and support from community health improvement funds ofa large academic health care system. Seeing value in the CHW intervention, the owners of the Section 8 intervention

building decided to fund a continuation of the program and its expansion to two other buildings. They have partnered with Henry Street Settlement (the communitybased organization partner for our intervention) to provide CHW services.

This model may potentially be replicable in subsidized housing developments that participate in the federal Rental Assistance Demonstration, which often entails partnerships with communitybased organizations to provide social services to tenants. That the Section 8 building's board of directors chose to expand the program also shows the importance of considering diverse interests of cross-sector partners rather than focusing narrowly on health care cost reductions for housing-based interventions.

PUBLIC HEALTH SIGNIFICANCE

CHWs successfully engaged a significant proportion of vulnerable subsidized housing residents in an intervention focused on addressing broadly defined health-related needs. We saw positive outcomes for social and economic risk factors, particularly improvements in food security and ability to pay rent, and connection to a personal doctor. We hypothesize that these were the areas that CHWs were most likely to affect in the short term, which might have other downstream health effects. It may take longer for health care use and other health outcomes to emerge. A more disease-focused intervention also may be necessary to affect some of these measures.

Our study suggests that placebased CHW interventions in subsidized, low-income housing are feasible and have the potential to address the broadly defined health needs of a concentrated population of vulnerable residents. Future research should examine subsidized housing as a site for health-related interventions, with the potential to reach patients with high levels of health and social risk factors.

CONTRIBUTORS

T. Li conducted the data analysis, and A. L. Freeman and K. M. Doran assisted with interpretation. A. L. Freeman, S. A. Kaplan, I. Gould Ellen, M. N. Gourevitch, and K. M. Doran participated in study design. A. Young assisted with research implementation and supervision. All authors made critical revisions to the article.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to disclose.

HUMAN PARTICIPANT PROTECTION

Institutional review board approval was obtained from the New York University School ofMedicine for this research.

Sidebar

ABOUT THE AUTHORS

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DETAILS

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The "Abortion Pill" Misoprostol in Brazil: Women's Empowerment in a Conservative and Repressive Political Environment

Löwy, Ilana, PhD; Corrêa, Marilena Cordeiro Dias Villela, MD, PhD

ABSTRACT (ENGLISH)

In the aftermath of the introduction of severe restrictions on abortion in several US states, some activists have argued that providing widespread access to an abortive drug, misoprostol, will transform an induced abortion into a fully private act and therefore will empower women. In Brazil, where abortion is criminalized, the majority of women who wish to terminate an unwanted pregnancy already use the illegal, but easily accessible, misoprostol. We examine the history of misoprostol as an abortifacient in Brazil from the late 1980s until today and the professional debates on the teratogenicity of this drug. The effects of a given pharmaceutical compound, we argue, are always articulated, elicited, and informed within dense networks of sociocultural, economic, legal, and political settings. In a conservative and repressive environment, the use of misoprostol for selfinduced abortions, even when supported by formal or informal solidarity networks, is far from being a satisfactory solution to the curbing of women's reproductive rights.

FULL TEXT

Headnote
In the aftermath of the introduction of severe restrictions on abortion in several US states, some activists have argued that providing widespread access to an abortive drug, misoprostol, will transform an induced abortion into a fully private act and therefore will empower women. In Brazil, where abortion is criminalized, the majority of women who wish to terminate an unwanted pregnancy already use the illegal, but easily accessible, misoprostol. We examine the history of misoprostol as an abortifacient in Brazil from the late 1980s until today and the professional debates on the teratogenicity of this drug. The effects of a given pharmaceutical compound, we argue, are always articulated, elicited, and informed within dense networks of sociocultural, economic, legal, and political settings. In a conservative and repressive environment, the use of misoprostol for selfinduced abortions, even when supported by formal or informal solidarity networks, is far from being a satisfactory solution to the curbing of women's reproductive rights. (Am J Public Health. 2020;1 10:677-684. doi: 10.2105/AJPH.2019.305562)
In spring 2019, several US states introduced laws that severely limited access to abortion. Reacting to this development, the New York Times published an op-ed by the activist and women's advocate Cari Sietstra, in which she said, "Georgia's terrible law doesn't have to be the future of abortion. A self-induced abortion with misoprostol can be a safe, reliable way to end an unwanted pregnancy."1 Self-induced abortion with misoprostol, Sietstra argued, can be a very good way to end an unwanted pregnancy, but it also empowers women and enables them to control the fate of their pregnancy privately. Misoprostol "should be seen as a prophylactic drug that deserves a place in our medicine cabinets," like an EpiPen for those with allergies. We should, Sietstra adds, ask clinicians to prescribe this drug before we need it, and women with means should share their misoprostol supply with those less fortunate.
Brazil has a long experience with the use of misoprostol as an abortifacient. Abortion is illegal in Brazil. Its inclusion as a crime in Brazil's criminal code of 1830 was confirmed in the criminal code of 1890 and consolidated in the penal code of 1940, still valid today. From the 1970s on Brazilian feminists fought to liberalize abortion, but the only important change was decriminalization of abortion for anencephaly in 2012.2 Despite its criminalization, abortion is widespread in Brazil, especially among lesseducated women, while misoprostol, readily available through informal circuits, is employed by numerous women who want to terminate a pregnancy.3
Its popularity notwithstanding, the dominant image of misoprostol in Brazil is not as a tool of women's empowerment. Misoprostol is linked with culpability, suffering, and potential harm to future children. Anthropologists who spoke with mothers of children with Zika-induced microcephaly from Recife, Brazil, learned that some mothers-the great majority of whom were poor and non-White-were targets of derogatory and hostile remarks:
When circulating around the city with their children on their lap, they heard discriminatory statements about the different formation of their children's bodies, and people accused them that they had tried an abortion. Their children were called "abortion children."4
The idea that a woman who tries-and fails-to induce an abortion may injure her future child is not a new one. It links a view of abortion as a transgression, an illegal act, and a sin with an awareness of the danger of methods employed by desperate women to eliminate an unwanted pregnancy.5 These methods are often extremely risky for the pregnant woman and, in some cases, can harm the fetus too. In the 1990s and early 2000s, debates on the induction of birth defects by misoprostol led to a reactivation of the popular perception of birth defects as "wages of the sin of abortion." Health professionals found out that using this drug greatly reduced the danger of abortion for hundreds of thousands of Brazilian women.6 At the same time, media reports fed the popular imagery of misoprostol as linked with the "production of monsters"-the literal meaning of teratogenesis-and the parallel creation of "monstrous" mothers.
THE BEGINNING OF A CONTROVERSY
Misoprostol (Cytotec), a synthetic analog of prostaglandin E1 developed in 1973 by the pharmaceutical company Searle, was originally marketed as a treatment for gastrointestinal problems. One of the side effects of this molecule, its manufacturers rapidly found out, was to induce miscarriage. In the 1980s, French endocrinologists demonstrated that a combination of mifepristone (RU-486, a steroidal antiprogestogen) with misoprostol was a very efficient way to

induce an abortion. Misoprostol reached Brazil in 1985, and from 1988 on was produced by the Brazilian firm Biolab. In the late 1980s, Brazilian pharmacists started to recommend this product for terminating pregnancies as a workaround of the criminalization of abortion. At that time, misoprostol was sold in pharmacies without a prescription.

The first study of using misoprostol as an abortifacient, made by Helena Coelho and her colleagues from the Federal University of Ceara in Fortaleza, Brazil, was published in July 1991. Pharmacy students visited registered pharmacists in the Fortaleza area, asking for a drug that would terminate an early pregnancy. The majority of the pharmacists recommended misoprostol and told the buyers how to use it, but only a small minority among them also explained what the physiological effects of misoprostol were and mentioned the importance of seeing a physician after an abortion.7

In an article published in the Lancet, a German physician, Peter Schönhöfar, attracted attention to the widespread use of misoprostol in Brazil to terminate pregnancies. He argued that it was urgent to halt the sale of this drug, because "it is ineffective about half of the time, and it exposes the fetus to [the] possible risk of severe malformations."8 Schönhöfars claim that misoprostol is an ineffective abortifacient relied on a single clinical trial of this drug. His claim that it is a dangerous teratogen relied on a report made by Walter Fonseca and his colleagues from the University of Ceara, which linked a severe and atypical cranial malformation in five newborn babies with exposure to misoprostol early in pregnancy.9

The latter claim rapidly reached the general public. In April 1991, one of the main Brazilian newspapers, O Globo, published an article on a presumed link between misoprostol and cranial anomalies: "Popular Abortifacient Deforms Fetuses."10 Earlier, in November 1988, a physician explained in another major Brazilian newspaper, Jornal do Brasil, that an incomplete abortion with a newly developed "abortive pill," would induce severe fetal anomalies: "If we agree to the distribution of these pills in Brazil, surely we will have a generation of monsters."11 The 1991 claim that misoprostol induced severe anomalies of the cranium was not confirmed by other studies.12 Nevertheless, the double question of the efficiency and teratogenicity of misoprostol thereafter dominated all the debates among Brazilian doctors about the use of this drug to induce abortions.

THE BRAZILIAN EXPERIENCE

In July 1991, the Brazilian ministry of health decreed that misoprostol could be sold only by prescription and exclusively for the treatment of gastrointestinal problems.13 As a consequence, the diffusion of this drug moved into an illegal circuit, and its price, previously very low, rose sharply. Despite the official interdiction, women could still easily purchase misoprostol in a parallel market, and even with the increase in its price, abortion with misoprostol remained cheaper than termination of pregnancy in an illegal clinic. Women explained that they elected to use misoprostol because they hoped to end their pregnancy in a private setting and because they believed that it was safer than the invasive methods of abortion. The latter opinion was shared by professionals, who rapidly linked the use of misoprostol to an observed decrease of mortality and morbidity from illegal abortions.14 Moreover, some women also persuaded themselves that the use of misoprostol was not a "real" abortion.

In the early 1990s, misoprostol became the most popular abortive method in Brazil.15 Women's subjective experience of misoprostol-induced abortion was, however, frequently harsh, because they often did not know what to expect and were surprised and frightened by the violence of the drug's effects. Women who took misoprostol after the recommended limit of 10 weeks of pregnancy might have had an especially harrowing experience. A 1994 study found that the majority of the women who terminated a pregnancy with misoprostol declared that they would not use the drug again and would not recommend it to a friend.16 Another study, from 1993, confirmed that the majority of women evaluated their experience with misoprostol-induced abortion as very negative. Many took misoprostol at night without informing anyone and without knowing what was going to happen to their bodies. They then discovered that the druginduced abortion was longer, more painful, and messier than they had expected; many ended by having a surgical abortion.17 Brazilian doctors interviewed by the authors of the same study had a more positive view of misoprostol. The use of this drug, they explained, greatly reduced the frequency of abortion-related complications and allowed them to perform surgical terminations of pregnancy without being held responsible for an illegal act.18

A 1995 study that interviewed women from Rio de Janeiro's favelas who were hospitalized for an induced abortion confirmed that the great majority of them used misoprostol. It also revealed the persistence of negative attitudes toward abortion. Nearly all the interviewed women complained that they were treated with disrespect, and some with cruelty, by the public hospital's staff. At the same time, many among them, including some who had had several abortions, strongly criticized women who "take out their baby" (tira a criança). A woman's duty, they explained, is to accept her child (tem que augentar unfilho!). Their highly ambivalent discourse reflected deeply engrained cultural beliefs that see maternity as an inescapable female fate and that stigmatize women who refuse to accept this fate.19 In the early 1990s, many women believed that misoprostol would enable them to quietly abort in the privacy of their home.20 Sociological studies conducted in the 21st century indicate that, with time, numerous women learned from each other what the effects of misoprostol were, relied on informal support circuits, and counted on the help of a "friend who had aborted."21 In consequence, the goal of many of misoprostol's users shifted from achieving a complete abortion to inducing bleeding that could be presented as a spontaneous miscarriage and would allow them to obtain a curettage. 22 Women shared information about the right ways to achieve this goal: how long to wait before going to a hospital, how to find a hospital where they would be at least minimally respected, and how to present themselves to the hospital's staff.23 These goals resonated with the gynecologists' view that in Brazil misoprostol frequently acts as a "passport" to obtain a safe abortion in a public facility.24

MULTIPLE MEANINGS OF EFFICIENCY

In the early 1990s, experts explained that misoprostol alone had much lower effectiveness (50%-60%) than a sequential administration of mifepristone and misoprostol.25 Later studies indicated, however, that misoprostol alone can be a reasonably efficient abortifacient. Experts from the nonprofit organization Gynuity Health Projects were especially interested in a study of the abortive efficiency of misoprostol alone, because in many developing and intermediary countries women have no access to mifepristone.26 When used correctly in early pregnancy (intravaginal or sublingual application of appropriate doses), they argued, misoprostol is a "good enough" abortifacient.27 This claim was based on results of several clinical trials, mostly conducted in countries where abortion is legal, such as Cuba, Vietnam, and China. The reported effectiveness of misoprostol was more than 90% in the Cuban trials and between 65% and 85% in other trials.28

A 2019 information sheet issued by the feminist organization Women on Web affirms that when used correctly abortion with misoprostol alone is effective in up to 94% of cases.29 The Gynuity information sheet provides a more conservative estimate: up to three quarters of women who take misoprostol abort in the first 24 hours, but sometimes an abortion takes longer, and some women fail to abort with this drug.30 The Gynuity statement is probably based on a 2019 metanalysis of clinical trials of misoprostol, which affirms that 22% of the women who used this abortifacient underwent a surgical evacuation of the uterus. This metanalysis also affirms that the majority of misoprostol users declare themselves satisfied with this method of pregnancy termination.31

The latter statement is, however, based on an analysis of clinical trials made in countries where abortion is legal. It is reasonable to assume that participants in these trials received accurate information about misoprostol's effects, were supported by competent and sympathetic professionals, and, if the drug failed, had access to a surgical termination of pregnancy. Brazilian women use misoprostol in a very different environment, and for many, a self-induced abortion with this drug continues to be a difficult experience.32 Pilot programs, such as the experimental Athenas Program introduced in 2015 by the Federal University of Bahia to improve the treatment of women undergoing an abortion, although undoubtedly important, cannot provide an efficient solution to the dilemmas of hundreds of thousands of Brazilian women who use misoprostol as an abortifacient.33 Some of the women who attempted-and failed-to terminate their pregnancy with this drug either were too afraid to go to a hospital for a curettage or changed their mind and decided to have the child. These women may face an additional hurdle: fear that their child will be born with a severe anomaly.

MOEBIUS SYNDROME AND OTHER IMPAIRMENTS

The 1991 report that connected misoprostol with severe cranial anomalies was never confirmed.34 However, in 1993, a group of Brazilian experts, led by the geneticist Claudette Hajaj Gonzalez, linked misoprostol with Moebius

syndrome, a rare inborn neurologic condition that primarily affects the muscles that control facial expression and eye movement.35 This study linked seven cases of neurologic anomalies (four with confirmed Moebius sequence) with using misoprostol and stated:

As far as we know Brazil is unique in a very sad fact, the use (or better, the misuse) of misoprostol, a synthetic analog of prostaglandin El, commercialized as Cytotec, by women who want to abort.36

The description of use of misoprostol as a "sad fact" perhaps reflected a fear that its widespread use would lead to an "epidemic" of birth defects.37 This fear did not materialize. Brazilian women massively employ misoprostol, but Moebius syndrome and related anomalies continue to be very rare.38 They were also more solidly associated with misoprostol.

One of the most complex questions in epidemiology, the establishment of firm causal links, may be especially difficult when dealing with a potential teratogen.39 In 1994 a US pediatrician, Thomas Shepard, established a list of seven criteria that may define a substance as a teratogen. The first four, Shepard proposed, were essential: (1) proven exposure to the agent at one or more critical times during prenatal development, demonstrated, for example, by physicians' prescriptions; (2) consistent findings by two or more high-quality epidemiological studies; (3) careful delineation of clinical cases (i.e., the description of a specific defect or defects); and (4) rare environmental exposure that is associated with a rare defect. An additional three criteria were helpful, but not indispensable: (5) teratogenicity in experimental animals; (6) an association teratogen malformation that makes clinical sense; and (7) for chemical compounds, proof that the agent acts in the body in an unaltered state.40 When, a year later, Shepard discussed a possible association between misoprostol and Moebius syndrome, he did not apply his own criteria to the case, probably because, dealing with an illegal substance, it was difficult to ascertain what the level of exposure was.41

In the late 1990s and early 2000s, several studies consolidated the hypothesis that exposure to misoprostol early in pregnancy increases the probability of Moebius syndrome.42 These studies indicated that misoprostol was associated with a significant but small (2%-3%) increase in this and similar syndromes. Two systematic reviews of the medical literature confirmed this conclusion.43 The difficulty of assessing the risk of exposure to misoprostol when the drug is diffused through illegal circuits was partly overturned by two French studies that employed data from national toxicology and teratogenicity registries. Because physicians prescribed misoprostol to the women included in these studies, these studies fulfilled Shepard's first criterion: positive proof of exposure in a known sample of exposed individuals.

One study lumped together women exposed to misoprostol early in pregnancy because they were treated for gastrointestinal disorders and women who decided to continue the pregnancy after a failed attempt at abortion with mifepristone and misoprostol. The second study compared the effects of misoprostol on women who received the drug to end a pregnancy, with its effect on women treated with misoprostol for a different reason. Both studies confirmed the existence of a link between exposure to misoprostol and birth defects. The first study estimated such a risk at 2.2%, and the second at 3.5%.44

The French studies also pointed to a seldom discussed issue: women's ambivalence about their reproductive choices. Debates on ethical aspects of abortion often assume that every pregnant woman is either 100% sure that she wants to have a child or 100% sure that she rejects the pregnancy. Yet in real life women may have contradictory feelings about their pregnancy and oscillate between acceptance and rejection. Even in France, where abortion is legal and the majority of citizens view it as a woman's right, a small number of women who failed to abort with drugs changed their mind later. It is reasonable to assume that, because Brazil combines a strong moral condemnation of abortion with lower efficacy of drug-induced abortions, more Brazilian women continue their pregnancy after failure of an attempt to end it with misoprostol. French women who decided to continue their pregnancy after a failed attempt at a medical abortion are supported by health professionals trained to respect their reproductive decisions.45 Few Brazilian women exposed to misoprostol early in pregnancy receive such support.

MISOPROSTOL AS A COLLECTIVE SOCIAL SPECTACLE

In 2001, the journal Canadian Family Physician published a letter from a general practitioner who had learned that one of his patients had been treated with misoprostol without knowing that she was pregnant and asked what the

risk for her future child was. The consulted experts, the Canadian Gideon Koren and the Brazilian Lavinia Schüler (coauthors of studies of links between misoprostol and inborn anomalies), answered that risk was low. Children born to women exposed to misoprostol have a 30-fold increased risk of Moebius syndrome, but because this malformation is extremely rare, the absolute risk of giving birth to a child with this syndrome is still very small. Because of the thalidomide disaster, many women believed that after exposure to a teratogenic drug they had a 25% or greater chance of giving birth to an impaired child. It was important to explain to them that the risk of exposure to misoprostol is incomparably smaller.46

Koren and Schüler wrote for physicians in a country where abortion is legal. The Brazilian debate on putative links between misoprostol and birth defects was conducted in a very different political and sociocultural context. Scholars that supported the legalization of abortion in Brazil argued that the debate on the teratogenic risks of misoprostol was pointless. When a woman takes this drug to terminate a pregnancy, the pertinent question is not whether the misoprostol is dangerous to the fetus but how to ascertain that when this drug fails she can end the pregnancy by a different method. The real problem is not misoprostol but the criminalization of abortion.47 This is an important point. We focus here, however, on a somewhat different question: the transformation of the Brazilian debate on the teratogenicity of misoprostol from a topic debated only by experts as a "social problem."48

Once a given biomedical issue becomes a "collective social spectacle," the US sociologist Charles Bosk has argued, the complexities, nuances, and subtleties that are embodied in specific clinical situations are erased through public exposure in the media.49 Brazilian newspapers and television networks have widely published stories about misoprostol-induced birth defects. Some stories point to the existence of a risk without indicating its magnitude.50 Others dramatize this risk. An O Globo article from February 1995 that discussed a BBC program on the extensive use of misoprostol as an abortifacient in Latin America quoted a fetal medicine expert, Antonio Moron, who affirmed that misoprostol is more dangerous than thalidomide.51

A 2013 short film produced by the Brazilian television network R7 opens with the dramatic statement that when a woman who takes misoprostol fails to abort, there is a "big chance" that she will give birth to a child with Moebius syndrome. Next, an anonymous woman explains that she tried to terminate a pregnancy with misoprostol and that now her child has a distorted face, and a pediatric neurologist, Maria Joaquina Marques-Dias, explains that the majority of Brazilian children with Moebius syndrome are born to women exposed to misoprostol. The film then shows Mafiosi-looking men selling misoprostol. It ends with a question: Why can this illegal and dangerous drug be so easily purchased in Brazil?52

Brazilian media rarely provide data on the absolute risk of neurologic anomalies linked with exposure to misoprostol. Moreover, as the 1988 newspaper article on the danger of an "abortive pill" and the 1991 article on fetuses deformed by a "popular abortive drug" attest, the claim that abortifacients produce monsters preceded the display of links between misoprostol and Moebius syndrome. The pioneer of sociology of scientific knowledge, Ludwik Fleck, argued that the strong belief that syphilis equals "bad blood" stimulated a tenacious quest for a serological test for this disease.53 The belief that an "abortive pill" will induce birth defects favored a search for the teratogenic effects of misoprostol and then the transformation of a suspected link between this drug and visible inborn anomalies into a popular belief. Mothers of microcephalic babies accused of giving birth to "abortion children" illustrate the fate of a complex medical question that, to follow Charles Bosk, was "washed out by the klieg lights and culturally resonant dramatic framings that mark the discussion of private troubles as public issues receiving media attention."54

In Brazil, the publicity given to the teratogenicity of misoprostol unfolded in the context of strong condemnation of women who elect to terminate a pregnancy, especially of those who belong to lower socioeconomic strata.55 Pharmaceutical action, the anthropologists Anita Hardon and Emilia Sanabria have explained, is not reducible to the intrinsic properties of a given molecule but is articulated, elicited, and informed within a "meshwork" of experimental, regulatory, and care settings.56 The Brazilian "misoprostol meshwork" includes intersections of medicine, religion, and law but also social precariousness, injustice, and daily aggressions, particularly where women's bodies are concerned. It was also strongly linked with disparaging attitudes toward the sexuality of poor, non-White women.57

MEDICAL ABORTION IN CONTEXT

In a country characterized by dramatic inequalities and a high level of gender violence, women's ability to decide whether and when they will be mothers is but one of many changes needed to promote true gender equality in Brazil. It is, nevertheless, an important element of the struggle for this equality. Ideally, all women should have not only access to legal and safe abortions but also the choice of the method by which they wish to terminate an unwanted pregnancy.58 When abortion is legal and accessible, it is also not unreasonable to discuss the benefits and risks of making misoprostol available as a "prophylactic drug," a step that will allow some women to "privatize" an early termination of pregnancy. The situation in Latin America, and increasingly in some US states, is, however, very different.

The availability of misoprostol in Latin America has dramatically reduced mortality and morbidity linked with illegal abortions. It has also lessened abortion-related stress, especially for women who have access to efficient support networks and can escape hostility and fear mongering. Misoprostol can thus be described as an important damage-reducing device. Alas, terminating a pregnancy with misoprostol continues to be a distressing event for many Brazilian women, especially vulnerable ones: those who are young, non-White, less educated, isolated. Abortion can be traumatic for vulnerable women everywhere, but in Brazil using misoprostol in a context of criminalization of abortion, strong social disproval, ignorance, solitude, and fear of giving birth to an impaired child may produce a uniquely distressing configuration for very large numbers of women. Such a configuration is very different from the positive image of selfinduced abortion as an empowering event. Damage reduction is an important public health goal, but when the damage is rooted in an unjust law, an important concern should be to change that law. ÂfPH

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

Footnote

ENDNOTES

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DETAILS

Subject:	Abortion; Birth defects; Womens health; Pregnancy; Criminalization; Teratogenicity; Misoprostol; Women; Empowerment; Fetuses; Womens rights; Reproductive rights; Pharmaceutical industry; Drug stores; Professionals; Oppression; States

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First, Prevent Harm: Eliminate Firearm Transfer Liability as a Lethal Means Reduction Strategy

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ABSTRACT (ENGLISH)

The US suicide rate is at its highest since World War II1; suicides are the second leading cause of death among persons aged 10 to 34 years and the 10th leading cause in the United States overall. By 2017, the number of suicide deaths had risen to 47 173 and, when combined with opioid overdoses, produced a three-year decline in US life expectancy for the first time in 50 years.2

In the United States, firearms are used in less than 6% of suicide attempts but are the mechanism of death in more than 50% of completed suicides.3 State suicide rates vary more than threefold, with the majority of the difference accounted for by firearm suicides. Although the preponderance of suicide attempts involve intentional overdoses, firearms have a 55-fold higher lethality rate,4 making it imperative to understand mechanisms for preventing firearm suicide attempts.

The commentary by Gibbons et al. (p. 685), in this issue of AJPH, speaks to the challenges of one key mechanism of firearm suicide reduction, namely the temporary surrender of firearms. Extreme risk protective order legislation has become the de jour mechanism, with 18 states enacting such laws as of February 2020. These laws remove firearms from owners via an involuntary mechanism and necessitate families' engagement with a complicated court system. The use of these laws has been highly variable. In a period of a year and a half, Florida had more than 2000 "red-flag" orders, whereas over a similar period California had less than 200-but each state has roughly 2.5 million firearm-owning households.5,6

FULL TEXT

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An option for suicide prevention is voluntary temporary surrender of firearms. These weapons are typically entrusted to family, friends, gun retailers, or law enforcement. On the surface, this appears to be a simple solution if gun owners are willing to relinquish their firearms. However, as Gibbons et al. point out, profound legal and liability issues must be considered. For example, among the 20 states that require universal background checks (along with the District of Columbia), only 14 provide exemptions during times of crisis such as suicidal ideation. But what happens when the crisis has passed and it is time to return the firearm?

Under current law, it would be extremely difficult to hold any party who accepts a firearm during a suicide crisis-whether family, friends, gun retailers, or law enforcement organizations -liable for negligently transferring the weapon back to the individual who relinquished it. Thus, it is both ironic and unfortunate that gun retailers and law enforcement organizations report fearing potential liability for storing and then returning firearms under federal and state law. Such fears likely stem from popular assumptions that one can sue anyone successfully for anything in America. In fact, the law places the legal responsibility on the person who attempts or commits suicide and thus makes it difficult to hold anyone liable for helping to cause that behavior.

This framework protects family or friends who temporarily hold a firearm and then return it, so long as these individuals act as reasonable stewards who ensure that firearms are appropriately stored and do not return them in the midst of a clear suicide crisis. In addition, it is particularly difficult to sue both gun retailers and law enforcement organizations, the very entities we hope will become community partners in suicide prevention.

Although responsibility is placed upon the individual who makes the suicide attempt, there are a few exceptions to this rule. For example, if someone undertakes a legal duty to watch over another to prevent selfharm and breaches this duty through unreasonable conduct, that caretaker can be held liable. If an act of suicide is the product of an "irresistible impulse" associated with brain trauma from a prior injury (such as a car accident), the person responsible for that injury can be held liable for the suicide as well. Neither of these exceptions nor any others neatly fit with transfer-back liability for family, friends, gun retailers, or law enforcement organizations.

It also matters whom one seeks to sue. Under common law, a gun retailer could face liability for breaching a legal duty to keep a firearm safe and, in theory, for transferring the firearm back to the owner when the owner is manifesting suicidal behaviors. The vast majority of liability for negligence, however, could be eliminated through a release. Moreover, gun retailers enjoy substantial legal protections; Congress and several state legislatures have passed laws immunizing gun retailers from liability related to criminal acts by third parties that use their products. Law enforcement organizations are even more difficult to sue. They enjoy immunity for discretionary acts, such as when the police release potentially dangerous individuals after assessing them and determining that they are not a danger to themselves or others. Law enforcement can, however, be held liable for not following mandatory protocols (e.g., state laws establishing particular transferback time frames for holding a firearm for an individual).

Educating gun retailers and law enforcement organizations about these limitations on liability might correct misconceptions about transfer-back liability. Congress and state legislatures could offer further protections by establishing clear protocols for firearm storage and transfer-back, together with model releases that individuals, retailers, and law enforcement could use to eliminate liability.

Thus, sound policies that provide detailed guidance on transfer-back protocols are the most urgent need to facilitate voluntary surrender. Ideally, such policies should incorporate guidance created by mental health professional associations or developed by legislatively appointed committees that include mental health practitioners, judges, law enforcement representatives, and gun retailers, among others. A release protecting family, friends, gun retailers, and law enforcement organizations that comply with the transfer-back protocol could certainly be part of that statutory scheme and should explicitly disclaim liability for determining whether individuals are a danger to themselves or others. Any such protocol should prioritize ease of compliance. For example, a protocol that requires owners to provide a letter from a mental health professional before retrieving firearms would function as a deterrent to voluntary relinquishment of firearms during a psychiatric crisis.

Another sticking point is how to navigate state laws requiring background checks for temporary transfers between private parties. It is ironic that the state laws most conducive to reducing firearm fatalities are the same state laws

that erect barriers to temporary transfers in moments of suicide crisis. One solution is that universal background check laws should be paired with exclusions around temporary transfers related to suicidality.

To maximize efficacy, comprehensive public education campaigns should describe the details and implications of any legal reforms to both gun owners and potential transfer-back recipients. Existing partnerships, such as that between the American Shooting Sports Foundation and the American Foundation for Suicide Prevention, may heighten the credibility and perceived efficacy of transferback reforms. These efforts could incorporate health care providers offering lethal means counseling, who could refer gun owners to "partner organizations" that have agreed to receive and store firearms for owners in crisis.

Suicide is not inevitable. Beyond the clear value of therapy and emotional support, one ofthe best ways to prevent suicidal individuals from taking their own lives is to provide a mechanism for efficient and protected lethal means reduction. It is far better for our society to proactively enact such protections now than to look back and say "I wish we had done more" after the fact. Á¡P4

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Both authors contributed equally to this editorial.

CONFLICTS OF INTEREST

The authors report no conflicts ofinterest.

Sidebar

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DETAILS

Subject:	Legislation; Law enforcement; Protocol; Liability; Small arms; Firearm laws &regulations; State laws; Firearms; Drug overdose; Fatalities; Life expectancy; Suicide; Prevention; Public health; Mental health; Suicides &suicide attempts; Reduction; Life span; Households; Death &dying; Opioids; Lethality; Overdose
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Being an Environmental Health Officer

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ABSTRACT (ENGLISH)

Being an Environmental Health Officer Environmental Public Health: The Practitioner's Guide Paul L. Knechtges, Gregory D. Kearney, and Beth A. Resnick, Eds. Washington, DC: APHA Press; 2018 740 pp; $90 ISBN: 978-0-87553-293-6 eISBN: 978-0-87553-294-3

FULL TEXT

Being an Environmental Health Officer Environmental Public Health: The Practitioner's Guide Paul L. Knechtges, Gregory D. Kearney, and Beth A. Resnick, Eds. Washington, DC: APHA Press; 2018 740 pp; $90 ISBN: 978-0-87553-293-6 eISBN: 978-0-87553-294-3

Working as an environmental health officer (EHO) in one of approximately 2800 US city, county, and tribal nation health departments is challenging. Many of us know EHOs as public health inspectors and sanitarians. Today, "environmental health officer" is a more accurate job title. Having taught some classes for EHOs, I am amazed at how much has been added to their job responsibilities.

EVOLUTION OF THE POSITION

Rather than provide a list of responsibilities, which Knechtges et al. do in their book, I illustrate the challenge with an example. Glen Belnay, a colleague and friend, was the health officerfora rural New Jersey township that became suburban in the 1970s. When he started, one of his standard jobs was inspecting restaurants and engaging in other food-related safety activities. He dealt with septic tanks, communicable disease outbreaks, and pest control. Each is part of traditional health officer practice.

Belnay worked for his community for 45 years, retiring in 2019. His jobs multiplied, which is really the story told by the practitioner guide. Belnay worked closely with the city planner to choose places in the town to locate multifamily housing and retailing to avoid sprawl. He collected data that led to part of a farm becoming a Superfund hazardous waste site. He worked on building a successful argument to remove a large quantity of elemental mercury that had been stored in the town for decades and eventually was shipped to an isolated US government facility in Nevada. As new suburbanites built large single-family homes, Belnay dealt with complaints that odors from nearby farms were interfering with use of new and expensive homes, depressing their resale value. Then there was the issue of new transmission towers that some claimed caused cancer (Remember electromagnetic fields and cancer?). These are only some of the new challenges EHOs now face.

In other places across the United States, health officers work with their colleagues on food security, providing affordable housing, redeveloping brownfield sites and grayfield sites, and helping school districts expand their physical plant. EHOs increasingly work with urban planners (see Greenberg and Schneider1). In essence, the job and tasks follow the issues. I think of EHOs as a local community's family doctor- that is, they have to be prepared to deal with everything from the consequences of automobile traffic to zoonotic disease outbreaks like Salmonella when horses and other animals interact with people. In essence, EHOs identify, evaluate, and try to control environmental risks.

THE PRACTITIONER'S GUIDE

EHOs do not need to be an expert on every issue. But they must understand biology, chemistry, environmental science and technology, food safety, radiation safety, risk analysis, urban planning, and risk communications. They need to be part detective, part law officer to take action, and they need to work with public and private entities to be successful because some of their work angers businesses and property owners when additional costs are incurred. They must acquire multidisciplinary knowledge and apply it in practice. In short, EHOs need carefully crafted synopses of massive literatures. I praise Knechtges, Kearney, and Resnick, as well as 25 other contributors for writing Environmental Public Health: The Practitioner's Guide. When I taught portions of the sanitarian course, each of the instructors assembled a set of readings. In New Jersey, the students received multiple thick loose-leaf books of reading material. One large volume is a much better option as a main text.

Knechtges et al.'s 25-chapter, 740-page book is divided into three sections. The first consists of five chapters that summarize the history of the sanitary movement, and the legal, science, and organizational bases of public health. Part 2 offers chapters about processes widely used by EHOs: surveillance, risk analysis, toxicology, and risk communication. The book's third part highlights 16 programs and services provided by EHOs. These include traditional ones like food safety, pest and vector control, wastewater disposal and septic systems, housing, noise, safe drinking water, air quality, and occupational safety. Other issues have emerged as major challenges in the past 25 years, including environmental justice; climate change; hazardous chemical, biological, and nuclear waste; and public health emergencies. These existed for decades, but now are more prevalent EHO responsibilities.

The 25 chapters vary considerably in depth. The chapters that introduce toxicology, food safety, foodborne illness, safe drinking water, indoor and outdoor air pollution, and noise are detailed. Some chapters offer a list of resources and suggested reading, as well as references in the text. Some of the chapters could have used more depth. For example, the radiation protection chapter would have been more complete had it included the Department of Energy's role with nuclear waste and plutonium disposition, which are issues in some states. Also, EHOs will need to supplement what the book offers about solid and hazardous waste, healthy communities, and the legal framework of public health. I do not mean to be critical because those are well-written chapters. I do mean to point out that a book written by so many authors about such a large literature will present chapters of varying depth. Robert Friis's excellent four-volume set, The Praeger Handbook of Environmental Health,2 epitomizes wide variations in chapters written by dozens of authors.

Overall, I would use Environmental Public Health: The Practitioner's Guide as a basic text for EHOs and supplement it with pieces from government Web sites, as well as private, not-forprofit, and business sources. Overall, Environmental Public Health: The Practitioner's Guide is a valuable contribution that will still be relevant in a decade. While the content of this book represents a major improvement over what has been available in the past, the reality is that many public health professionals expect continuing evolution of the job. Specifically, I think many readers of this journal will be disappointed if by the year 2030 the upstream determinants of health model developed by the Robert Wood Johnson Foundation has not been fully incorporated into public health practice at the local level, which means directly working with urban planners, school systems, the local economic development officer, road department, and many others. Furthermore, we expect the health officer to play a much more central role working with doctors and other medical care practitioners in response to federal mandated requirements related to the Affordable Care Act. In short order, I expect health officers will need to increase the breadth and depth of their knowledge and rely on staff to perform many of the inspections and other traditional functions of the EHO. They will need ongoing continuing education focused on organizational management and technical training focused on those subjects that are most directly relevant to enhancing public health and quality of life in the community. The EHO job should become more complicated and oriented to joint management of public health and public health-related assets. >4JPI-I

Michael Greenberg, PhD

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CONFLICTS OF INTEREST

The author reports no conflict of interest.

Sidebar

Correspondence should be sent to Michael Greenberg, Bloustein School, Rutgers, 33 LivingstonAve, New Brunswick, NJ 08901-1958 (e-mail: mrg@ejb.rutgers.edu). Reprints can be ordered at http://www.ajph.org by clicking the "Reprints" link.

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2. Friis R, ed. The Praeger Handbook of Environmental Health. Santa Barbara, CA: Prager Press; 2012.

DETAILS

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Black–White Differences in Cardiovascular Disease Mortality: A Prospective US Study, 2003–2017

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ABSTRACT (ENGLISH)

Objectives. To determine factors that explain the higher Black:White cardiovascular disease (CVD) mortality rates among US adults. Methods. We analyzed data from the Reasons for Geographic and Racial Differences in Stroke study from 2003 to 2017 to estimate Black:White hazard ratios (HRs) for CVD mortality within subgroups younger than 65 years and aged 65 years or older. Results. Among 29 054 participants, 41.0% who were Black and 54.9% who were women, 1549 CVD deaths occurred. Among participants younger than 65 years, the demographic-adjusted Black:White CVD mortality HR was 2.23 (95% confidence interval [CI] = 1.87, 2.65) and 1.21 (95% CI = 1.00,1.47) after full adjustment. Among participants aged 65 years or older, the demographic-adjusted Black:White

CVD mortality HR was 1.58 (95% CI = 1.39, 1.79) and 1.12 (95% CI = 0.97, 1.29) after full adjustment. When we used mediation analysis, socioeconomic status explained 21.2% (95% CI = 13.6%, 31.4%) and 38.0% (95% CI = 20.9%, 61.7%) of the Black:White CVD mortality risk difference among participants younger than 65 years and aged 65 years or older, respectively. CVD risk factors explained 56.6% (95% CI = 42.0%, 77.2%) and 41.3% (95% CI = 22.9%, 65.3%) of the Black:White CVD mortality difference for participants younger than 65 years and aged 65 years or older, respectively. Conclusions. The higher Black:White CVD mortality risk is primarily explained by racial differences in socioeconomic status and CVD risk factors. (Am J Public Health. 2020;110: 696-703. doi:10.2105/AJPH.2019.305543)

FULL TEXT

Headnote

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Results. Among 29 054 participants, 41.0% who were Black and 54.9% who were women, 1549 CVD deaths occurred. Among participants younger than 65 years, the demographic-adjusted Black:White CVD mortality HR was 2.23 (95% confidence interval [CI] = 1.87, 2.65) and 1.21 (95% CI = 1.00,1.47) after full adjustment. Among participants aged 65 years or older, the demographic-adjusted Black:White CVD mortality HR was 1.58 (95% CI = 1.39, 1.79) and 1.12 (95% CI = 0.97, 1.29) after full adjustment. When we used mediation analysis, socioeconomic status explained 21.2% (95% CI = 13.6%, 31.4%) and 38.0% (95% CI = 20.9%, 61.7%) of the Black:White CVD mortality risk difference among participants younger than 65 years and aged 65 years or older, respectively. CVD risk factors explained 56.6% (95% CI = 42.0%, 77.2%) and 41.3% (95% CI = 22.9%, 65.3%) of the Black:White CVD mortality difference for participants younger than 65 years and aged 65 years or older, respectively.

Conclusions. The higher Black:White CVD mortality risk is primarily explained by racial differences in socioeconomic status and CVD risk factors. (Am J Public Health. 2020;110: 696-703. doi:10.2105/AJPH.2019.305543)

Although cardiovascular disease (CVD) mortality rates have declined over the past several decades in the United States,1,2 studies have consistently demonstrated higher rates of CVD mortality among Black compared with White adults.2-4 Racial differences in factors associated with increased CVD risk exist in several domains including socioeconomic status (SES),5 psychosocial factors,6 CVD risk factors (i.e., systolic blood pressure, total and high-density lipoprotein cholesterol) included in the Pooled Cohort risk equations (used to determine 10-year risk for a CVD event),1 and other clinical risk factors (e.g., body mass index) with a higher prevalence among Blacks compared with Whites.7 These differences may contribute to the disparity in CVD mortality.

Although previous studies have found higher rates of CVD mortality for Black compared with White adults,2 4 they have not identified reasons for this difference. Understanding reasons for these differences is useful because race is a category that is socially and historically constructed, with little of the contribution to differences between Blacks and Whites in health outcomes resulting from genetic factors.8 Identifying modifiable factors contributing to higher Black:White CVD mortality rates has the potential to provide policymakers and clinicians information to prioritize directions for interventions aimed at eliminating this difference.

The Williams model of racial differences in health provides a useful framework to study the unequal Black:White CVD mortality rate.8 This model proposes that certain basic causes such as historical, political, and legal structures in the United States lead to racial differences in SES.8 SES then influences exposure to other nonbiological causes of poor health such as psychosocial factors and access to medical care. This leads to differences in biological processes (e.g., CVD risk factor development) and ultimately differences in health outcomes (e.g., CVD mortality).8 The purpose of this study was to compare CVD mortality rates in Black and White adults, and to determine whether the higher prevalence of low SES, psychosocial factors, and CVD and other clinical risk factors among Blacks

compared with Whites explained the differences. Also, we determined the percentage of the difference in Black:White CVD mortality explained by each of these categories by using mediation analysis. For comparison, we also conducted analyses to determine if a racial difference in nonCVD mortality was present and to identify risk factors that might explain this difference.

METHODS

The Reasons for Geographic and Racial Differences in Stroke (REGARDS) study enrolled a population-based cohort of30 239 community-dwelling, non-Hispanic, Black and White adults aged 45 years or older from across the United States between 2003 and 2007. It was designed to examine reasons for the higher rate of stroke mortality among Blacks compared with Whites and among residents of the Southeastern United States compared with the rest of the contiguous United States.9,10 Residents of the Stroke Buckle (coastal plain region of North Carolina, South Carolina, and Georgia) and the Stroke Belt (remainder of North Carolina, South Carolina, and Georgia, and Alabama, Mississippi, Tennessee, Arkansas, and Louisiana) regions of the United States and Black adults were oversampled. The outcome of coronary heart disease is being investigated in an ancillary study. The final analytic sample included 29 054 participants. Exclusions are listed in Table A (available as a supplement to the online version of this article at http://www.ajph.org).

Baseline Data Collection

Information on medical history and health status were collected at baseline with a computer-assisted telephone survey. This was followed by an in-home examination during which blood pressure, height, and weight were measured; an electrocardiogram was performed; and fasting blood and urine samples were collected following standardized protocols. Race, age, sex, education, income, health insurance status, relationship status, current cigarette smoking, antihypertensive medication use, antihyperglycemic medication use, insulin use, and aspirin use were self-reported.9 The definitions and measurement protocols for history of CVD, depressive symptoms, stress, systolic and diastolic blood pressure, total and highdensity lipoprotein cholesterol and triglycerides, high-sensitivity C-reactive protein, diabetes, body mass index (weight in kilograms divided by the square of height in meters), albumin-to-creatinine ratio, and estimated glomerular filtration rate are presented in Table B (available as a supplement to the online version of this article at http:// www.ajph.org).

Identification and Adjudication of Deaths

Participant deaths were detected through online sources (e.g., the Social Security Death Index), the National Death Index, and by report of deceased study participants' proxies or next of kin during semiannual follow-up calls. Cause of death was adjudicated with information from death certificates, medical records, and autopsy reports. All cases were reviewed independently by 2 clinician-adjudicators, and disagreements were resolved by committee (Table B).11 The main underlying cause of death was defined as the 1 disease or injury that precipitated the events resulting in death. CVD-related mortality included sudden cardiac death, myocardial infarction, heart failure, stroke, other cardiac, not cardiac but other CVD (e.g., ruptured aortic aneurysm), and pulmonary embolism. Non-CVD-related mortality included all other causes of death (i.e., cancer; infection; chronic lung disease; other noncardiac or nonstroke death; unclassified death; dementia; accident, injury, suicide, or homicide; end-stage renal disease; and liver disease). For the current analysis, participants were followed from their baseline examination, 2003 to 2007, to their death or December 31, 2016, for those who did not die.

Statistical Analyses

We conducted all analyses for participants younger than 65 years and aged 65 years or older separately for 3 main reasons: (1) Black adults develop risk factors for CVD mortality at earlier ages compared with White adults,12 (2) previous research reports a decrease in Black:White mortality disparities as age increases,5,13 and (3) focusing on populations younger than 65 years and aged 65 years or older separately allows for different policy implications. We also tested the statistical interaction between race and age group (aged< 65 years and ‡65 years separately) in an overall model and found statistically significant racial differences in CVD and non-CVD mortality by age group (P< .001). We calculated participant characteristics and CVD and non-CVD mortality rates for Blacks and Whites separately. We calculated cumulative incidence curves for CVD and non-CVD mortality separately among adults

younger than 65 years and those aged 65 years or older (Figure A, available as a supplement to the online version of this article at http://www. ajph.org).

Utilizing cause-specific hazards to account for competing risks, we calculated hazard ratios (HRs) for CVD and non-CVD mortality separately, comparing Black and White participants. To include participants with incomplete data (Table C, available as supplement to the online version ofthis article at http://www.ajph.org), we imputed missing covariates with 20 data sets by using chained equations.14 The base model included adjustment for sociodemographic covariates including age, sex, and region of residence. The fully adjusted model included adjustment for SES (education, income, and insurance status), psychosocial factors (relationship status, depressive symptoms, and stress), CVD risk factors used in the Pooled Cohort risk equations (systolic blood pressure, antihypertensive medication use, diabetes, cigarette smoking, total and high-density lipoprotein cholesterol), and additional clinical risk factor biological processes variables of disease severity (high-sensitivity C-reactive protein, albuminuria, body mass index, statin use, insulin use, aspirin use, and history of CVD). We repeated this analysis for the 5 most common causes of death in the current study and stratified by history of CVD. We also conducted a post hoc analysis, testing for evidence of a race-by-age (modeled as a continuous variable) interaction on CVD and non-CVD mortality separately among participants younger than 65 years and those aged 65 years or older.

We conducted mediation analyses for multiple mediators by using the inverse odds ratio weighting methodology.15 We created multiple mediator categories (SES, psychosocial factors, CVD risk factors, and additional clinical risk factors) by using the Williams model of racial differences in health as a guide.8 Briefly, this mediation utilized predicted probabilities of exposure (i.e., race) based on each mediator covariate group and age, sex, and region of residence.15 We estimated the ßcoefficient for the association of race with mortality from a Cox regression model with and without weighting. This allows for the decomposition of total effects of the exposure variable on the outcome into direct and indirect effects. We calculated the weights by the inverse of the odds of exposure.16 We estimated the percent mediation as the percent change between the ßcoefficients with and without weights applied. Confidence intervals (CIs) for these percent changes were nonparametrically estimated from the 2.5th and 97.5th percentiles from the distribution of 2000 bootstrapped samples.15 We conducted analyses with SAS version 9.4 (SAS Institute, Cary, NC).

RESULTS

Black participants were less likely to be male and to live in the Stroke Buckle compared with Whites (Table 1). Compared with White participants, Black participants were more likely to have less than a highschool education, a household income less than $20 000 per year, no health insurance, depressive symptoms, and high stress. Also, Black participants were more likely than were White participants to not be living with a significant other, to smoke cigarettes, to be taking antihypertensive medication, to have diabetes and be taking insulin, and to have a high-sensitivity C-reactive protein greater than 3 milligrams per liter, an albumin-to-creatinine ratio greater than 30 milligrams per gram, and an estimated glomerular filtration rate less than 60 milliliters per minute per 1.73 square meters. Mean systolic blood pressure was higher among Black compared with White participants.

Disease Mortality Rates

There were 1549 CVD and 4108 nonCVD deaths in the current study (Table D, available as a supplement to the online version ofthis article at http://www.ajph.org). Mean follow-up time for CVD mortality among adults younger than 65 years and for nonCVD mortality among adults younger than 65 years and those aged 65 years or older was 8.9 years (maximum 13.9 years). Follow-up time for CVD mortality among adults aged 65 years or older was limited to 6.0 years (maximum 6.9 years) to avoid violating the proportional hazards assumption. Sudden death and myocardial infarction accounted for the majority of CVD deaths while cancer and infection accounted for the majority of non-CVD deaths. Among participants younger than 65 years, the CVD mortality rate was 5.6 (95% CI = 5.0, 6.2) and 2.7 (95% CI = 2.4,3.1) per 1000 person-years among Black and White participants, respectively (Table 2). For participants aged 65 years or older, the CVD mortality rate was 14.2 (95% CI = 12.9, 15.5) and 10.5 (95% CI = 9.7, 11.4) among Black and White participants, respectively. Non-CVD related mortality rates were 9.0 (95% CI = 8.2, 9.8) and 6.4 (95% CI = 5.9, 7.0) per 1000 person-years among Black and White participants younger than 65 years,

respectively, and 25.3 (95% CI = 23.9, 26.8) and 24.9 (95% CI = 23.8, 26.0) among Black and White participants aged 65 years or older, respectively. Table E (available as a supplement to the online version of this article at http://www.ajph.org) presents mortality rates for subtypes of CVD and non-CVD mortality.

Black:White Hazard Ratios for Mortality

Among participants younger than 65 years, the sociodemographic- (age, sex, and region) adjusted Black:White HR for CVD mortality was 2.23 (95% CI = 1.87, 2.65; Table 2). The fully adjusted BlackWhite HR for CVD mortality was 1.21 (95% CI = 1.00,1.47). For participants aged 65 years or older, the sociodemographicand fully adjusted Black: White HRs for CVD mortality were 1.58 (95% CI= 1.39, 1.79) and 1.12 (95% CI = 0.97, 1.29), respectively. For non-CVD mortality, among participants younger than 65 years, the sociodemographic-adjusted and fully adjusted BlackWhite HRs were 1.51 (95% CI = 1.33, 1.71) and 0.90 (95% CI = 0.78, 1.03; Table 2). Among participants aged 65 years or older, the sociodemographic and fully adjusted Black:White HRs for nonCVD mortality were 1.16 (95% CI = 1.08, 1.25) and 0.88 (95% CI = 0.81, 0.96), respectively. Table F (available as a supplement to the online version of this article at http://www.ajph.org) presents results progressively adjusted for sociodemographic factors, SES, psychosocial factors, CVD risk factors, and clinical risk factors. Tables G and H (available as supplements to the online version of this article at http://www.ajph. org) present HRs for the association of individual covariates from the fully adjusted models with CVD mortality and non-CVD mortality, respectively. Table I (available as a supplement to the online version of this article at http://www.ajph.org) presents HRs for CVD and non-CVD mortality stratified by history of CVD.

In posthoc analysis testing for evidence of a race-by-age (modeled as a continuous variable) interaction on CVD and non-CVD mortality separately, the association of Black compared with White race with increased CVD mortality risk was weaker as age increased among those aged 65 years or older (P< .001), but there was no evidence of effect modification for those younger than 65 years (P = .191). For non-CVD mortality, among adults younger than 65 years, the association of Black compared with White race with increased non-CVD mortality risk was weaker as age increased (P< .001), but there was no evidence of effect modification for those aged 65 years or older (P = .197).

For individual causes of CVD mortality, the largest sociodemographic-adjusted Black:White HR among adults younger than 65 years was for stroke (2.83; 95% CI = 1.78, 4.50; and fully adjusted HR of 1.61; 95% CI = 0.97, 2.69), and among adults aged 65 years or older it was for myocardial infarction (1.78; 95% CI = 1.46, 2.18; and fully adjusted HR of 1.26; 95% CI = 1.00, 1.58; Table 3). For non-CVD mortality, in both age groups, the largest sociodemographic-adjusted Black:White HR was for infection among adults younger than 65 years (1.80; 95% CI = 1.33,2.44; and fully adjusted HR of 0.85; 95% CI = 0.61, 1.20) and aged 65 years or older (1.31; 95% CI = 1.11, 1.55; and fully adjusted HR of 0.89; 95% CI = 0.74,1.08). TableJ (available as a supplement to the online version ofthis article at http://www.ajph.org) presents results for individual causes of mortality progressively adjusted for sociodemographic factors, SES, psychosocial factors, CVD risk factors, and clinical risk factors.

Mediation Analysis Comparing Black:White Mortality

Among participants younger than 65 years and those aged 65 years and older, SES explained 21.2% (95% CI= 13.6%, 31.4%) and 38.0% (95% CI = 20.9%, 61.7%), respectively, of the Black:White difference in CVD mortality (Table 4). CVD risk factors explained 56.6% (95% CI = 42.0%, 77.2%) and 41.3% (95% CI = 22.9%, 65.3%) of the difference in CVD mortality for adults younger than 65 years and those aged 65 years or older, respectively. All risk factors combined explained 76.4% (95% CI = 56.5%, 107.5%) and 61.1% (95% CI = 31.5%, 97.8%) of the excess risk for Black:White CVD mortality among participants younger than 65 years and those aged 65 years or older, respectively. For both age groups, the excess risk for non-CVD mortality was completely explained when we assessed all risk factors investigated simultaneously (Table 4).

DISCUSSION

In the current study, CVD mortality rates were higher among Black compared with White adults. The Black:White HR for CVD mortality was larger for participants younger than 65 years compared with participants aged 65 years or older. SES and modifiable CVD risk factors explained a substantial amount of the excess CVD mortality among Black compared with White participants. There was also increased non-CVD mortality risk among Black compared

with White participants.

Previous studies have reported an increased risk of mortality among Blacks compared with Whites for CVD mortality overall in the United States.2-4 The current study adds to these findings by documenting the presence of a Black:White difference in CVD mortality in a contemporary cohort and identifying factors that explain this difference. Similar to previous studies,10,13,17,18 BlackWhite differences were present for the most common subtypes of CVD mortality in the current study: sudden death, myocardial infarction, and stroke. The increased Black:White risk for sudden death was similar to a recent study that used data from the Atherosclerosis Risk in Communities (ARIC) study and may be explained by increased prevalence of CVD risk factors, particularly hypertension.17 However, factors related to SES such as longer ambulance response time, lower likelihood of bystander cardiopulmonary resuscitation, and limited access to highperforming hospitals have also been reported as reasons for the risk difference.17

The Black:White HR for CVD mortality was larger for participants younger than 65 years compared with those aged 65 years or older. Exposure to low SES and the earlier development of CVD risk factors among Black adults may explain this finding.1,12 In the Coronary Artery Risk Development in Young Adults (CARDIA) study, the cumulative incidence of hypertension after 20 years of follow-up among Black women and men was 37.6% and 34.5%, respectively, and among White women and men was 12.3% and 21.4%, respectively.12 The finding that the Black:White relative risk for CVD mortality was smaller at older age is consistent with previous studies.5,13 Providing health insurance, a nonbiological cause of health disparities in the Williams model, among Black adults younger than 65 years may be a valuable strategy to reduce CVD mortality through the pathway of earlier detection and treatment of CVD risk factors.19 Implementation of the Affordable Care Act increased the number ofBlack adults with insurance and access to care in the United States by 7% between 2011 and 2014.20 Although the US government provides Medicare insurance for adults aged 65 years or older in the United States, Black adults in this age group are more than twice as likely to report not being able to see a doctor because of cost.21 The prevalence of low income among Black adults in the current study was more than twice that of White participants. To decrease the Black:White difference in CVD mortality among adults aged 65 years or older, policymakers should consider providing subsidies for Medicare beneficiaries with low income who are not eligible for Medicaid.

Using mediation analysis, we identified CVD risk factors and SES as main contributors to the Black:White difference in CVD mortality risk. These data suggest that preventing the development ofCVD risk factors could substantially reduce the Black:White disparity in CVD mortality. For diabetes prevention, cultural tailoring of the Diabetes Prevention Program, an effective weight loss and exercise intervention that lowers risk of diabetes development among adults with prediabetes, has shown promise, and the Diabetes Prevention Program has been effectively implemented in community-based locations including predominantly Black churches.22 For treatment, antihypertensive medication and statin therapy both reduce CVD risk23,24 and have been shown to be cost-effective.25,26 However, control of blood pressure and use of statin therapy is less common among Black adults compared with White adults.27,28 Systems-level interventions may decrease this disparity in care. For example, the Kaiser Permanente health system in Southern California implemented an integrated health system model for hypertension treatment that resulted in control rates of greater than 80% among Black patients.29 This is in stark contrast with national blood pressure control rates of 64.7% among Black adults taking antihypertensive medication.27

Low SES is associated with an increased risk for development of CVD risk factors and CVD events.1 In the current study, racial differences in SES explained a substantial proportion of the excess CVD mortality risk experienced among Blacks compared with Whites. This finding supports the pathway of the effect of race on health described in the Williams model wherein social systems of inequality contribute to lower SES for Blacks compared with Whites.8 Subsequently, limited resources and exposure to negative health risk factors among individuals with low SES have an effect on biological processes and ultimately health outcomes.8 Policy and intervention strategies such as housing voucher programs may result in improvements in health for individuals with low SES.30 Voucher programs designed to allow relocation from high-poverty to low-poverty neighborhoods have demonstrated long-term impact

on financial and educational attainment.30 Also, CARDIA study participants who moved from high-poverty to lowpoverty neighborhoods and did not move back had a 5-millimeters-of-mercury decrease in systolic blood pressure compared with those who remained in high-poverty neighborhoods.31 Previous studies reported that Black adults who live in integrated neighborhoods have similar prevalence of CVD risk factors to Whites.7 However, housing segregation and discrimination still occurs even for Black adults with financial means. 32

In the current study, risk of non-CVD mortality was also higher for Black compared with White participants. Two factors that explained a large percentage ofthe difference in CVD mortality, CVD risk factors and SES, also explained a large portion ofthe difference in non-CVD mortality. One explanation for this finding could be that the leading cause of non-CVD mortality in the current study, infection, is often a result of hospital admissions because of CVD comorbidities.33 In the National Health and Nutrition Examination Survey Mortality Study, the adjusted relative risk for infection-related mortality was 2.0 and2.8 for adults with versus without diabetes and with versus without heart failure, respectively.33 Higher body mass index is associated with an increased risk of cancer.34 Therefore, it is possible that preventing and treating the development of CVD risk factors could result in reductions in the Black:White difference in non-CVD mortality.

Strengths and Limitations

Strengths of the current study include use of adjudicated cause of death and the enrollment of Black and White adults from across the United States. Information on SES and clinical risk factors were collected via standardized procedures. A large number of mortality events allowed for investigation of CVD and non-CVD causes of mortality separately.

However, several limitations should be considered. Although the REGARDS study identified cause of death through a structured adjudication process, the gold standard for classifying events, it is possible that the cause of some mortality outcomes could have been misclassified. Risk factors were only available at baseline. The assessment of depressive symptoms and stress used in the current study is based on the previous week and month, respectively, before measurement and was only conducted once during baseline. Previous studies have reported stronger associations between psychological factors assessed over longer periods of time, rather than once, and outcomes.35 Therefore, the association of these psychological measures with the racial difference in Black:White mortality outcomes may be underestimated. The REGARDS study contains participants from all 48 continental US states and Washington, DC; however, it is not a nationally representative sample because it only includes Whites and Blacks.

Public Health Implications

Higher CVD mortality rates for Black compared with White adults remain despite an overall decrease in CVD mortality rates over the past several decades in the United States.2 4 In the current study, differences in SES and CVD risk factors explained a substantial proportion of the mortality difference. Additional efforts toward the prevention and treatment of modifiable CVD risk factors including hypertension, dyslipidemia, diabetes, and cigarette smoking among Black adults are needed to reduce the Black:White difference in CVD mortality. Implementing national policies aimed at addressing social determinants of health could also potentially decrease the Black:White difference in CVD mortality risk.

CONTRIBUTORS

G. S. Tajeu led the writing, conceptualized and supervised the study, and assisted with the analyses. M. M. Safford conceptualized the study, interpreted the data and revised the manuscript critically for important intellectual content. G. Howard, V.J. Howard, and R.M. Tanner interpreted the data and revised the manuscript critically for important intellectual content. L. Chen and D. L. Long completed the analyses. P. Muntner conceptualized and supervised the study, and interpreted the data and revised it critically for important intellectual content.

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Note. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NINDS, NIA, NHLBI, NIDDK, or NIH. Representatives of NINDS have been involved in the review of the article but not directly involved in the collection, management, analysis, or interpretation of the data.
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HUMAN PARTICIPANT PROTECTION
Institutional review board approval was obtained for the REGARDS study, and participants provided written informed consent at baseline.
Sidebar
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DETAILS

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Russian Twitter Accounts and the Partisan Polarization of Vaccine Discourse, 2015–2017

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ABSTRACT (ENGLISH)

Objectives. To understand how Twitter accounts operated by the Russian Internet Research Agency (IRA) discussed vaccines to increase the credibility of their manufactured personas. Methods. We analyzed 2.82 million tweets published by 2689 IRA accounts between 2015 and 2017. Combining unsupervised machine learning and network analysis to identify "thematic personas" (i.e., accounts that consistently share the same topics), we analyzed the ways in which each discussed vaccines. Results. We found differences in volume and valence of vaccine-related tweets among 9 thematic personas. Pro-Trump personas were more likely to express antivaccine sentiment. Anti-Trump personas expressed support for vaccination. Others offered a balanced valence, talked about vaccines neutrally, or did not tweet about vaccines. Conclusions. IRA-operated accounts discussed vaccines in manners consistent with fabricated US identities. Public Health Implications. IRA accounts discussed vaccines online in ways that evoked political identities. This could exacerbate recently emerging partisan gaps relating to vaccine misinformation, as differently valenced messages were targeted at different segments of the US public. These sophisticated targeting efforts, if repeated and increased in reach, could reduce vaccination rates and magnify health disparities.

FULL TEXT

Headnote

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discussed vaccines to increase the credibility of their manufactured personas.
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Public Health Implications. IRA accounts discussed vaccines online in ways that evoked political identities. This could exacerbate recently emerging partisan gaps relating to vaccine misinformation, as differently valenced messages were targeted at different segments of the US public. These sophisticated targeting efforts, if repeated and increased in reach, could reduce vaccination rates and magnify health disparities. (Am J Public Health. 2020;110:718-724. doi:10.2105/AJPH.2019.305564)
In this study, we examined the ways in which the personas underlying Twitter accounts operated by the Russian Internet Research Agency (IRA) discussed vaccines between 2015 and 2017. We build on research demonstrating the IRA's efforts to sow public discord around vaccines,1 as well as preliminary qualitative analysis of their general Twitter activity.2 We demonstrate how anti- and provaccination IRA messages were used strategically to enhance the credibility of manufactured IRA "personas" in ways that could benefit the organization's attempts to intervene in subsequent political discussions including those surrounding the 2016 US presidential election. As a result, such activity can increase the partisan polarization around vaccines.
Using unsupervised machine learning3,4 and network analysis,5,6 we modeled IRA Twitter personas as thematic communities,2 groups of users that share the same thematic characteristics (discuss similar topics) and examined the ways in which their distinctive messaging about vaccination served each persona type, with a focus on pro-Trump and anti-Trump personas. We argue that vaccine-related content carried by specific Twitter personas has the potential to bolster partisan polarization around vaccines, resulting in a spiraling effect on vaccine hesitancy among specific US subpopulations.
Since mid-2014, the Russian government has operated a sophisticated online network of social media accounts to sow discord in the US political system and, before his election, to bolster the presidential candidacy of Donald J. Trump. This activity was conducted by the IRA, a Russian company based in St Petersburg and linked to the Russian government.2 While engaging in political issues that could directly influence the elections,7,8 IRA accounts have also used social media platforms such as Twitter to discuss a wide range of nonpolitical topics,2 from popular culture9 to genetic engineering,10 fracking,11 and, starting in early 2015, the safety and efficacy of vaccines.1 A previous study by Broniatowski et al., which analyzed 889 tweets by IRA accounts that used the hashtag #VaccinateUS, found that IRA accounts posted information both for and against vaccines.1 They suggested that the IRA's aim was to sow discord and deepen disagreements among people in the United States.
A later study by Linvill et al.2 observed that IRA discussions of political and nonpolitical topics were neither homogenous nor random. Using a qualitative analysis of almost 4000 tweets in the month leading to the elections, they identified 4 distinct types of accounts, differing in thematic content. They labeled these "right trolls," "left trolls," "newsfeed," and "hashtag gamers." The majority of activity that they isolated focused on nonpolitical content to camouflage their political intention. In other words, nonpolitical messages were used to bolster the credibility of their allegedly US accounts, by adhering to what Linvill et al.2 dubbed "personas."
Like Linvill et al.,2 we used the term persona not in its conventional usage,12 as a mask or performance aimed at projecting an improved image of the self.13 Instead, we focused on what we call "thematic personas," types of social media accounts that are consistent in their use of specific topics and discourses. These thematic masks are built, in part, by the use of specific language patterns native to and, hence, impersonating, a target group. For example, accounts that attempt to attract likely Trump supporters will be more likely to discuss topics that are (at least stereotypically) associated with his followers (e.g., the Second Amendment) or use terms such as MAGA (Make

America Great Again). Some of these topics are strictly political, in the sense that they relate to policy (e.g., gun control), while others are nonpolitical but nonetheless associated with the culture of political American subpopulations,14 embodied in preferences for food, art, music, sports, hashtags, and, as we demonstrate here, health topics such as vaccines.

While important for our understanding of the IRA's use ofTwitterpersonas, the analysis by Linvill et al.2 of 4 broad IRA personas is limited specifically in its ability to understand the discourse around topics such as vaccines, as the topic played a relatively small role in the general IRA activity (1968 tweets out of roughly 3 million) and therefore is not likely to be included in small samples used for qualitative analysis. Such analysis requires computer-assisted methods able to extract all mentions of vaccines and estimate their use among different personas. In addition, Linvill et al. only examined 1 month of IRA activity, out of more than 3 years online. Lastly, some groups of users might be too small to observe with a limited random sample of tweets used in qualitative analyses (e.g., our analysis identified an African American persona that was absent from previous work).

In this study, we harnessed the full data set of IRA activity over 3 years and used unsupervised machine learning and network analysis to identify 9 distinct thematic personas based on accounts' language tendencies. We demonstrate that each persona discussed vaccines in ways that were congruent with the general purpose of the persona. Simply put, pro-Trump accounts talked about vaccines in ways that are different from anti-Trump ones, and the difference was congruent with recent tendencies of conservatives to oppose, and liberals to support, vaccines.15 This method allowed us to also extend the work of Broniatowski et al.1 by contextualizing the IRA vaccine discourse they identified within the general IRA activity. We demonstrate how IRA accounts discussed vaccines not only to sow discord among people of the United States1 but also to flesh out the personalities of their "American" accounts in a credible way. Based on our findings, we argue that, by selectively catering to people with different political orientations, IRA activity could result in an increase in partisan polarization around vaccines that, in turn, could affect vaccine hesitancy, especially among susceptible subpopulations of conservatives and African Americans.

We addressed 3 research questions. The first extends the work of Linvill et al.6 to the full data set of IRA activity while allowing the automated unsupervised algorithm to identify personas they did not find in their qualitative analysis. The second and third extend the work of Broniatowski et al.1 by connecting the vaccine discourse to the IRA thematic personas:

1. What thematic personas did the IRA employ between 2015 and 2017?
2. Did these personas differ in the extent to which they engaged with the vaccine debate?
3. Did these personas differ in their attitudes regarding vaccines?

METHODS

Our data set included 2 827 928 Englishlanguage tweets from 2689 accounts identified by Twitter as operated by IRA,16 posted between January 1, 2015, and December 31, 2017, on Twitter.

We conducted analysis in 3 stages: (1) topic modeling of the textual data, (2) a novel thematic user network approach developed for this study to chart user thematic communities, and (3) manual coding of vaccine-related tweets for valence (neutral, provaccine, or antivaccine). Additional details regarding the method used such as model fit indicators and hyperparameter tuning can be found in the elaborated methodological report in Appendix A (available as a supplement to the online version of this article at http:// www.ajph.org). For replication and transparency purposes, we provide the R script used for preprocessing, topic modeling, and networking via the researchers' Github page (https://github.com/DrorWalt/ AJPH2020). Data are publicly available at Twitter's election integrity database.16

Topic Modeling

To address research question 1 and identify thematic personas among IRA accounts in an inductive way (i.e., not limited to the personas found by Linvill et al.2), we combined topic modeling and network analysis. Topic modeling is an unsupervised machine learning method for the analysis of textual data.3 Topic models are aimed at extracting a set of topics from which a corpus could be created.17 "Topics" are statistical entities, representing the probability that specific words will tend to belong to the same thematic unit based on the linguistic assumption of co-occurrence

(i.e., words that tend to appear frequently in the same documents share thematic meaning). Every document is composed as a mixture of all topics.18

In this work, we used latent Dirichlet allocation and Gibbs sampling.17 Using 10-fold cross-validation and comparing the perplexity scores of multiple models, we chose to focus on an optimal model of 60 topics (a = 0.01). To interpret and label topics, we examined the words with the highest loading on each topic, the words that are both prevalent and exclusive to each topic (FREX words19), and the full tweets that were most representative of each topic. The top 20 unique words for each topic alongside their assigned labels can be found in Appendix B (available as a supplement to the online version ofthis article at http://www.ajph.org).

Network Analysis

For each IRA account, we calculated the amount of language associated with each topic. This allowed us to calculate the similarity between accounts in terms of discussed topics, using cosine similarity over the topic-user matrix. We used the topical similarity scores between accounts to create a thematic network, where each node represents a single account. Importantly, the network does not describe social connections (e.g., liking, retweeting, following) but rather a thematic similarity relationship, in which accounts that tend to post about similar topics are more strongly connected, and are spatially closer to each other. We used a community detection algorithm (Louvain20) to segment our network to distinct thematic communities. Our algorithm identified 9 communities.

To understand the content posted by accounts employing different personas, 2 independent coders qualitatively content analyzed a sample of 100 tweets representing each community or persona (n = 900 tweets) and labeled them. These tweets can be found in Appendix C (available as a supplement to the online version of this article at http:// www.ajph.org). In addition, the full code we provide can be combined with the publicly available data set provided by Twitter.

Volume and Valence

To address research question 2, for each community, we counted the share of vaccine-related content out of the total community activity. We used the string "vaccin" and identified 1968 tweets from 270 accounts in our whole sample. In addition, we also calculated the share of users that mentioned vaccines at least once, out of the community's total number of users.

Lastly, to address research question 3 and assess the valence of tweets mentioning vaccines in each community, 2 independent coders manually analyzed whether the reference was antivaccine, provaccine, orneutral or irrelevant (KrippendorfFs a = 0.85) for a sample of 50 tweets per each of the 7 communities (n = 350) that mentioned vaccines at least once (as detailed in Results, 2 of the 9 communities never discussed vaccines).

RESULTS

We identified 60 topics and 9 thematic personas. Figure 1 presents the top words for each of the thematic personas. Based on the qualitative open-ended analysis of tweets from each community, we labeled the 9 thematic communities:

1. hard news,
2. anti-Trump,
3. pro-Trump,
4. youth talk and celebrities,
5. African Americans and Black Lives Matter,
6. mixed international topics,
7. Ukraine,
8. soft news, and
9. retweets of various topics and hashtag games.

Figure 2a shows the results of this analysis, with each node representing an IRA account; the edges between nodes representing how often different accounts talked about similar topics; the colors representing membership in a thematic community, as identified by a Louvain algorithm; and the size of nodes representing reach in terms of total retweets of all their communication between 2015 and 2017.

After thematically mapping the different IRA personas (research question 1), we assessed whether accounts in each community ever talked about vaccines and, if so, how often (research question 2). Each node in Figure 2b represents an IRA account; the edges between nodes indicate how often different accounts talked about the same topics; red nodes are accounts that tweeted about vaccines at least once; and black nodes accounts that never did so in the period analyzed. As can be seen in Figure 2, vaccine discourse was limited to specific areas of the graph and was more common (in terms of number of accounts that ever talked about vaccines) in some personas than others.

Lastly, we analyzed a sample of50 vaccinerelated tweets for each community to determine the valence toward vaccines (pro-, anti-, or neutral). The volume and valence per persona can be seen in Table 1. We elaborate more on our findings in the following paragraphs.

The first persona type engaged mostly with links to hard news online updates (e.g., war, terrorism). Only 2% of these accounts ever talked about vaccines, and only 0.04% of all their tweets were about them. When talking about vaccines, these accounts tended to provide links to news articles without expressing their own opinion (60%).

We found a similar user ratio for the second persona, which focused on liberal and antiTrump content. Here the rate of vaccine tweets was slightly higher (about 0.5%). Importantly, tweets seemed to be mostly provaccine (38%) or neutral (52%), reporting on developments in regulation, legislation, and life-saving operations globally or locally. Only 10% were coded antivaccine.

For the third persona, representing proTrump discourse (with accounts having relatively higher reach), many of the accounts using the persona talked about vaccines- 17% of these accounts mentioned vaccines at least once. However, while many accounts under the persona talked about vaccines, vaccines accounted for only 0.04% of their tweets. On average, they expressed mostly antivaccine sentiment (54% of vaccine tweets). Thus, the anti-Trump persona was dedicated to supporting vaccines, while the pro-Trump persona opposed them.

Accounts belonging to the fourth persona immersed themselves in topics often associated with youths, such as celebrities (many of which are Russian-related such as Maria Sharapova or Alexander Nevsky). Tellingly, these alleged young users never talked about vaccines.

The fifth persona imitated African American users, both in topics (e.g., Black Lives Matter activism and African American celebrities such as Talib Kweli) and language (e.g., stereotypical use of the n-word). While less negative toward vaccines then the "proTrump" persona, this persona exhibited a balance between antivaccine messages, directed mostly against corporations and the government (40%), and provaccine ones (36%). Like the pro-Trump persona, many accounts using this persona tweeted about vaccines at least once (11%), but this content accounted for only 0.03% of their total tweets. Another similarity to the pro-Trump persona was the existence ofa relative high number of high-reach users-that is, users with large number of total retweets for their overall communication between 2015 and 2017.

The sixth persona focused on a mixture of international topics, including some conversation about the Russian-Ukrainian conflict and the 2011 Fukushima nuclear disaster. Ten percent of the accounts using this persona tweeted about vaccines at least once, accounting for 0.09% of their tweets. As was the case in the persona imitating the African American community, sentiment toward vaccines was balanced with 42% of tweets coded as antivaccine, 44% as provaccine, and 14% as neutral.

As the figures indicate, the seventh persona exhibited a unique thematic pattern. These accounts focused almost exclusively on Ukraine, highlighting the alleged injustice of the US stance on the conflict between Russia and Ukraine, the immorality of its people (e.g., Ukraine aiding Nazi brigades), and the failures of the Ukrainian government. This persona did not tweet about vaccines at all.

The eighth persona focused on soft news updates (e.g., health, sports, and local topics). Twenty-two percent of these accounts mentioned vaccines at least once, and roughly 1 out of every 1000 tweets created by this persona type was about vaccines. However, their vaccine tweets tended to be neutral (78%), with only 16% pro- and 6% antivaccine.

Finally, accounts using the ninth persona did not focus on 1 specific topic, instead focusing their activity on

retweeting others and on engagement with trendy hashtag games (viral online prompts encouraging users to create content around a specific premise or topic-for example, prompts promoted by the popular Comedy Central show @midnight). Their vaccine-related content (13% of users but only 2 in every 10 000 tweets) was more pro- (46%), than anti- (32%) vaccine, and extensively used the #VaccinateUS hashtag, a finding consistent with that of Broniatowski et al.1

DISCUSSION

Using the full data set of more than 3 million tweets published by IRA accounts on Twitter between 2015 and 2017, we show that the vaccine discourse that was first identified by Broniatowski et al.1 was part of a larger effort to solidify and bolster identifiable thematic personas, probably for a later political use including during the 2016 presidential elections. Our automated analysis identified 9 personas, compared with the 4 found in qualitative research.2 We were able to identify the additional personas because we were working with a higher resolution and larger sample.

Vaccines as Part of Personas' Discourse

Our method identified 9 thematic personas, operationalized through the consistent preference of specific topics and language. This linguistic behavior, we believe, was an attempt to project coherent and reliable personas that do not focus exclusively on the elections and politics (thus avoiding being tagged as suspicious by their Twitter followers). None of the personas dedicated itself exclusively to vaccines, nor to health topics in general. Two were focused on soft and hard news, 2 focused on supporting or opposing presidential candidate Trump, 1 mimicked African Americans with a focus on Black Lives Matter activism, and 2 were mixed in topics, focusing on retweets and the language and interest of younger users. Two personas focused on international issues, 1 focusing solely on the conflict between Russia and Ukraine, and 1 focusing on a larger number of international issues including the Russian- Ukrainian conflict and the 2011 Fukushima nuclear disaster.

Importantly, in line with our argument that different accounts disguised themselves as different personas with different opinions and interests, some personas tweeted about vaccines, while others did not. Among those who did, we identified persona-tied differences in intensity and centrality ofthe vaccine issue, as well as differences in the valence of opinions about vaccines. This finding contextualizes previous findings offered by Broniatowski et al.1 Of particular importance for public health, the pro-Trump personas tended to oppose vaccines, while the anti-Trump ones did not. For example, an account associated with the pro-Trump persona, the supposed conservative Christian @ameliebaldwin, wrote on November 12, 2016, that "Holistic doctors found #autism-causing carcinogens in #vaccines before being murdered." On the contrary, the allegedly African American user @imissobama wrote on January 13, 2017, that "The anti-vax movement can only exist bc few living Americans can recall what polio actually did to ppl. I fear the same is true of fascism."

The personas focused on sharing soft and hard news reports tweeted about vaccines relatively often, but their tweets did not take a position on the issue. Rather, they tended to merely retweet news stories on vaccines, just as they did for other non-vaccine-related issues. Finally, personas focusing on youth issues and Ukraine did not post any tweets about vaccines. Thus, different accounts, aimed at different subpopulations of the US public, shared dramatically different information regarding vaccines.

While beyond the scope of this study, attention should be directed in the future to the dynamics of persona use over time. Our data indicate that a higher level of vaccine-related IRA tweets appeared around the vote on a California bill on mandatory school vaccinations (SB277). Future studies are needed to better understand the strategic use of vaccines and other health topics over time, with a focus on whether it changes around events tied to citizen voting. In summary, our findings indicate that, in addition to sowing discord, vaccine-related IRA Twitter activity functioned to fashion believable personas. Such behavior could have detrimental effects on public health if targeted to vulnerable vaccine-hesitant communities.

Public Health Implications

Regardless of the motivation behind the Russians' involvement with vaccine discourse online, this behavior could threaten US public health, especially when targeted at specific users. Historically, the antivaccine movement and the

individuals supporting it were not associated with one political party or the other.16 However, like other topics, political polarization can affect attitudes toward vaccination as well. It is worrisome that recent polls and surveys indicated that individuals who identify as conservative have begun shifting against vaccination.16

The partisan polarization of public health issues is cause for concern. Attitudes toward and intentions to follow public health recommendations should be formed as the result of a consideration of risks and benefits, based on scientific, nonpartisan inquiry. The increase in partisan polarization could result in an increase in the number of conservatives who make their judgment of vaccines' safety and necessity not based on the science but based on their political disposition and their perception ofhow the topic aligns with their support for a political leader. Such a phenomenon could be further fueled by misinformation that distorts credible scientific evidence,21 especially in social media and online sources where antivaccination messages are more common than in mainstream media. This, in turn, could increase vaccination hesitancy.

Even if small in magnitude, the intentional Russian spread of antivaccine discourse targeted at specific subpopulations that are susceptible to it (e.g., pro-Trump users and African Americans on Twitter) could be the beginning of a new front in the ongoing informational cyberwar. >4jPI-l

CONTRIBUTORS

AH authors were responsible for the design, analysis, and write-up ofthe study, as well as subsequent revisions. The method for identification of thematic communities was developed by D. Walter and Y. Ophir. The code for the analysis was written by D. Walter.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest.

HUMAN PARTICIPANT PROTECTION

All data are publicly available and released officially by Twitter. Usernames are masked. Therefore, human participant protection was not required.

Sidebar

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DETAILS

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Disparities in Distribution of Particulate Matter Emissions from US Coal-Fired Power Plants by Race and Poverty Status After Accounting for Reductions in Operations Between 2015 and 2017

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ABSTRACT (ENGLISH)

Objectives. To investigate potential changes in burdens from coal-fired electricitygenerating units (EGUcfs) that emit fine particulate matter (PM2.5,defined as matter with a nominal mean aerodynamic diameter of< 2.5 mm) among racial/ethnic and economic groups after reduction of operations in 92 US EGUcfs. Methods. PM2.5 burdens calculated for EGUs listed in the 2008, 201 1, and 2014 National Emissions Inventory were recalculated for 2017 after omitting emissions from 92 EGUcfs. The combined influence of race/ethnicity and poverty on burden estimates was characterized. Results. Omission of 92 EGUcfs decreased PM2.5 burdens attributable to EGUs by 8.6% for the entire population and to varying degrees for every population subgroup. Although the burden decreased across all subgroups, the decline was not equitable. After omission of the 92 EGUcfs, burdens were highest for the below-poverty and non-White subgroups. Proportional disparities between White and non-White subgroups increased. In our combined analysis, the burden was highest for the non-White-high-poverty subgroup. Conclusions. Our results indicate that subgroups living in poverty experience the greatest absolute burdens from EGUcfs. Changes as a result of EGUcf closures suggest a shift in burden from White to non-White subgroups. Policymakers could use burden analyses to jointly promote equity and reduce emissions. (Am J Public Health. 2020;110: 655-661. doi:10.2105/AJPH.2019.305558)

FULL TEXT

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Conclusions. Our results indicate that subgroups living in poverty experience the greatest absolute burdens from EGUcfs. Changes as a result of EGUcf closures suggest a shift in burden from White to non-White subgroups. Policymakers could use burden analyses to jointly promote equity and reduce emissions. (Am J Public Health. 2020;110: 655-661. doi:10.2105/AJPH.2019.305558)

(ProQuest: ... denotes formulae omited.)

Marginalized communities may be at increased risk for exposure to and health effects of particulate matter with a nominal mean aerodynamic diameter of less than or equal to 2.5 micrometers (PM2.5) emitted by industrial facilities. Communities of color and communities affected by poverty are more likely to live near significant sources of air pollution (e.g., industrial facilities)1 or in locations with elevated ambient concentrations2,3 than are communities made up mostly of non-Hispanic people of White race (hereafter White). Recently, Mikati et al.4 found that the burden from all PM2.5-emitting facilities in close proximity to an individual's census block group centroid was 89% higher among non-Hispanic people of Black race (hereafter Black) than among White people. Similarly, the burden among those below the poverty line was 47% higher than among those above the poverty line. The public health ramifications of PM2.5 exposure have been demonstrated in several large-scale epidemiological studies reporting relationships between both short- and long-term PM2.5 exposures and mortality.5-11 Moreover, several studies

have shown highermagnitude health effect associations for Black and Hispanic populations than for White populations12 15 and, in some cases, for populations below the poverty line.14,15

Although air pollution reduction strategies are designed to provide broad public health benefits, these benefits are not always distributed equitably. Gelobter16 examined reductions in total suspended particulate concentrations that were attributable to the National Ambient Air Quality Standards and stratified results from 1970 to 1984 by race and income. He found that the largest reductions consistently occurred among the highest income group and those who were White. However, this analysis was limited to urban areas as a means of controlling for confounding between race and urbanicity. More recently, Nguyen and Marshall17 observed that reductions in diesel particulate matter sources designed to decrease disparities in exposures across the population did not decrease inequities in all locations, where inequity of exposures was defined to mean the average exposure among subgroups (e.g., race/ethnicity orpoverty/nonpoverty) would not be the same.

Coal-fired power plant emissions represent direct PM2.5 sources that present risks to surrounding communities in terms of both exposure to and potential health effects from PM2.5.18 Henneman et al.19 combined National Emissions Inventory (NEI) data for PM2.5 from coal-fired electricitygenerating units (EGUcfs) with the Hybrid Single Particle Lagrangian Integrated Trajectory dispersion model and the Community Multiscale Air Quality Model to predict population-weighted PM2.5 exposures. PM2.5 exposures were predicted to be highest in the Ohio Valley region, and the largest decreases between 2005 and 2012 in PM2.5 exposures overall and exposures due to coal-fired power plants were also found to occur in that region.19 In 2014, roughly 13 000 deaths were reported to be attributable to PM2.5 emitted by EGUcfs.18 Monetary costs of deaths in the United States attributable to PM2.5 from coal-fired power plants range from $30 000 to $150 000 per ton of PM2.5 emitted.20 22

The costs and benefits of electricity generated by EGUcf s have been shown to be inequitably distributed. Tessum et al.18 calculated an inequity index to compare source-specific PM2.5 exposure with PM2.5 attributed to consumption patterns among Black, Hispanic, and White subgroups in the United States. Their results indicated inequities among the Black subgroup, which was exposed to 43% more PM2.5 from EGUcf s than produced via electricity consumption. The Hispanic and White subgroups, respectively, were exposed to 12% and 9% less PM2.5 from EGUcf s than produced via electricity consumption.

Since 2014, 92 US EGUcf facilities have retired operations of at least 1 unit.23-25 The objective of this follow-up to Mikati et al.4 was to investigate how the burden from PM2.5emitting EGUcfs has potentially changed among racial/ethnic and poverty/nonpoverty subgroups after EGUcf closures. We calculated burdens as a result of fossil fuel combustion according to race/ethnicity and poverty status for 2008, 2011, and 2014 and estimated the burden for 2017 by omitting coal-fired power plants with retired operations from our analyses. We compared the 2017 burden with the burdens calculated by randomly classifying coal-fired power plants as closed to assess whether actual closures may have been selected in a nonrandom fashion. Finally, we examined trends in burdens due to fossil fuel combustion according to the combined influence of race/ethnicity and poverty status.

METHODS

The concept of "burden" regarding emissions combines residential proximity to emitting facilities with the magnitude of emissions. This analysis extended the work of Mikati et al.4 by calculating the burden of PM2.5 emitted from EGUcfs on race/ ethnicity and poverty/nonpoverty subgroups and then investigating how the burden has changed as a result of facilities retiring some or all of their operations. The NEI does not report unit-specific emissions within a facility, so it was not possible to omit from our analyses only those emissions attributable to a single unit's closure within a larger facility. Therefore, we assumed that the entire facility was retired, knowing that burdens may have been underestimated at locations where only one unit was retired. Nationwide burdens were recomputed after removal of retired facilities and compared with burdens calculated for 2014 prior to facility closures.

Data Sources

We accessed self-reported 2012 to 2016 population data from the American Community Survey (ACS) at the census block group level.26 Designated ACS race/ethnicity subgroups included White and non-White, which included all other races/ethnicities, Hispanic persons, and Black persons. Similarly, designated income subgroups included

those at or below the poverty line and those above the poverty line. These subgroups were compared with the total population.

The NEI database contains data for point, nonpoint, on-road, nonroad, and event sources submitted to the US Environmental Protection Agency by local, state, and tribal governments.27 We selected stationary anthropogenic point source data for primary PM2.5 emissions (tons per year) from each fossil-fuel EGU reported to the NEI in 2008, 2011, and 2014 using the North American Industry Classification System code for all fossil fuels; a separate code specific to EGUcfs was not available. Ninety-two EGUcfs with retired coal-fired operations during 2015, 2016, and 2017 were identified in 32 states across the nation by using data from the US Energy Information Administration.23 25 Within these 92 facilities, 191 units were permanently shut down.

NEI PM2.5 emissions data for each source in 2008, 2011, and 2014 were merged with demographic data from the 2012 to 2016 version of the ACS at the census block group level into a single data set as follows.26 The location of each facility within the NEI was given by latitude and longitude.27 A facility was then assigned to block groups via the "centroid containment" assignment method described by Mikati et al.4 and originally presented by Boyce and Pastor,28 in which a facility is assigned to any block groups for which its centroid falls within 2.5 miles. Mikati et al.4 performed sensitivity testing of the radius used for these calculations and determined little difference when radii between 0.5 and 5.0 miles were tested. The population counts for each subgroup were assigned to each facility when a block group was mapped to a facility.

Data Analysis

Burdens were calculated for each census block group and then aggregated to the national scale following the procedure detailed in Mikati et al.4 Absolute burden (AB in Equation 1) was defined as the populationweighted average emissions in a block group:

(1) ...

Absolute burden can be calculated for the entire population or for a specific subgroup (e.g., Black or above the poverty line). Proportional burden (PB in Equation 2) was defined as the ratio ofabsolute burden among one subgroup to absolute burden among the total population:

(2) ...

A proportional burden greater than 1.0 signified that the subgroup had a higher absolute burden than the total population. A score of 1.0 in every subgroup would indicate an equitable distribution of emissions.

Initially, 2008, 2011, and 2014 NEI data were used to calculate PM2.5 absolute and proportional burdens attributable to EGUcf s for each subgroup. Next, to obtain the 2017 burden due to PM2.5 emissions from EGUcf s, we omitted EGUcf s that retired operations between 2015 and 201723 25 from units listed in the 2014 NEI when computing burdens as a result of PM2.5 emissions. We estimated 2017 absolute and proportional burdens by omitting PM2.5 emissions associated with the 92 facilities where at least 1 unit had ceased operations from our analysis of 2014 NEI data.

We conducted a sensitivity analysis in which we compared burdens computed after omitting the EGUcfs that were retired with burdens computed after removing EGUcf s at random for each subgroup. Large differences between the burdens computed from actual facility closures and from random closures would indicate inequitable burdens across the population. We conducted a Monte Carlo analysis to assess whether burdens calculated after omission of retired EGUcfs differed from burdens calculated after omission of 92 facilities at random from the 1881 NEI fossil fuel combustion facilities. The simulations were repeated 1000 times. Absolute and proportional burden means and 95% confidence intervals (CIs) from Monte Carlo analyses were plotted alongside those from the full 2014 NEI and reduced EGUcf analyses.

We explored the combined influence of race/ethnicity and poverty status by computing burdens for each subgroup before and after the EGUcf s were retired and comparing the results for each subgroup with those for the total population. It was not possible to identify the numbers of ACS participants fitting into different permutations of race/ethnicity-poverty groupings at the block group level.26 For this reason, we developed the following joint subgroupings:

* Non-White-poverty stratum: block groups that are nationally in the top quartile with respect to both non-White population and individuals living below the poverty line
* Non-White-nonpoverty stratum: block groups that are nationally in the top quartile with respect to both non-White population and individuals living above the poverty line
* White-poverty stratum: block groups that are nationally in the top quartile with respect to both White population and individuals living below the poverty line
* White-nonpoverty stratum: block groups that are nationally in the top quartile with respect to both White population and individuals living above the poverty line Absolute burdens were computed for each of the block groups fitting the previously mentioned criteria, and these burdens were compared with those calculated from the ACS population.26 We used R version 3.1.2 (R Foundation for Statistical Computing, Vienna, Austria) in managing data and conducting our analyses.

RESULTS

Among the 92 facilities with retired units, most were located in the Midwest, including a high concentration of facilities around the Ohio River and the Great Lakes (Figure 1). Eighteen percent of retired facilities were located in block groups in which the proportion ofnon-White individuals was greater than in the US population overall. In comparison, 38% of the US population is nonWhite according to the 2012 to 2016 ACS.26 Fifty-one percent of retired facilities were located in block groups in which the proportion of individuals living below the poverty line was greater than in the US population, whereas 15% of the US population lives below the poverty line according to the 2012 to 2016 ACS results.

Omission of the 92 retired EGUcfs decreased the block group-level absolute burden attributable to EGUcfs in the total population by 8.6%, from 4.09 tons per year to 3.74 tons per year (Table A, available as a supplement to the online version of this article at http://www.ajph.org). The absolute burden also fell for every subgroup after omission of these facilities. The largest decrease in absolute burden occurred in the White subgroup (an 11% reduction, to 3.66 tons per year). A smaller reduction was observed for the non-White subgroup (5.0%, to 3.87 tons per year). Within the non-White subgroup, smaller reductions were observed for the Hispanic (4.4%, to 3.49 tons per year) and Black (6.6%, to 3.59 tons peryear) subgroups. However, the 2014 absolute burdens for these subgroups were lower than those for the White subgroup. Absolute burdens decreased for the above- and below-poverty subgroups by 8.5% (to 3.67 tons per year) and 8.8% (to 4.15 tons per year), respectively. Consequently, the proportional burden decreased slightly, by 2.4%, among the White subgroup (to 0.98) while increasing among the non-White (3.9%, to 1.03), Hispanic (4.5%, to 0.93), and Black (2.2%, to 0.96) subgroups (Table B, available as a supplement to the online version of this article at http://www.ajph.org). Changes in proportional burdens were less than 1% for both the above-poverty (to 0.98) and below-poverty (to 1.11) subgroups.

Absolute and proportional burdens were compared through Monte Carlo simulations of random facility closures (Figure 2). After omission of the 92 retired EGUcfs (among 1880 total facilities), the absolute burden for the overall population was below the average absolute burden predicted from the Monte Carlo simulations. The absolute burdens for the White and Black subgroups and for both income subgroups also fell below the average absolute burden from the simulations. Monte Carlo subgroup-level changes in absolute burden often led to greater disparities in proportional burdens among subgroups. Proportional burdens were above the upper 95% CI in the Monte Carlo analysis for the non-White subgroup, close to the upper 95% CI for the Hispanic subgroup, and below the lower 95% CI for the White subgroup. Results among poverty subgroups showed fewer differences from the Monte Carlo simulations.

Stratified analyses revealed patterns in how EGUcf closures would influence burdens among populations living close to the facilities (Figure 3 and Table C, available as a supplement to the online version of this article at http://www.ajph.org). Absolute burdens were 2.69 tons per year for block groups in the White-nonpoverty stratum and 3.88 tons per year for block groups in the White-poverty stratum. For these strata, retirement ofEGUcfs resulted in an 18% to 33% reduction in absolute burden from 2014 to 2017 and a 70% to 72% reduction from 2008 to 2017. The absolute burden was 3.12 tons per year for block groups in the nonWhite-nonpoverty stratum. Notably, the

absolute burden was lower for both the Black- nonpoverty and Hispanic-nonpoverty strata than for the non-White-nonpoverty stratum. For block groups in the non-White-poverty stratum, the absolute burden was 4.03 tons per year after closure of the EGUcfs. These closures resulted in a 1.4% to 4.2% reduction in the absolute burden from 2014 to 2017 and a 52% to 74% reduction from 2008 to 2017 for non-White subgroups. The absolute burden was nearly identical for the non-White- poverty and Hispanic-poverty strata, especially during 2011 to 2017. However, for the Black-poverty stratum, the burden decreased from 13.40 tons per year in 2008 to 4.84 tons per year in 2017, a 64% reduction. From 2014 to 2017, closures resulted in a 6% reduction in the absolute burden.

DISCUSSION

The overall reduction in the absolute PM2.5 burden attributable to fossil fuel emissions for the entire US population (Figure 2) suggests that reduced EGUcf operations benefit every segment of the population by reducing premature mortality attributable to PM2.5.5 11 Still, changes in absolute burdens for each subgroup suggest that reductions have been greater among those living above the poverty line and among White individuals, although the reductions observed were not significantly different from the cases in which facilities were retired at random (Figure 1). In the nationwide analysis, the difference in absolute burden was largest for the below- and above-poverty subgroups, and that difference did not change between 2014 and 2017. Disparities between proportional burdens in below- and abovepoverty subgroups were unchanged, with a 13% higher proportional burden for the below-poverty subgroup in both 2014 and 2017. Mikati et al.4 and Mohai et al.1 also observed higher burdens for all PM2.5 sources among those below the poverty line compared with those above the poverty line.

Without regard to poverty status, the White subgroup was estimated to have benefited more from reduced EGUcf operations than the non-White subgroup, with the absolute burden well below the central estimate for the Monte Carlo analysis. This finding is consistent with the results of other studies examining the role of race and ethnicity in disproportionate exposure to environmental hazards.1,2,4,29 However, absolute burdens for the Black and Hispanic subgroups attributable to fossil fuel combustion were lower than the absolute burden for the White subgroup in 2014 and continued to be lower after retirement ofEGUcf s. Part ofthe reason for the difference between the non-White subgroup and the Black and Hispanic subgroups may be that the non-White category also encompassed Asian, American Indian/ Alaska Native, Native Hawaiian and Other Pacific Islander, and other racial groups (in total, these subgroups accounted for 22% of the non-White subgroup). The other races subgroup could have included individuals of 2 or more races as well as nonrespondents, adding uncertainty to the absolute burden estimates for the Black and Hispanic subgroups. It was surprising that the Black subgroup did not account for a larger share of the absolute burden given that this subgroup was found by Tessum et al.18 to have the largest exposure to PM2.5 from EGUcfs emissions.

Relative to the absolute burden calculations, a comparison of the 2017 proportional burden estimates with the Monte Carlo analysis suggests that the closures might not have been random but instead were influenced by communities' racial makeup, with the non-White subgroup potentially bearing an increased PM2.5 burden. The 2017 proportional burden was found to fall below the 95% CI of the Monte Carlo analysis for the White subgroup. At the same time, the proportional burden increased beyond the 95% CI of the Monte Carlo analysis for the non-White subgroup and almost increased beyond the 95% CI for the Hispanic subgroup. The proportional burden increased slightly for the Black subgroup but not beyond the Monte Carlo 95% CI. The proportional burden for 2014 emissions data was less than 1% lower for the non-White subgroup than for the White subgroup. Conversely, the burden was nearly 6% higher for the non-White subgroup after omission of EGUcf s with reduced operations. Such increases in proportional burden suggest that the burden ofEGUcf-related PM2.5 emissions may be shifting toward non-White subgroups. As differences between proportional burdens in the White subgroup and each non-White subgroup increased with reductions in EGUcf operations, inequities in burdens appeared to grow.

The stratified analyses shed further light on changes in absolute burdens based jointly on race/ethnicity and poverty status. Unsurprisingly, burdens were greater in the poverty strata than the nonpoverty strata regardless of race, although disparities in PM2.5 absolute burdens both within and between the poverty strata and the nonpoverty strata diminished over the 9-year period. The higher absolute burden for the Black-poverty stratum than for the White-

poverty, non-White-poverty, and Hispanic-poverty strata indicates that the Black-poverty stratum assumed a greater share of the burden after the 92 EGUcfs were removed from the analysis. This was not evident in the Monte Carlo simulations, because the data were not broken down by both race/ ethnicity and poverty status. Differences among the non-White-poverty, Hispanic- poverty, and White-poverty strata's absolute burdens were small in 2017 and therefore should not be overinterpreted in the absence of data from future years.

Our findings suggest that place-based characteristics such as demographic community makeup are important determinants of burden. The White subgroup had a higher absolute burden than did the Black subgroup within the non-White-nonpoverty stratum and a higher absolute burden than did the Hispanic subgroup within the non-White-poverty stratum. Likewise, the Black subgroup had the lowest absolute burden ofany subgroup within the Black-poverty stratum, although that stratum had the highest absolute burden among the race/ethnicity- poverty strata investigated. Mikati et al.4 investigated absolute burdens from all US PM2.5 emissions for different rural-urban commuting area classifications and found similar levels of absolute burden among most race/ethnicity and poverty subgroupings within these classifications but dissimilarities among the classifications themselves. These findings support the conclusion that those living in non-White or impoverished communities are at higher risk, regardless of individual characteristics.

Limitations and Strengths

A limitation of this study is that when EGUcfs appeared in Energy Information Administration reports, we assumed that their operations were fully retired. It is likely that some facilities continued operations at a reduced level. If so, the reductions in absolute burden described here would have been overestimated, and the 2017 absolute burden values would have been underestimated. The true absolute burden values estimated for 2017 on the basis of EGUcf retirements would be somewhere between the burdens computed with the 2014 NEI data and the values presented for 2017. In addition, the NEI data were coded according to the North American Industry Classification System, which groups all fossil fuels together (i.e., coal, petroleum coke, petroleum liquids, natural gas). Therefore, comparisons of absolute burden from 2008, 2011, and 2014 may have been inflated, and the percentage reductions in absolute burden may have been underestimated relative to an analysis drawing only from EGUcfs. However, given that EGUcfs and petroleum-fueled EGUs have been largely supplanted by cleaner-burning and cheaper natural gas generators, the error in absolute burden would be anticipated as small.30 A strength of our study is its insight into the interaction ofrace/ethnicity and poverty with absolute burden, particularly in the context of US utilities replacing coal with natural gas.30

Public Health Implications

Our results suggest that state and local policymakers responsible for implementation of air quality management under the Clean Air Act should consider place-based characteristics in a wider strategy to effect decisions that jointly promote equity and reduce PM2.5 emissions. For example, the Government Code of the State of California was amended in 2016 to require that local planners identify policies seeking to improve environmental quality in communities that have experienced disproportionate impacts of environmental pollution.31 Local planners in California can comply with this code in part by using our burden analysis technique as a basis for recommending which EGUcfs should be prioritized for emissions reductions to determine scenarios that reduce inequities in the burden due to EGUcf -related PM2.5 emissions before policies are implemented. More generally, policymakers can stratify emissions burdens by the socioeconomic and demographic characteristics of geographically defined communities to allow comparisons of different scenarios. This type ofdetailed analysis can then provide a data-driven foundation32 for local policymakers to hold discussions that engage affected community members and environmental justice organizations to make equitable decisions with regard to air pollution sources. ÂfPU

CONTRIBUTORS

J. Richmond-Bryant originated the study, contributed to the statistical analysis, and drafted the article. I. Mikati originated the study, contributed to the statistical analysis, and edited the article. A. F. Benson performed the geographic information systems analysis and produced the map. T. J. Luben and J. D. Sacks provided consultation throughout the study and edited the article.

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None of the authors report any conflicts of interest.
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No protocol approval was needed for this study because no human participants were involved.
Sidebar
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DETAILS

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The Occupational Safety and Health Administration's Impact on Employers: What Worked and Where to Go From Here

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ABSTRACT (ENGLISH)

When the OSH Act of 1970 was passed, Congress created the Occupational Safety and Health Administration (OSHA) to ensure safe and healthful working conditions for employees. OSHA did so by setting and enforcing standards and by providing training, outreach, and education.
Early standard setting was aggressive and ambitious, with the incorporation of industry consensus standards and the promulgation of new standards. OSHA's standard setting and enforcement sparked increased membership in safety and health professional organizations, which in turn led to strong demand for obtaining safety or health certification. Additionally, this growth drove the development of a wide variety of safety and health products, in effect creating a new market. Vendors used OSHA standards and enforcement to motivate sales.

FULL TEXT

When the OSH Act of 1970 was passed, Congress created the Occupational Safety and Health Administration (OSHA) to ensure safe and healthful working conditions for employees. OSHA did so by setting and enforcing standards and by providing training, outreach, and education.
Early standard setting was aggressive and ambitious, with the incorporation of industry consensus standards and the promulgation of new standards. OSHA's standard setting and enforcement sparked increased membership in safety and health professional organizations, which in turn led to strong demand for obtaining safety or health certification. Additionally, this growth drove the development of a wide variety of safety and health products, in effect creating a new market. Vendors used OSHA standards and enforcement to motivate sales.
In the early days ofOSHA, as now, employer compliance with OSHA standards was daunting, particularly for startups trying to get established. Unfortunately, OSHA focused on enforcement and failed to offer much in the way of compliance assistance. Employers typically complied with OSHA regulations out of fear of an OSHA citation and penalty. The survival of any company is based on profitability, and most employers did not appreciate or understand the value an effective safety and health program adds to their business. They believed that complying with regulations was costly and unnecessary; many employers could not imagine a catastrophic incident ever occurring in "my" workplace.
Through the 1980s, standards rolled out of OSHA at a fast clip. Standards addressing recordkeeping, personal protective equipment, fall protection, hearing conservation, respiratory protection, hazard communication, confined spaces, lockout-tagout, chemical exposures, and process safety management received national media attention and raised industry awareness. These large and highly visible standards kept businesses scrambling to comply well into

the 1990s. Companies had to invest to upgrade their operations and control hazards to make the workplace safer. Employers complained about the cost and feasibility of compliance with OSHA. However, in most cases, compliance with the rules improved their productivity. For example, the standard for vinyl chloride (a liver carcinogen) was widely opposed when issued in the 1970s. Employers argued that to comply, they would have to upgrade many of their operations and the cost would drive them out of business. In reality, these employers complied quickly and increased both their productivity and profitability. It should be noted that OSHA enforcement activities also help to "level the playing field." For years, employers have complained that employers (particularly in the construction industry) that do not fully comply with OSHA standards receive an unfair competitive advantage. Some frustrated employers have even taken the drastic step of reporting their competitors' unsafe conditions to OSHA.

EVOLVING EMPLOYER ATTITUDES

Employer recognition of the value of occupational safety and health has come a long way since 1970. OSHA deserves some credit for this transition. Currently, when OSHA announces the development of a new rule, it's not uncommon for employers to begin major compliance efforts long before the standard is finalized. Consequently, when the new standard actually goes into effect, many employers are already in compliance.

However, in the past 20 years, OSHA's position in workplace health and safety has diminished. When the OSHA assistant secretary spoke at the annual National Safety Congress in the 1970s through the 1990s, the hall was standing room only. Employers-uncertain about compliance requirements, in the dark about OSHA's next moves regarding new standards, and worried about enforcement policies-wanted to hear directly from the head ofOSHA. In 2019, the head of OSHA did not even attend the congress, and current OSHA activities were relegated to small technical sessions.

OSHA's diminishing influence is owing in part to its standard-setting process. Most would agree that this process is broken. There are so many steps involved in setting a standard that it takes four to six years to get from proposal to a final standard. For example, most current permissible exposure limits are based on data from the 1960s or earlier. In the case of the recently issued walking and working surfaces standard, it took OSHA more than 20 years to promulgate and issue a final standard. Fixing the standard-setting process would require amending the OSH Act, which is not doable in the near future.

GETTING BACK ON TRACK

Looking to the future, there are several actions OSHA can take to revitalize its efforts and reassert its relevancy. OSHA's top focus going forward should be to issue a safety and health management system or program standard. During its first 50 years, the agency never had the political or public support to set programmatic requirements for a basic occupational safety and health program standard that would include management leadership, employee involvement, training, hazard recognition and assessment, and hazard prevention and control and mitigation. Some occupational safety and health authorities have speculated that this should have been the first standard OSHA ever issued. Such a standard would have a dramatic impact on overall health and safety.

A safety and health program standard would mirror the importance and beneficial effect of OSHA's hazard communication standard. In my opinion, the hazard communication rule is one of the agency's most significant standards. For years, employers understood the importance of "right to know" but were challenged when trying to comply with widely varying state requirements, including chemical labels and placarding. The OSHA hazard communication standard was a win both for employee protection and chemical hazard training and for employers in their compliance struggles. This federal standard actually simplified employer responsibilities by establishing uniform requirements in all states. A safety and health program standard would achieve a similar result for employers in standardizing the elements of an effective workplace safety and health program.

Considering that most OSHA standards are out of date, the agency also should focus on updating existing standards to reflect new data and insights gained in the intervening years since their issuance. It is equally important for the agency to move forward in developing regulations in new and emerging areas of concern, including workplace violence, nanotechnology, temporary and contract workers, and workplace stress and fatigue.

OSHA also must regain its safety and health leadership role, and OSHA staff need to reclaim their role as safety and

health experts. On the enforcement side, OSHA cannot continue to rely on the model it adopted 50 years ago. Times have changed, industry has changed, and new hazards have surfaced. OSHA coverage has moved beyond the manufacturing, construction, and maritime industries. Better integration of enforcement and cooperative programs is needed. These two areas are critical to OSHA's balanced approach, and they need to work together to advance health and safety.

I would suggest revisiting the Maine 200 Program concept from the 1990s, which offered OSHA assistance to employers with a history of accidents and injuries. The program was "voluntary," in that these employers could work cooperatively with OSHA or they wouldbe inspected. OSHA tried to implement this program on a national level but was sued and lost. With some adjustments, this approach could serve as the basis to transition away from the old enforcement model. It would also allow OSHA's free consultation service to work directly with OSHA enforcement-something that has not been done before.

Lastly, OSHA has two recognition programs for excellence in safety and health: the Voluntary Protection Program and the Safety and Health Achievement Recognition Program. These programs should be combined. >4jPI-l

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CONFLICTS OF INTEREST

The author has no conflicts of interest to declare.

Sidebar

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A Short History of Occupational Safety and Health in the United States

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ABSTRACT (ENGLISH)

As this short history of occupational safety and health before and after establishment of the Occupational Safety and Health Administration (OSHA) clearly demonstrates, labor has always recognized perils in the workplace, and as a result, workers' safety and health have played an essential part of the battles for shorter hours, higher wages, and better working conditions. OSHA's history is an intimate part of a long struggle over the rights of working people to a

safe and healthy workplace. In the early decades, strikes over working conditions multiplied. The New Deal profoundly increased the role of the federal government in the field of occupational safety and health. In the 1960s, unions helped mobilize hundreds of thousands of workers and their unions to push for federal legislation that ultimately resulted in the passage of the Mine Safety and Health Act of 1969 and the Occupational Safety and Health Act of 1970. From the 1970s onward, industry developed a variety of tactics to undercut OSHA. Industry argued over what constituted good science, shifted the debate from health to economic costs, and challenged all statements considered damaging. (Am J Public Health. 2020;1 10:622-628. doi:10.2105/AJPH.2020.305581)

FULL TEXT

Headnote

As this short history of occupational safety and health before and after establishment of the Occupational Safety and Health Administration (OSHA) clearly demonstrates, labor has always recognized perils in the workplace, and as a result, workers' safety and health have played an essential part of the battles for shorter hours, higher wages, and better working conditions. OSHA's history is an intimate part of a long struggle over the rights of working people to a safe and healthy workplace. In the early decades, strikes over working conditions multiplied. The New Deal profoundly increased the role of the federal government in the field of occupational safety and health. In the 1960s, unions helped mobilize hundreds of thousands of workers and their unions to push for federal legislation that ultimately resulted in the passage of the Mine Safety and Health Act of 1969 and the Occupational Safety and Health Act of 1970. From the 1970s onward, industry developed a variety of tactics to undercut OSHA. Industry argued over what constituted good science, shifted the debate from health to economic costs, and challenged all statements considered damaging. (Am J Public Health. 2020;1 10:622-628. doi:10.2105/AJPH.2020.305581)

"It may seem strange that any men should dare to ask a just God's assistance in wringing their bread from the sweat of other men's faces."

-Abraham Lincoln, Second Inaugural Address, 1865

Abraham Lincoln's Second Inaugural Address, delivered 41 days before his assassination, is rightfully remembered for its powerful statement on the moral underpinnings of the American Civil War: slavery was a system of exploitation in which owners wrenched "their bread from the sweat of other men's faces." Lincoln contended that the war was God's retribution for "all the wealth piled by the bondsman's two hundred and fifty years of unrequited toil" and might righteously continue "until every drop of blood drawn with the lash shall be paid by another drawn with the sword."1

The physical exploitation of the powerless by the powerful, slavery itself, was literally engrained in the Constitution as a tenet of American political, economic, and legal culture. But the law was also instrumental in maintaining the power relationships of the landowner over the sharecropper, the manager over the employee, the husband over the wife, the White over the Black. In the workplace specifically, the courts often enshrined the terms "master" and "servant" to encompass a host of formal and informal relationships between worker and owner.2

This brief review of the history of occupational safety and health on the occasion of the Occupational Safety and Health Administration's (OSHA's) 50th anniversary explores the ongoing struggle by labor and its allies to address workplace inequalities that have resulted in injuries and disease among workers over time. This is not a comprehensive history of the various social movements, professional developments, governmental actions, or individual actors that have contributed to what is a centuries-old and ongoing effort to provide security and well-being to workers and their families. Nor does it fully explore the uneven roles that unions and public health have played in promoting safety and health. Rather, we explore here the cross-class coalitions of labor activists, lawyers, government bureaucrats, journalists, medical clinicians, social workers, some unions, and others from various social strata that at different moments in history sought to improve the lives of working people, their families, and communities.

The post-Civil War era saw America transformed from a largely rural, agricultural society to an urban society in which an industrial workforce was employed in the growing number of factories, mills, and mines. In the postwar

period, legal historian Robert Steinfeld writes, the abolition of slavery "gave way to another form of legal regula- tion that offered workers greater formal autonomy but continued indirectly to place them at the disposal of those who owned productive assets."3 The evolution of a labor system in which workers and owners bargained for wages in exchange for labor superficially papered over the ongoing inequalities that were intrinsic to the new industrial economy.4

With industrialization came mechanization, speedups, massive factories, and other changes that increased the dangers that workers faced on the job. Dangerous machinery, and the introduction of new chemicals and scientific management techniques, sapped the health and strength of industrial workers.5 In the wake of such conditions, unions began to fight for safer working conditions, better pay, the 10hour and then the 8-hour day, and shorter work weeks. In May 1886, tens of thousands of workers marched in the first May Day Parade in Chicago. Subsequently, hundreds of thousands of workers throughout the country went on strike for shorter hours with no reduction in pay.6 Immigrant workers organized fraternal societies that provided "contract doctors" in case of sickness and burial benefits for breadwinners who died young because of injuries on the job.7 Labor, along with journalists, social reformers, socialists, and others, advocated for better working conditions- what today we capture under the umbrellas of "occupational safety and health" and, more generally, "public health."8

Responding to increased labor activism that arose to protest against unsafe and unhealthy working conditions, some state legislatures passed regulations that challenged the ideology-propounded by ruling elites and the courts-that individual workers were truly "free" to negotiate the terms of their employment. In the 1880s and 1890s, there were a series of strikes in the bakeries of New York City against horrible working conditions that often lasted 18 hours a day in hot, unventilated basements. In response, in 1895 the NewYork State legislature passed a law limiting bakery workers to no more than 10 hours per day or 60 hours a week.9 The legislation was successful in large part because the plight of workers was tied to fears that these conditions were a breeding ground for infectious diseases, particularly tuberculosis, that would be transmitted through the bread consumers ate. The role of women in this movement through the Consumers League-and especially its leader, Florence Kelley-was critical, linking together work, family, and community. In 1901, a bakery owner, John Lochner, in upstate Oneida, New York, was found in violation of this law; he appealed his conviction, and the case eventually was heard by the US Supreme Court.10 The case, Lochner v New York (1905) was decided in a 5 to 4 decision, with the Court determining that the law was unconstitutional because it interfered with the "right" of owners and workers to "purchase and sell labor."11 The court held that the "free" laborer was "guaranteed" the "right" to work 18 hour days, and the state could not prevent them from doing so. For industrial workers and their advocates, this "contract" was akin to what many called "wage slavery," and injuries on the job came to symbolize the huge costs of this new production system.12 (We will be using the term "injury" rather than "accident" throughout as many of the events that occurred in the rising industrial plants were anticipated, even expected. The exceptions, of course, are in the quotations of contemporaries like Upton Sinclair and Crystal Eastman.)

WORKING CONDITIONS IN THE EARLY 20TH CENTURY

The enormous costs of industrialism in the decades around the turn of the 20th century reached into every aspect of American life as "muckraking" journalists detailed the extraordinary injury rates in mining, steel manufacturing, and meat packing, and the growing number of diseases that accompanied the development of new industries and industrial processes. Upton Sinclair's The Jungle is generally remembered for its role in the development of consumer protection of the food supply and the passage of the 1906 Pure Food and Drug Act. But, in fact, the novel tells the story of how Jurgis Rudkus, a vibrant, strong Lithuanian immigrant worker, was destroyed in body and soul by the production process and capitalism itself. As Sinclair himself later wrote: "I aimed at the public's heart, and by accident I hit it in the stomach."13 The Pittsburgh Survey, a classic investigation of working-class life in Pittsburgh, Pennsylvania, appeared in 1907. Included in the survey was Work-Accidents and the Law by Crystal Eastman-feminist journalist, lawyer, and cofounder of the American Civil Liberties Union-which detailed the impact of industrial injuries on working-class families and communities in this center of the steel and coal industries.14

Shortly thereafter, a massive strike of largely young immigrant Jewish and Italian women in the garment industry in

New York City brought the wretched conditions of the sweatshops of this industry to the attention of millions of people across the country. A year later, a fire in the Triangle Shirtwaist Factory in lower Manhattan galvanized the nation as thousands of onlookers-along with reporters, photographers, and graphic artists- watched women, faced with the prospect of being burned alive, jump to their deaths from the ninth floor of the factory. Reformers were spurred to action by these striking images and reports.15 The response, however, fell very short of the overall demands and only addressed the horrendous working conditions in a few of the industrial states. In the short run the impacts were limited, but the attention to the human costs of industrial capitalism were brought to a national audience. Alice Hamilton, Eleanor Roosevelt, Frances Perkins, and other women reformers emerged from the turmoil of the early 1900s dedicated to addressing the terrible conditions of work and life for the industrial workforce-both female and male, child and adult. 16

Questions arose that led to ongoing debates throughout the middle decades of the new century. When was a worker truly free, and when was he or she being coerced through threats of violence, deprivation, or lost wages? When was the worker's assumption of the dangers of the job-danger from injury, from poisoning and disease-a reasonable outcome of the free negotiations between a worker and his employer? And when was it an outcome of the coercive power that employers had in their "negotiation" with workers? The question of occupational safety and health was part and parcel of a larger movement to reform American society and improve public health.

This movement produced legislative results. Many states passed legislation to improve factory inspection systems and prodded local labor and health departments to pay attention to occupational safety and health. States passed the first significant labor legislation designed to protect women and children as particularly vulnerable, "weaker" populations. Some in the women's and labor movements objected that protective legislation excluded women from certain jobs rather than improving the workplace for the benefit of all workers, male and female. Others in those movements believed that these legislative efforts were inadequate and discriminatory but would provide the basis for more general reforms later.17 In various localities, specific acts were passed regulating working conditions in tanneries, bakeries, foundries, and other industries. Also, for the first time, there was a serious attempt to organize a more reliable method for collecting statistics on occupational injuries and deaths.18 In 1900, no state in the country had a workers' compensation law on the books, but by 1915, most highly industrialized states had passed an act for some form of workers' compensation.19 As important as this set of state laws was, historians have critiqued these laws as efforts by employers to protect themselves against large lawsuits.20 Workers' compensation legislation also made filing for compensation extremely difficult for laborers.21

On the federal level, Congress established the Department of Labor in 1913, which included active women's and children's bureaus devoted to protecting their lives and health. In addition, in 1912 the Public Health Service (PHS) was assigned responsibility for addressing occupation-related diseases. The advent ofWorld War I made occupational safety and health a national priority as business, political, and labor leaders emphasized the need to protect the workforce, especially in the war-related industries. The concern with the unknown effects of new toxic chemicals such as TNT and picric acid shifted some of the focus of the PHS, with its established laboratory and technical expertise, from infectious disease to the dangers of the new industrial workplace.22

RADICALS AND CONSERVATIVES IN THE INTERWAR YEARS

During the more conservative 1920s, the broad view of the relationship between work and health narrowed. Many corporations, large and small, joined the National Safety Council, first formed in 1912, which focused on the prevention of what the organization called accidents through its "safety first" educational campaigns.23 In addition, during the 1920s some companies attempted to hide the impact of industrial exposures and dangers from the workforce through their employment of occupational physicians. During this time, physicians interested in occupational safety and health had few options other than to work directly for corporations. Therefore, they were often placed in the position of serving their employers by identifying workers who were ill or poisoned on the job so that companies could lay them off before they filed workers' compensation claims.24

But there were countervailing tendencies as well, such as the Workers' Health Bureau of America. It was organized by Grace Burnham, Charlotte Todes, and Harriet Silverman- leftist women who sought to use both technical

expertise and union activism to address workplace hazards. Providing the former were Emory Hayhurst of the Ohio Department of Health,Yale University's C. EA. Winslow, and Harvard's first female professor, Alice Hamilton. Among the unions that worked with the bureau were the International Union of Painters and Allied Trades, the United Hatters of North America, and the International Ladies' Garment Workers' Union. In 1927, the Workers' Health Bureau organized the First National Labor Health Conference with the Pennsylvania Federation of Labor, the Michigan Federation of Labor, the Electrical Workers, and the United Mine Workers, among others, although the American Federation of Labor itself maintained a frosty relationship with the bureau.25

The New Deal expanded the role of the federal government in the field of occupational safety and health, particularly regarding the chronic dust diseases silicosis and asbestosis. This was in part due to the tragedy at Gauley Bridge, West Virginia, in which more than 700 primarily African American migrants died as a result of dust diseases contracted while digging a tunnel for Union Carbide.26 The PHS provided money to state and local departments of health to establish industrial hygiene units. By 1941, 24 states established offices with funds from Title VI of the Social Security Act of 1935. Before 1936, only five state departments of health had industrial hygiene units.27 At the same time, the US Department of Labor established the Division of Labor Standards, but there were fundamental differences in the ways that the PHS and the Department of Labor approached the issue of how to protect workers on the job. The PHS defined its role as primarily to gather data and act as nonpartisan scientists, not as activists. The Department of Labor-under the leadership of the first woman cabinet secretary, Frances Perkins, and her colleagues Verne Zimmer and Clara Beyer-saw its role as an advocate for labor in union efforts to improve working conditions.28 The United Automobile Workers, for example, incorporated working conditions into their original unionization demands.29

Until the New Deal, the state departments of labor were the sole governmental agencies that had any right to intervene in the private workplace. This changed in 1936, when the first federal legislation to control workplace conditions was enacted. The Walsh-Healey Act required companies with contracts with the federal government of more than $10 000 to maintain certain workplace standards for health and safety.30 Until the enactment of OSHA, the limited protections ofWalsh-Healey were the only federal safeguards workers could expect.

World War II presented new challenges for protecting workers' safety and health. The massive military buildup, combined with the draft of millions of young men, resulted in the recruitment of women in unprecedented numbers into heavy industry, and they were faced with speedups and long hours.31 The exposure of these workers to asbestos in the ship-building industry, to benzene, beryllium, lead, and a host of other toxic chemicals in airplane and ordinance production-along with the dangers inherent in the production of explosives-made safety and health and the conservation of labor a major concern for government, management, and unions alike.32

THE POSTWAR LABOR ACCORD AND THE CREATION OF OSHA

The end of the war unleashed many of the tensions that had been built up between management and labor during the war years. In 1945, the death of President Franklin D. Roosevelt and the resignation of Secretary of Labor Frances Perkins marked the end of the New Deal for labor. In the two years following the end of the war, there were more strikes involving more workers than at any other time in American history. Business and more conservative politicians reacted strongly to this challenge to business dominance in labor- management relations. Spearheaded by conservative Republican congressmen and fueled by a growing fear of communism at home and abroad, a series of antilabor initiatives were passed, including the Taft-Hartley Act of 1947. In addition to legislation, labor and management sought to achieve an "accord" to reduce labor strife. As part of this accord, most unions often ignored or downplayed issues of occupational safety and health in contract negotiations. Although wages and hours were negotiable, safety and health issues were ceded to management as part of their control over the work process.33 This had important, negative effects on labor's ability to shape conditions at work. For most unions, negotiations regarding health now revolved around health insurance and hospital and physician care rather than control over working conditions. For example, the United Mine Workers, among the most radical unions of the 1930s, was faced with demands for increased production and greater exposure to deadly coal dust with the introduction of highspeed power drills. In exchange for this increased production and, ultimately, higher rates of disease, owners provided

funding for a system of hospitals and health clinics for their workforce. There were notable exceptions to a pattern of exchanging health services for control over the workplace, such as the Union of Mine, Mill and Smelter Workers in the 1950s and the Oil, Chemical and Atomic Workers Union in the 1960s, both of which continued to prioritize working conditions.34

By the 1960s, the beginnings of deindustrialization and the mobilization around the war in Vietnam led US industry to intensify its demands on labor, which resulted in longer hours and increasingly dangerous working conditions. Workers in the shipyards of Louisiana and the oil fields of west Texas would witness epidemics of once seemingly rare silicosis; miners in West Virginia and Pennsylvania would later find themselves disabled by coal workers' pneumoconiosis. Immigrant labor was an early focus of attention among unorganized agricultural workers in California, Washington State, and Oregon. Cesar Chavez brought to national attention the sorrowful conditions of labor and the threat of pesticides to migrant workers through a national strike and boycott of grapes, joining together their concerns with those of middle-class consumers who, in the wake of Rachel Carson's Silent Spring, were conscious of the potential harms of pesticide residues in foods. In addition, labor organizers, public health physicians, scientists, environmentalists, and consumer advocates such as Tony Mazzocchi, Irving Selikoff, Barry Commoner, Ralph Nader, Lorin Kerr, and Rachel Carson became part of a broader environmental and labor movement pushing for federal legislation to protect workers and consumers alike. Among the major occupational diseases that were the focus of attention and activism were asbestosis and mesothelioma, coal workers' pneumoconiosis, byssinosis, and lead poisoning for both workers and children.35 Out of this mobilization by unions and social movements alike came the passage of the Coal Mine Health and Safety Act of 1969 and the Occupational Safety and Health Act of 1970 (OSH Act), as well as the National Environmental Policy Act (1969), the establishment by Executive Order of President Richard Nixon of the Environmental Protection Agency (1970), and the Consumer Product Safety Act (1972). The role of Mazzocchi and the Oil, Chemical and Atomic Workers Union was especially important for the passage of the OSH Act, but it was the organized efforts of retired union miners with the guidance of Lorin Kerr, even in the face of opposition or inaction on the part of the United Mine Workers, that led to the passage of Coal Mine Safety and Health Act. Never before had the federal government established agencies with as broad a mandate to protect the majority of the nation's workers, the environment, and consumers alike.36

THE OSH ACT AND BEYOND

The OSH Act is rightfully recognized as a milestone in overcoming the challenge that Lincoln raised a century earlier. Through it, the long history of labor's struggles over exploitation was formally recognized by the government, and two agencies, OSHA and the National Institute for Occupational Safety and Health (NIOSH), were established to rectify centuries of injustice. NIOSH, as an agency in the Department of Health, Education, and Welfare, was designed to provide OSHA with the best scientific evidence of how workers should be protected from harm, and under administrators such as Anthony Robbins it fulfilled those objectives. But OSHA, as a regulatory agency, had a more complex mandate: to balance the interests of labor and management, as well as to take into consideration the economic impact of regulations and their technical feasibility. From the first, the historical tensions over the inequalities that led to workers' deaths and diseases were evident. The history of asbestos regulation is an example. NIOSH, in 1972, speaking of asbestos-associated lung cancer and mesothelioma, held that there was no truly "safe" level of exposure. But OSHA was unable to adopt a zero-exposure standard that threatened the existence of entire industries. While OSHA had over the decades significantly lowered the Permissible Exposure Limit for asbestos, to this day, despite the unanimity of professional opinion that asbestos is carcinogenic, it is still allowed in many products.

Despite the legislation's shortcomings, there was tremendous optimism among unions and their membership that OSHA would improve conditions on the job, bringing the authority and power of the federal government to work on behalf of labor. The leadership of Eula Bingham from 1977 to 1981 gave hope that this could be the case, especially since OSHA was able to establish a series of new standards that significantly lowered exposures to dangerous materials such as asbestos, arsenic, benzene, lead, cotton dust, and others, including a number of carcinogens.37 Bingham also was instrumental in broadening OSHA's base of support through her use of "New Directions" grants,

which provided support for the Committees for Occupational Safety and Health that had begun forming in the early 1970s.38 OSHA's reputation as an activist agency stems almost completely from its activities during Bingham's brief tenure.

Very quickly, strong industry opposition to OSHA developed through such organizations as the Business Roundtable, the John Birch Society, and lawsuits challenging the right of OSHA inspectors to enter private workplaces without warrants.39 Soon, OSHA's efforts to reform the workplace were undermined by lawsuits, industry-funded scientific studies, challenges to the evolving science of occupational safety and health, and an enormous propaganda campaign associating regulatory actions as a threat to business growth and prosperity.40 Beginning in the 1980s with the ascent of Ronald Reagan to the presidency, business groups pushed an antiregulatory program. OSHA was a particular target as Reagan appointed Thorne Auchter, an executive in the construction industry, to head the agency. As Charles Noble describes his tenure, Auchter "withdrew [OSHA's own] booklets on cotton dust, acrylonitrile, health and safety rights, and vinyl chloride because they were too one-sided."41 Opposition continued through the 1990s and early 2000s. During the Clinton administration, OSHA worked with labor unions to pass new ergonomic standards, but their efforts were quashed by the Republican Congress and George W. Bush, who in March 2001 signed a joint resolution to reject it.42

Barack Obama's election led to new hope that OSHA would once again live up to its original promise, especially with the appointment of David Michaels, epidemiologist and labor advocate, as its administrator. He reinvigorated an agency that had been under assault for nearly its entire existence. One major accomplishment was OSHA's promulgation of a silica standard that the agency had first proposed in the 1970s.43 Shortly after the advent of the Trump administration, OSHA once again found itself under attack as the administration's antiregulatory policies led to "declining federal oversight of workplace safety" that "coincided with an increase in deaths in workplaces monitored by OSHA."44 Michaels stated in 2010 that "Fourteen workers die on the job each day, far from the headlines, often noted only by their families, friends, and co-workers."45 And injuries have been far from the only hazards US Labor faces. As Michaels pointed out, "every year more than four million workers are seriously injured or sickened by exposure to toxic agents."46

Throughout the 20th century, the central contradiction of a culture that idealized the rights of the individual and equality between workers and owners was pressed by the changing social realities of work in America. On the one hand, the state could intervene to protect the health and welfare of workers because it recognized that there was a fundamental inequality in power between management and labor. On the other hand, despite all the reforms and accomplishments of OSHA, there is a continuing inequality in power between owners and workers. Although Lincoln's Second Inaugural addressed the fundamental immorality of slavery and although the Civil War formally ended the most obtuse manifestation of its grotesque legacy, the struggle over occupational safety and health continues.

In 1960, Edward R. Murrow commented on the world as he saw it then when he noted that "We no longer own slaves; now we can rent them."47 Today, the daily toll of mesothelioma, lead poisoning, injuries in construction and trucking, silicosis, and numerous other deaths and diseases is a testament to this truth. As this short history of occupational safety and health demonstrates, labor and its allies have recognized these perils in the workplace, and as a result, workers' safety and health capture the ongoing history of America's struggles against various forms of oppression. ÂfPH

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Both authors have appeared in court on behalf of workers who have been harmed by industrial injuries and disease.
Footnote
ENDNOTES
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DETAILS

Subject:	Working hours; Maritime industry; Working conditions; Abolition of slavery; New Deal; Legislation; Public health; Occupational safety; Industrial development; Occupational health; Federal court decisions; Mining industry; Strikes; Womens health; Federal legislation; Journalists; Federal government; Injuries; Unions; Workplaces; Economic impact; Tactics; 20th century; Federal agencies; Workers; Mining accidents &safety; Health care expenditures; Bakeries; Working class; Capitalism; Labor unions; Consumer protection; Consumers; Costs; Wages &salaries; Noncitizens; Manufacturing; Factories
Business indexing term:	Subject: Strikes Bakeries Working class Capitalism Consumer protection Occupational safety Workers Consumers Costs Working conditions Manufacturing Factories; Industry: 92615 : Regulation, Licensing, and Inspection of Miscellaneous Commercial Sectors 31181 : Bread and Bakery Product Manufacturing
Location:	United States--US; Pittsburgh Pennsylvania; New York City New York; New York

People:	Sinclair, Upton Beall (1878-1968); Lincoln, Abraham (1809-1865)
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CARDIORESPIRATORY FITNESS DECLINE IN AGING FIREFIGHTERS

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FULL TEXT

We read "Longitudinal Decline in Cardiorespiratory Fitness With Age Among Male Firefighters in San Diego, California, 2005-2015" by Cameron et al.1 with great interest. This article demonstrated that age is negatively associated with cardiorespiratory function (CRF) among firefighters. Given that cardiovascular disease is the leading cause of death among on-duty firefighters and that CRF impairment is a pronounced risk factor for cardiovascular disease, the findings of this study indicate that (1) the reduced CRF in combination with high physical and mental demands might increase the likelihood ofdeath among older firefighters, and (2) improving CRF may prevent cardiovascular disease and reduce death caused by cardiovascular disease among on-duty aging firefighters.

Some highlighted findings require further clarification. First, the researchers found that body fat does not moderate the association between age and CRF. However, previous studies have documented that increased age is directly associated with CRF reduction,2 that age is positively related to body fat,3 and that elevated body fat is inversely associated with CRF.4 Therefore, body fat may serve as a mediator in the causal pathway between age and CRF, instead ofa moderator. Additionally, this could suggest the addition of several different moderators, such as the initial CRF level, which may counterbalance this mediation effect.

Second, Cameron et al. concluded that CRF increased by 0.9 metabolic equivalents over 10 years among those aged 50 years and older. This marked increased in CRF seen in the older group occurred possibly because the authors may not have consider the extremely high rate of dropout (e.g., retirement), resulting in dramatically decreasing the number of participants from 212 at baseline visit to 7 at the 10th visit. This suggests that the remaining older firefighters are fit because of their recorded maximal oxygen uptake (VO2max) compared with national norms. Furthermore, the treadmill test is not equivalent to cycle ergometer testing because the treadmill test might lead to a 14% higher VO2max compared with the VO2max obtained during cycle ergometer testing.5

Third, we believe that it is difficult to claim that this small sample size is representative of all US firefighters. Obviously, this study was conducted in San Diego, California, which indicates a regional sample instead of a representative sample. Fourth, it might not be a strict observational study because the intervention, a wellness program, was included. Finally, the treadmill test might lead to a 14% higher VO2max compared with the VO2max obtained during cycle ergometer testing.5

In summary, we support the need to provide interventions and wellness programs to promote CRF in firefighters, who protect public health and ensure public safety. /4JPI-I

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Note. The views expressed are those of the authors and do not necessarily reflect the official policy or position, either expressed or implied, of the US Air Force, Department ofDefense, Department ofHealth and Exercise Science, Colorado State University, or the US government.
CONFLICTS OF INTEREST
The authors have no conflicts ofinterest to declare.

Sidebar

EDITOR'S NOTE
Cameron et al. declined to respond.
Letters to the editor referring to a recent AJPH article are encouraged up to 3 months after the article's appearance. By submitting a letter to the editor, the author gives permission for its publication in AJPH. Letters should not duplicate material being published or submitted elsewhere. The editors reserve the right to edit and abridge letters and to publish responses.
Text is limited to 400 words and 7 references. Submit online at www. editorialmanager.com/ajph. Queries should be addressed to the Editor-inChief, Alfredo Morabia, MD, PhD, at editorajph@qc.cuny.edu.

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DETAILS

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A Breath of Fresh Air

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ABSTRACT (ENGLISH)

A Breath of Fresh Air Choked: Life and Breath in the Age of Air Pollution, First Edition By Beth Gardiner Hardcover: 312 pages; $27.50 Chicago, IL: University of Chicago Press; First edition (April 19, 2019) ISBN-13: 978-0226495859

FULL TEXT

A Breath of Fresh Air Choked: Life and Breath in the Age of Air Pollution, First Edition By Beth Gardiner Hardcover: 312 pages; $27.50 Chicago, IL: University of Chicago Press; First edition (April 19, 2019) ISBN-13: 978-0226495859

Writing about the health effects of air pollution for general audiences can be akin to steering between Scylla and Charybdis. Focusing too much on the numbers-four million deaths per year from ambient air pollution, seven million if including household air pollution1-can seem dry and impersonal, but focusing too much on individual anecdotes can seem unscientific and not befitting the scale and scope of the problem. An emphasis on the adverse effects of air pollution seems overly gloomy and ignores the tremendous progress made in many cities and countries around the world, but an emphasis only on progress and potential does not give adequate weight to the population health toll.

Beth Gardiner's book Choked: Life and Breath in the Age of Air Pollution skillfully navigates this terrain and provides a gripping and robust portrait of current air pollution conditions and their implications around the world. She captures the political, economic, and social factors that have led to this global challenge and that also provide some optimism regarding our ability to improve air quality globally. She directly tackles the contradictions inherent in an exposure that everyone experiences, but the implications of which few appreciate.

THE GLOBAL CONDITION

Gardiner tells the story of air pollution by deftly moving across settings that reinforce both the ubiquity of air pollution and the variability across cities and countries. An important element of Gardiner's book is her recognition of populations most vulnerable to the health effects of air pollution, ranging from children working at brick kilns in India to agricultural workers in California to coal miners in Poland. But rather than portraying these populations as powerless and anonymous victims, Gardiner spends significant time talking to people to understand the circumstances that contributed to their exposures. More importantly, she devotes large sections ofthe book to conversations with community advocates and others who are working to effect change.

Although Gardiner's observations in the field and conversations with individuals provide the backbone of the book, key aspects of air pollution science and epidemiology are discussed throughout. Her coverage of the state of the science is thorough and up-to-date, acknowledging the growing literature related to neurocognitive effects and birth outcomes rather than solely focusing on respiratory or cardiovascular effects. Few people outside of the scientific community connect air pollution with diseases like Alzheimer's or Parkinson's, and raising consciousness about these associations in an aging world is quite important.

There were two small omissions in the book, which do not detract from its power but represent missed opportunities in telling the comprehensive story of air pollution. The first was that, in spite of Gardiner's emphasis on traffic and

near-roadway air pollution, there was no discussion of ultrafine particulate matter. More generally, there was no discussion of how the scientific and regulatory communities have evolved in their thinking about the most relevant sizes ofparticulate matter. She does introduce the structure of the lung in the Prologue and makes reference to the size offine particulate matter in Chapter 2, but does not go further and talk about the regulatory evolution from total suspended particles to PM10 to PM2.5 (particulate matter <10 and 2.5 mg in aerodynamic diameter), nor does she consider the implications of not directly regulating ultrafine particulate matter given growing evidence of its health effects.2 This does not detract from the scientific precision ofthe book, and may only be of interest to a narrow group of readers, but it would have made the story more vivid to describe what particles of different sizes do in the body and to contemplate the implications of an unregulated size fraction of particulate matter.

A second missed opportunity relates to indoor air pollution in the developed world. Gardiner rightly focuses on biomass burning and cookstoves in the developing world, which have a profound health impact that disproportionately affects low-income rural women and children, but it would have been an interesting contrast to examine residential exposures to air pollution in the developed world as well. Given that most people spend the vast majority of their time indoors,3 and given that residential exposures can often be addressed more readily than ambient air pollution, the indoor environment is an important part of the air pollution story in the developed world as well. There are also many interesting angles to explore, given strong socioeconomic exposure disparities,4 economic constraints that may preclude taking health-protective action, personal decisions made by households, and complex ethical questions such as whether smoking bans in public housing are morally justified.5

That said, a book about an exposure that influences everyone across the world must necessarily make hard choices about where to focus. Gardiner rightly hones in on the countries where the public health burden of air pollution is greatest (India and China), pinpoints the factors that have led to successes and failures in those settings, and draws lessons that can be extrapolated elsewhere.

CURRENT EVENTS

There are two topics that are difficult for a book on air pollution published in 2019 to avoid. The first is the antipathy of the Trump administration toward environmental protection and much of the environmental research enterprise.6 Gardiner acknowledges this reality but tackles it from a novel perspective by focusing one chapter on the players involved in drafting the 1970 Clean Air Act, telling a fascinating story that has details that will be unfamiliar to many inside and outside of the field. The bipartisan spirit and the focus on finding evidence-based common ground provide a stark contrast to present time.

In addition, as Gardiner indicates in the Epilogue and elsewhere, it is difficult to think about the effects of air pollution without considering climate change, particularly with wildfires occurring with alarming regularity and severity in California, Australia, and elsewhere. It is logical that Gardiner does not dwell on climate change, as the global implications of air pollution are sufficiently complex without weaving in climate change. But she does conclude by raising the important but often underemphasized point that strategies to address one will often address the other. Even more importantly, the near-term health benefits related to reduced air pollution may justify actions to mitigate climate change, given that the climaterelated benefits have a much longer time horizon. This argument has been made many times in many settings, but it would have been interesting to get Gardiner's take on the argument (or the perspective of the many individuals she interviewed).

A UNIVERSAL MESSAGE

Through her personal story as a parent living in London, her global observations and conversations, and her review of the scientific literature, Gardiner makes the issue of air pollution relatable to a range of audiences. Forreaders with little background in air pollution, Choked gives a primer about why it matters, who is at risk, and what we can do about it. For those well-versed in the scientific literature as well as the politics of air pollution, Choked educates about the personal experiences of those who are affected by air pollution and want to effect change in their communities, as well as some of the lesser-told stories connected to environmental regulation and pollution control. This makes Choked a valuable contribution to the popular literature on air pollution. >4jPI-l

Jonathan I. Levy, ScD

CONFLICTS OF INTEREST

The authordeclares no conflicts ofinterest.

Sidebar

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The Influence of Heat on Daily Police, Medical, and Fire Dispatches in Boston, Massachusetts: Relative Risk and Time-Series Analyses

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ABSTRACT (ENGLISH)

Objectives. To examine the impact of extreme heat on emergency services in Boston, MA. Methods. We conducted relative risk and time series analyses of 911 dispatches of the Boston Police Department (BPD), Boston Emergency

Medical Services (BEMS), and Boston Fire Department (BFD) from November 2010 toApril 2014 to assess the impactof extreme heat on emergency services. Results. During the warm season, there were 2% (95% confidence interval [CI] = 0%, 5%) more BPD dispatches, 9% (95% CI = 7%, 12%) more BEMS dispatches, and 10% (95% CI = 5%, 15%) more BFD dispatches on days when the maximum temperature was 90°F or higher, which remained consistent when we considered multiple days of heat. A 10°F increase in daily maximum temperature, from 80° to 90°F, resulted in 1.016,1.017, and 1.002 times the expected number of dailyBPD, BEMS, and BFD dispatch calls, on average, after adjustment for other predictors. Conclusions. The burden of extreme heat on local emergency medical and police services may be agency-wide, and impacts on fire departments have not been previously documented. Public Health Implications. It is important to account for the societal burden of extreme heat impacts to most effectively inform climate change adaptation strategies and planning.

FULL TEXT

Headnote

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Methods. We conducted relative risk and time series analyses of 911 dispatches of the Boston Police Department (BPD), Boston Emergency Medical Services (BEMS), and Boston Fire Department (BFD) from November 2010 toApril 2014 to assess the impactof extreme heat on emergency services.
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Conclusions. The burden of extreme heat on local emergency medical and police services may be agency-wide, and impacts on fire departments have not been previously documented.
Public Health Implications. It is important to account for the societal burden of extreme heat impacts to most effectively inform climate change adaptation strategies and planning. (Am J Public Health. 2020;1 10:662-668. doi:10.2105/AJPH.2019. 305563)

(ProQuest: ... denotes formulae omitted.)

Extreme heat is a significant public health threat that is increasing in frequency, duration, and severity with climate change.1 In 1971 through 2000, Boston, Massachusetts, the focus of this study, experienced an average of 11 hot days (at least 90°F) per year, but it could experience up to 40 hot days by 2030 and 90 by 2070, depending on greenhouse gas emission trajectory.2 Although the definition of heat waves and extreme heat events varies by location and agency, heat has been the leading cause of death of all meteorological phenomena in recent decades in the United States3 and results in significant morbidity and a myriad of poor health outcomes.4,5 Recent research has shown that even at lower thresholds than previously thought, heat has the ability to affect public health and societal services6 and governance.7 It has been well documented that heat stressrelated ambulance calls,8-12 aggressive behavior (even in normal interactions and situations),13 and violent crime14 16 increase on hot days. Extreme heat has been associated with declines in cognitive function17,18 and sleep.19,20 Cognitive failures have been associated with increased driving errors in healthy adults.21 Poor sleep or sleep deprivation has been associated with increased traffic accidents,22 increased occupational injury,23 and inhibition of working memory and concentration.24 Extreme heat may also result in increases in impulsivity, which can escalate otherwise positive or neutral situations into aggressive situations.13 With these health outcomes, there are many potential pathways to emergency situations when the clinical and subclinical health impacts of extreme heat are being experienced across a large population, like a city.

Despite these many potential outcomes, as of 2016, the only incorporation of emergency services into heat preparedness planning in Boston was through increased awareness of medical practitioners of heat-related illness and increasing onsite power generation and backup for police, ambulance, and fire stations.2 Even though local first

responder groups, public health practitioners, and nonprofit groups were all able to provide anecdotal awareness of these societal impacts on hot days, a lack of quantitative evidence has limited resilience and adaptation planning to date.

The premise of this study was to evaluate agency-wide impacts of extreme heat on emergency services, as these health and behavioral changes that happen during extreme heat periods create pathways to emergency situations. The study's objective was to determine whether emergency services in Boston experienced greater need during extreme heat-through the dispatch of police, ambulance, and fire department services; we assessed this using both relative risk and time series analyses.

METHODS

Daily counts of emergency dispatch calls forthe City ofBoston forNovember 1,2010, to April 21, 2014, were publicly available from the Boston Department of Innovation and Technology.25 These calls represented 3 agencies-the Boston Police Department (BPD), Boston Emergency Medical Services (BEMS), andBoston Fire Department (BFD). Major holidays and local events (e.g., the Boston Marathon) were evaluated to determine if they were outliers. We computed descriptive statistics on the distribution of dispatches within agencies across the full year and the warm season (May-September) using a Student t test.

Meteorological Data and Exposure Assessment

We obtained daily maximum ambient temperature and daily maximum heat index (to assess both temperature and humidity) from Boston Logan International Airport and assessed them as continuous variables. Extreme heat can also be assessed by using temperature thresholds set a priori for a specific location. A common measure of extreme temperature exposure in Boston is when the daily maximum temperature is 90°F or above, and heat advisories are issued beginning at a daily maximum heat index of 95°F or above, both as defined by the local National Weather Service.26 City agencies use this definition to enact local warnings and responses (e.g., opening of cooling centers). In this study, hot days were those in which the maximum temperature was 90°F or above, and days with a maximum heat index of 95°F or above were considered hot and humid. We examined cumulative impacts of heat as a binary variable indicating 2 consecutive hot or hot and humid days. Data on daily ozone and particulate matter 2.5 microns or smaller in size (PM2.5) were available from the US Environmental Protection Agency's Air Quality System for Station 25-025-0042 located in Roxbury, Boston. Summary statistics of the local climate and air pollution can be found in Table 1.

Relative Risk Analysis

We used relative risk analyses to determine an agency's relative risk of dispatch on a hot day compared with nonhot days. We restricted relative risk analyses to the warm season to reduce seasonal confounding and any bias introduced from population fluctuations between the academic year and the warm season. (Analyses on the full study period are in Table A and Figure A, available as supplements to the online version of this article at http://www.ajph.org). The relative risk quasi-Poisson regression model equation is as follows:

(1) ...

where mj is the expected count of dispatch calls for an agency on day j, Ij [HotDay] is a binary indicator of a hot day, and log(Population) in year k represents the yearly number ofpermanent residents in Boston. We ran the same model substituting the indicator for hot day with an indicator for hot and humid day, 2 and 3 consecutive hot days, and 2 and 3 consecutive hot and humid days.

Time Series Analysis

We used time series (TS) analyses to assess the relationship between maximum temperature and dispatch call counts for each agency per unit increase in temperature, using a quasi-Poisson regression. TS analyses were also restricted to the warm season, but full-year analyses are in Table A and Figure A. The warm-season-restricted TS models used a nonparametric spline with 1 degree of freedom per year to account for any long-term trends in emergency services (we used 4 degrees of freedom per year in the full-year analysis to account for seasonal trends), and a natural cubic spline with 2 degrees of freedom for maximum temperature or maximum heat index, all determined a priori on the basis of previous research and to optimize the generalized cross validation criteria.

Sensitivity analyses on the degree of freedom for maximum temperature or maximum heat index did not influence the main results (not shown). We controlled for day of the week with indicator variables for each day, with reference to Friday. We also inserted linear terms for daily ozone and PM2.5 into the model, given ozone and PM2.5's association with both high temperature and relevant health outcomes. The TS model equation is as follows:
(2) ...
where mj is the expected count of dispatch calls for an agency on day j, I (HotDay)j is a binary indicator ofa hot day, I(DayofWeek). is an indicator for day of week, and s represents splines on variables with nonlinear trends; daily maximum temperature, ozone, and PM2.5 were all examined as continuous variables for each day j, and log(Population) in year k represents the yearly number of permanent residents in Boston. We ran the same model substituting maximum temperature for maximum heat index. Results are reported as percentage increase in the relative number of dispatch calls for each agency for a +10°F increase in maximum temperature or maximum heat index. We calculated local inflection points of the nonlinear maximum temperature for maximum heat index term for each agency to evaluate local trends in this exposure with our outcome of interest.

RESULTS

A total of 1268 days were included in this study period, whereas the analyses restricted to just the warm season consisted of446 days. Forty-one days exceeded 90°F, and there were 22 and 13 days when there were 2and 3-consecutive-day periods that exceeded this threshold, respectively. A total of 111 days had maximum temperatures exceeding 95°F, and there were 67 and 39 2- and 3-consecutive-day periods that exceeded this threshold, respectively. There was a total of 3 474 332 emergency dispatch calls during the study period (Table 2). Across all agencies, the mean number of dispatches per day was significantly greater during the warm season than during the full year (all P< .001; Table 2).

Relative Risk Analyses

The relative risk ofdispatch on a hot day, as determined by a binary indicator in which maximum temperature was 90°F or above, compared with a nonhot day, increased for all agencies during the warm season (Table 3; all full-year relative risk analyses can be found in Table A). The magnitude of this increase on single days of high temperatures was greater for BEMS (9%; 95% confidence interval [CI] = 7%, 12%) andBFD dispatch calls (10%; 95% CI = 5%, 15%) than for BPD calls (2%; 95% CI = 0%, 5%). When we considered 2- and 3-day periods when the maximum temperature was 90°F or above, there was still not a significant increase in the relative risk of dispatch for BPD. However, the relative risk of dispatch for BEMS was 10% (95% CI = 6%, 14%) and 10% (95% CI = 5%, 15%) on 2- and 3-day periods of maximum temperatures of 90°F and above, respectively. The relative risk of dispatch for BFD was greatest during 2-day (11%; 95% CI = 4%, 17%) and 3-day (13%; 95% CI = 5%, 22%) periods of high temperatures.

When we also factored in humidity, the relative risk of dispatch on days with a maximum heat index of 95°F or above increased 2% (95% CI = 0%, 4%) for BPD, 7% (95% CI = 5%, 9%) for BEMS, and 7% (95% CI = 4%, 10%) for BFD during the warm season. During 2- and 3-day periods of maximum heat index of 95°F or above, relative risks were slightly attenuated, but still excluded the null (relative risk = 1.0) for BEMS and BFD (Table 3).

Time Series Analyses

The estimated effects of maximum temperature were nonlinear for dispatches from all agencies, with higher relative risk at hot temperatures for BPD and BEMS and higher risks at hot and cold temperatures for BFD (Figure 1). The binary indicator for days with a maximum temperature of90°F or above, or a maximum heat index of 95°F or above, was not a significant predictor for any agency's dispatch calls in the TS model. However, the continuous values of maximum temperature and maximum heat index were significant predictors in all warm-season TS models. Ozone was a significant predictor of dispatches for BPD and BFD only when we evaluated maximum heat index and maximum temperature, respectively. PM2.5 was a significant predictor of dispatches for BPD only when we evaluated maximum heat index.

During the warm season, a 10°F increase in daily maximum temperature-from 80° to 90°F-resulted in 1.016, 1.017, and 1.002 times the expected number of daily BPD, BEMS, and BFD dispatch calls, respectively, on average, after

adjustment for the other predictors in the model. Full-year TS estimates can be found in Figure A. When we examined heat index as a continuous, nonlinear variable in the TS model, the same 10°F increase in daily maximum heat index resulted in 1.007, 0.985, and 1.018 times the number of BPD, BEMS, and BFD dispatch calls, respectively (Figure B, available as a supplement to the online version of this article at http://www.ajph.org).

The TS analyses show how there were increases in the predicted number of dispatches for each agency on days when the maximum temperature did not reach 90°F and days when the maximum heat index did not reach 95°F, both of which are thresholds currently used for putting local heat interventions into effect. The nonlinear effect of temperature on dispatch had local inflection points at 75°F for BPD, 85°F for BEMS, and 88°F forBFD, potentially indicating increases in the rate of increase in dispatches above these temperatures for each agency. We used these inflection points at threshold values for a secondary evaluation ofrelative risk (Table B, available as a supplement to the online version of this article at http://www.ajph.org).

DISCUSSION

This study offers a comprehensive analysis of the impacts of extreme heat on emergency services in Boston. It assesses the impacts of extreme heat and high temperatures on the frequency of emergency dispatch calls across Boston, during the full year and within the warm season. Moreover, the increased demand for police, medical, and fire services reported herein captures an additional public health burden from extreme heat that has not yet been fully captured in research examining the impacts of climate change on public health and societal services. These findings can inform climate change adaptation strategies, for both budgets and institutional preparedness, to ensure the resilience of emergency services as heat waves increase in frequency, severity, and duration in Boston.

During the warm season, there were 2% (95% CI = 0%, 5%) more BPD dispatches, 9% (95% CI = 7%, 12%) more BEMS dispatches, and 10% (95% CI = 5%, 15%) more BFD dispatches on days when the maximum temperature was 90°F or above. There were 2% (95% CI = 0%, 4%), 7% (95% CI = 5%, 9%), and 7% (95% CI = 4%, 10%) more BPD, BEMS, and BFD dispatches, respectively, on days when the maximum heat index was 95°F or above. During the warm season, TS analyses demonstrated that a 10°F increase in daily maximum temperature-from 80°F to 90°F-resulted in 1.016, 1.017, and 1.002 times the expected number of daily BPD, BEMS, and BFD dispatch calls, on average, after adjustment for other predictors.

The nonlinear effect of temperature on dispatch had local inflection points at 75°F for BPD, 85°F for BEMS, and 88°F for BFD, all of which are below current thresholds used for local heat warnings, as well as local heat interventions, such as the opening of cooling centers. This supports previous work that saw increased rates of morbidity and mortality in New England27 and public health impacts28 from extreme heat below current heat advisory criteria set by the National Weather Service.

Our findings demonstrate increases in BPD and BEMS dispatches as the temperature and heat index increase, establishing evidence that extreme heat events have agency-wide impacts on emergency services for these 2 agencies. Future analyses on the nature of each dispatch call would be necessary to fully understand this and the specific nature of dispatch calls that may be disproportionately increasing on extreme heat days. Ambulance calls8,10-12 and violent crime13-15 have been found to increase on hot days, and hospitalizations related to heat stress and other heat-related health outcomes increase during higher ambient temperatures.29,30 All of these relationships provide potential pathways for heat to result in increased need of BPD and BEMS services; police or emergency medical technicians could be required in emergency situations that involve more than violent crime or heat-stress-related health outcomes. The estimates found within this analysis for BPD and BEMS are similar to those found in previous research on extreme temperatures and ambulance dispatches in other cities around the world. For example, in parts of China, 1 study revealed a 2.6% increase in ambulance dispatches during a heat wave,8 and another demonstrated a 3% to 5% increase in the relative risk of ambulance dispatch with extreme heat. Similar analyses in the United States have shown a 8% to 14% increase in ambulance calls on hot days in the greater Seattle, Washington, area.12 During a particularly strong heat wave event in Australia in 2011, all-cause ambulance calls were found to increase 14%,11 demonstrating perhaps a high-end comparison had local conditions been particularly extreme during this study period. Police agency-wide impacts from extreme heat are less

prominent in previous literature; however, a national analysis of various societal governance metrics in the United States demonstrated that police-initiated stops increased up to approximately 29°C (84.2°F) and then decreased beyond this temperature, despite increases in police-related violations (e.g., violence, driver error).7

The result demonstrating the largest increase in relative risk in BFD dispatches on extreme heat days is, to our understanding, a novel finding. Most previous research on the influence of weather on fire department services shows strong links between climate change and wildfires,1 as well as between cold temperatures and residential fires from heating equipment and holiday decorations.31,32 The cold season was not the primary focus ofthis study. This is one ofthe first studies to provide evidence that fire departments, and the services they provide, are affected by extreme heat. Firefighters, including those in Boston, respond to many emergency scenarios across a variety of needs, including medical emergencies. More than 60% of Boston firefighters have an emergency medical technician certification; more than 40% of BFD responses in 2012 were for medical emergencies, whereas fewer than 10% were for actual fires.33 Thus, we hypothesize that the increase in BFD dispatch calls during days with high temperatures follows pathways similar to those of BPD and BEMS dispatches, but has been underrepresented in the body of scientific evidence highlighting the impact of heat on emergency services and climate adaptation planning. This association warrants more analysis to best understand the drivers of increased BFD dispatches during hot days and what specific call types may be most affected by extreme heat.

Limitations

This study has a few limitations. The use of ambient temperature measurements likely introduces a nondifferential exposure misclassification into the analysis, as the temperatures throughout Boston were different than at the airport and varied throughout the city. We also did not have information on those utilizing these emergency services, so we could not do any further analyses on age, gender, other modifiable factors, or the geographic distribution of these services. Additionally, we do not know if multiple emergency agencies (e.g., BPD and BEMS) were dispatched for the same call, which would involve personnel and financial costs for both services. This must be considered when planning appropriate future actions for these services during periods of extreme heat.

Future studies will include additional information on high spatial resolution of urban temperature patterns, and of sociodemographic and environmental parameters, to comprehensively assess vulnerability to these increases in emergency services spatiotemporally, with records on the details of each dispatch call. With the results presented in this article, we plan to work with local emergency service agencies to further evaluate the impact of extreme heat on the specific types of dispatch calls these agencies are receiving. This will allow for a clearer understanding of the causal pathway from extreme heat to emergency services, as well as enhance the financial, personnel, and climate change preparedness of emergency service agencies.

Conclusions

Despite these limitations, to our knowledge this was the first study to document the impact of heat on local fire department dispatches, as well as one of the first to examine the impacts ofheat on agency-wide BPD and BEMS dispatches in Boston, thus expanding the scientific understanding beyond violent crime and heat-stress-related ambulance calls. Strong and significant effects were seen across all agencies in both a relative risk and a TS analysis, even in analyses limited only to the warm-season months. Although summers in Boston are getting hotter, its climate is more moderate than that of many other urban centers in the United States, given its proximity to the ocean, and sea breezes influenced by the concavity of its coast, and the topography that allows summer temperatures to remain cooler than they otherwise might.34 Additionally, Boston's rate of some emergency situations, such as violent crime, may differ from those of other cities across the United States. The analysis framework used in this study will allow evaluation of extreme heat impacts on emergency services in other cities to inform local adaptation strategies. Effects may be even stronger in other cities with either heat exposure or emergency scenarios that are more extreme than in Boston, and we are currently working to explore this issue.

The impacts of hot days on increased emergency dispatch calls may result in significant financial and personnel burdens that warrant further consideration. An additional area of consideration that must be accounted for is the occupational heat stress experienced by these first responders on hot days,35 which would likely increase in the

future as heat becomes more pervasive. Despite research demonstrating the impact of extreme temperatures on health and societal services, climate adaptation plans more often account for mitigating the health impacts of extreme heat than planning for the increased need of a broad number of societal services. In Boston, the impacts ofstorm-related flooding and sea level rise on emergency services are well documented: increased stormwater flooding at fire and police stations will impede access and response; high tide flooding events will expose property valued at $1.3 billion occupied by essential facilities, including fire, emergency medical services, and police infrastructure; and low-probability flood events have the potential to inundate approximately 25% of police stations, which has led to Boston prioritizing flood-related adaptation for emergency service facilities.2 When it comes to extreme heat, despite the vast range of demonstrated societal impacts (e.g., negative health impacts, increased stress on electricity grid for air conditioning, expansion of roads and rails, poorer air quality), municipal services are only recommended to install backup power generation systems to adapt to extreme heat in the future.2 It is also vital to consider these societal burdens when planning for future emergency services.

Public Health Implications

This study expands scientific understanding of the many ways extreme heat influences public health and society, demonstrating that heat affects the agency-wide dispatch services of police, emergency medical, and fire department services. During the warm season, there were 2% (95% CI = 1.00%, 1.05%) more BPD, 9% (95% CI = 1.07%, 1.12%) more BEMS, and 10% (95% CI = 1.05%, 1.15%) more BFD dispatches on days with a maximum temperature of 90°F or above. There were 2% (95% CI = 1.00%, 1.04%), 7% (95% CI = 1.05%, 1.09%), and 7% (95% CI = 1.04%, 1.10%) BPD, BEMS, and BFD dispatches, respectively, on days with a maximum heat index of 95°F or above. However, when examining this with continuous temperature and heat index variables, we found that there are significant increases in the relative risk of dispatches on days well below 90°F. A local reexamination of extreme heat warning criteria and the associated social services that are provided once these thresholds are met (e.g., opening of cooling centers, transportation to cooling centers) may better protect the population and reduce negative societal consequences of extreme heat.

Climate change risk assessments and adaptation plans often account for the significant mortality and morbidity health impacts attributed to extreme heat. However, it is important to account for these societal burdens of extreme heat impacts on emergency services. Although this will be beneficial to ensuring the provision of services, the increase in first responders and budgets needed to meet a higher demand for services at higher temperatures should also be considered to allow Boston, and other cities around the United States, to most effectively, sustainably, and equitably implement climate change adaptation strategies. ÂfPU

CONTRIBUTORS

A. A. Williams served as the lead analyst and author. J. G. Allen, P.J. Catalano, andJ. D. Spenglerassistedwithstudy design and analysis. A.A. Williams, J. G. Allen, andJ.J. Buonocore obtained funding for the research. All authors contributed to the writing and editing of the article.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

HUMAN PARTICIPANT PROTECTION

No personal data or human participants were used in this study, so no approval was required by the university's institutional review board.

Sidebar

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DETAILS

Subject:	Climate change; Population; Sleep; Public health; Emergency medical services; Ozone; Trends; Temperature; Seasons; Weather; Heat; Air pollution; Outdoor air quality; Time series; Risk analysis; Police; Emergency services; Fire departments; Fires; Confidence intervals; Health services; Variables; Emergency medical care; Extreme heat
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Vaccine Communication as Weaponized Identity Politics

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ABSTRACT (ENGLISH)

The World Health Organization declared vaccine misinformation-and consequent declines in vaccination rates-as a top health threat of2019 (http:// bit.ly/37G2NWP). In 2018, there have been measles outbreaks in 98 countries worldwide (including 1717 cases in Russia from January to June 2018-a 13-fold increase from the previous year; http://bit.ly/2S1upit), resulting in more than 140 000 deaths (http://bit.ly/2S0Pbin). Deaths from vaccine-preventable illnesses may be attributed primarily to the spreading phenomenon of vaccine refusal.

FULL TEXT

The World Health Organization declared vaccine misinformation-and consequent declines in vaccination rates-as a top health threat of2019 (http:// bit.ly/37G2NWP). In 2018, there have been measles outbreaks in 98 countries worldwide (including 1717 cases in Russia from January to June 2018-a 13-fold increase from the previous year; http://bit.ly/2S1upit), resulting in more than 140 000 deaths (http://bit.ly/2S0Pbin). Deaths from vaccine-preventable illnesses may be attributed primarily to the spreading phenomenon of vaccine refusal.

"ASTROTURFING" VACCINE REFUSAL

Typically framed as grassroots opposition, vaccine refusal has been increasingly linked with populist political rhetoric and attempts to undermine scientific authority.1 Concurrently, recent evidence has linked actors in the "vaccine debate" to state-sponsored interests-especially those associated with Russian interference in the 2016 US elections.2 We found that one set ofRussian trolls was more than 22 times more likely to tweet about vaccines than was the average Twitter user. An in-depth analysis of hundreds of these troll-generated tweets indicated that the trolls were "playing both sides" of the vaccine debate, seemingly to promote political discord on the topic. Consequently, what appears to be popular support is at least partially "Astroturf ' (i.e., artificial tweets, masquerading as grassroots advocacy).

Since our article appeared, Twitter has released several data sets pertaining to election integrity (http://bit.ly/318bdno). In this issue of AJPH, the work by Walter et al. (p. 718) draws on these new data to shed further light on the rationales underlying Russian troll activity, providing welcome new insights. Russian trolls used tweets about vaccination to construct "thematic personas" that enabled them to masquerade as US citizens taking specific political and other controversial stances, including presenting themselves as African American and promoting Black Lives Matter. This inclusion ofan African American persona seems to have explicitly targeted underlying racial tensions in US society, in part by playing on stereotypes about African Americans. Moreover, the

creation of that persona, in a time of significant racialized division, seems designed to fuel animosity with other stereotyped personas, such as the "pro-Trump" persona.

Evidence that vaccine content may be used to signal credibility and to create more "believable" personas reflects racialization of the vaccine debate that may or may not be accurate. Although lower levels of trust in government pertaining to vaccination and health care in general are long standing,3 these attitudes are not spread uniformly.4 Thus, the success of these trolling operations depends on how realistic these African American personas appear within the diverse African American community.

WEAPONIZED RACE RELATIONS

Unfortunately, stereotyped trolling campaigns may constitute a self-fulfilling prophecy. Decades of Kremlin-backed disinformation campaigns have targeted racial cleavages to promote internal strife and undermine Western values, both domestically and overseas, reinforcing the stereotypes that they sought to exploit. For example, on July 17, 1983, the Soviet KGB launched a disinformation campaign alleging that a mysterious illness-AIDS- was the result of US bioweapons experiments.5 Although initially created to discredit US influence in the Third World, this conspiracy theory ultimately morphed into an allegation of the US government using HIV for racial genocide of African Americans and Africans.

Public beliefs about the Ebola outbreak in 2014, and today's outbreak in the Democratic Republic of the Congo, have shaped more recent iterations of conspiracy theories, including recent Russian propaganda that accused Ebola treatment workers in the Democratic Republic of the Congo of spreading, rather than treating, the disease in a bid to depopulate the continent. This disinformation has led to direct attacks on these workers, increasing the likelihood of a deadly outbreak.

Thus, Russian attempts to weaponize complex racial attitudes and link them to vaccination are simply the latest in a series ofoperations designed to increase existing tensions in the United States and in the West more broadly. History has shown that simply debunking these conspiracy theories has not been effective in stopping their spread. Rather, as our previous work has shown, culturally sensitive communication using trusted intermediaries may be effective in increasing vaccination rates among this and other vulnerable populations.

WEAPONIZED POLITICAL DISCOURSE

Russian troll activity has demonstrated the extent to which the mainstream political discourse has infused vaccine policy. Until recently, childhood vaccination has been a relatively nonpartisan issue, with political polarization focused on very specific cases (e.g., the introduction of the Gardasil human papillomavirus vaccine).6 However, recent years have seen an uptick in political polarization on generalized vaccine opposition. For example, we found that vaccine opponents aligned themselves with candidate Donald J. Trump in the leadup to the 2016 presidential election and continued to express support for him on Twitter when rumors broke that he was considering appointing Robert F. Kennedy Jr. to lead a vaccine safety commission.7 Russian trolls seem to have exploited these changes opportunistically, aligning their discourse with the followers of different candidates in the 2016 US presidential elections.

Walter et al. found that, in their attempts to promote discord, Russian trolls used tweets about vaccination to build convincing personas both supporting and opposing specific candidates who had made public statements about vaccines. Although presidential elections are somewhat adversarial by nature, the 2016 election was considered to be especially partisan, and Russian interference in this election is widely considered to have been the primary aim of the Internet Research Agency's trolling campaign. The presence oftweets expressing consistent vaccine opposition by "pro-Trump" personas and tweets expressing support for vaccination by "antiTrump" personas therefore highlights the extent to which Russian trolls perceive vaccination becoming an increasingly partisan issue and, indeed, foster that change. Vaccine opposition may become entrenched as part of the political platforms of one of the major US political parties, as it has in populist movements worldwide. This would move a fringe position into the political mainstream and polarize a public health challenge, as has occurred with gun violence reduction and climate policies.

The sophistication of this Russian information operation sheds light on important aspects of vaccine

communications: targeting and tailoring communication. Best practice for health communicators is to use messages designed to speak to specific communities' needs, and it appears that foreign governments have become increasingly adept at identifying and targeting messages to vulnerable communities. This suggests a degree of cultural awareness that could be enabled only by significant financial and educational resources.

By contrast, many domestic public health agencies' communication operations are woefully underresourced and understaffed. These findings therefore point to an urgent need to invest in public health communication. There is a clear need for funding for research focused on how to effectively counter disinformation on social media.

Adversaries, such as Russian-backed disinformation campaigns, aim to promote discord and confusion and therefore are free to experiment with multiple, often conflicting, narratives in pursuit of their goals. By contrast, public health communications must remain evidence based while imparting meaningful and compelling messages. Constructing these messages requires both scientific guidance and sociocultural expertise. These online challenges also speak to the compelling need for public health agencies to use more traditional partners to promote vaccine acceptance. From health care providers, community organizations, faith communities, and others, we must ensure trusted, reciprocal, persuasive communications to strengthen vaccine acceptance and protect the health of our communities. ÂfPU

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D.A. Broniatowski wrote the first draft of the editorial. S. C. Quinn, M. Dredze, and A. M. Jamison critically revised the editorial.

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Note. The Knight Foundation had no role in study design.

CONFLICTS OF INTEREST

M. Dredze holds equity in Sickweather, Inc. and has received consulting fees from Bloomberg LP and Good Analytics, Inc. These organizations did not have any role in the study design, data collection and analysis, decisionto publish, orpreparation of the editorial.

Sidebar

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DETAILS

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NIOSH: A Short History

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ABSTRACT (ENGLISH)

The National Institute for Occupational Safety and Health (NIOSH) was established in Section 22 of the Occupational Safety and Health (OSH) Act of 1970 and placed in the Department of Health and Human Services (HHS).1 Introduced by Senator Jacob Javits as an amendment to the OSH Act, the idea was that a research program, separate and independent from the regulatory agency, would be able to generate objective scientific research findings in the field of occupational safety and health.2 The Act gave NIOSH authority to conduct research in a broad range of occupational safety and health topics.3 Among the research responsibilities are conducting studies of psychological factors and industrywide exposures, developing exposure criteria for toxic materials and harmful physical agents, and responding to a request from an employer or employee to perform a health hazard evaluation. The Act also provided NIOSH with "right-of-entry" authority to make inspections and question employers and employees.4 Finally, the Act makes clear that NIOSH is to produce research that can enable the Occupational Safety and Health Administration (OSHA) to mulate and health standards. NIOSH was also directed to conduct education programs, directly or through grants, to provide an adequate supply of safety and health specialists to carry out the purposes of the OSH Act and on the proper use of safety and health equipment.5

FULL TEXT

The National Institute for Occupational Safety and Health (NIOSH) was established in Section 22 of the Occupational Safety and Health (OSH) Act of 1970 and placed in the Department of Health and Human Services (HHS).1 Introduced by Senator Jacob Javits as an amendment to the OSH Act, the idea was that a research program, separate and independent from the regulatory agency, would be able to generate objective scientific research findings in the field of occupational safety and health.2 The Act gave NIOSH authority to conduct research in a broad range of occupational safety and health topics.3 Among the research responsibilities are conducting

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1970-1979

The first decade was busy for NIOSH. In 1971, NIOSH published its first Criteria for a Recommended Standard on asbestos and the first Toxic Substances List. In 1974, the NIOSH/ OSHA Standards Completion Program became the basis for 387 new OSHA standards. In 1975, the first Current Intelligence Bulletins were published. Grants for the first nine Education and Research Centers were awarded in 1977, later doubling to 18 by 2020. In 1978, the Pocket Guide to Chemical Hazards first published, and updates to the Pocket Guide continue to be published to this day.

1980-1989

As the service sector grew in the 1980s, NIOSH led pioneering research on emerging safety and health concerns. These included indoor environmental quality in office buildings, job-related musculoskeletal injuries, workplace violence, latex allergy among health care workers, and risks ofoccupational exposures to bloodborne pathogens. In 1986, NIOSH released a strategic plan for the top-10 work-related diseases and injuries called the Proposed National Strategies for the Prevention of Leading Work-Related Diseases and Injuries. Also in 1986, NIOSH launched a collaboration with the United Nations' International Labor Organization Program on Chemical Safety to establish peer-reviewed hazard communication cards (International Chemical Safety Cards).

1990-1999

As the workplace changed, NIOSH continued to adapt its research. In 1990, NIOSH awarded grants to establish its first Centers for Agricultural Health and Safety, which now number 11 centers across the United States. NIOSH issued a Current Intelligence Bulletin in 1991 on secondhand smoke in the workplace, which had become a major indoor air quality issue. In the mid-1990s, then-NIOSH director, Linda Rosenstock, MD, launched the National Occupational Research Agenda in response to an effort in Congress to eliminate NIOSH. This public-private partnership among industry, labor, and government to develop research priorities is now in its third decade. The first publication to represent this new model for conducting research through partnership was the NIOSH-issued Engineering Control Guidelines for Hot Mix Asphalt Pavers published in 1997. Responding to a surge in violence against workers, in 1996, NIOSH issued findings and recommendations for preventing workplace homicides and assaults. In 1997, NIOSH research identified a new lung disease in nylon flocking industry workers.6 That same year, authority for conducting mine safety research was transferred to NIOSH after the US Bureau of Mines was closed. This brought into NIOSH specialists in mine safety engineering and two new sites in Pittsburgh, Pennsylvania, and Spokane, Washington. As the 1990s ended, NIOSH published recommendations for prevention of allergic reactions to natural rubber latex in the workplace, made recommendations for preventing job-related stress, and recommendations for preventing work-related needlestick injuries.

2000-2009

NIOSH began the 2000s with a new program conducting occupational radiation dose reconstructions for atomic weapons industry workers with cancers who filed claims for compensation under the Energy Employees Occupational Illness Compensation Program Act of 2000. In response to the September 11,2001, terrorist attacks in New York City, at the Pentagon, and near Shanksville, Pennsylvania, NIOSH provided technical assistance for rescue and recovery workers. In 2002, NIOSH scientists published their research findings about a new lung disease found in workers at a series of microwavepopcorn plants.7 In 2004, NIOSH launched its Research-toPractice initiative to speed the adoption ofnew research findings into practice to benefit workers. Also in 2004, NIOSH began what is now called the Total Worker Health Program, championing policies, programs, and practices that integrate

protection from work-related safety and health hazards with promotion ofinjuryand illness-prevention efforts to advance worker well-being. In 2006, NIOSH commercialized two NIOSH-designed field methods to help first responders, public health officials, and remediation workers quickly detect the presence of methamphetamine on various environmental surfaces. In 2007, NIOSH took the first step in engaging an online community by launching the NIOSH Science Blog. Since then, NIOSH has expanded to developing smartphone apps on various topics and is actively engaged on social media.

2010-PRESENT

The decade began as NIOSH partnered with multiple government agencies to provide technical assistance during the Deepwater Horizon disaster in the Gulf of Mexico. In 2011, the Congress authorized the World Trade Center Health Program, a federal health plan that provides medical care to responders and community survivors of the September 11, 2001, terrorist attacks, naming the NIOSH director the administrator of the World Trade Center Health Program. To date, more than 100 000 responders and survivors have become members of the World Trade Center Health Program. In 2016, NIOSH published revised criteria for a standard on occupational exposure to heat and hot environments. As the decade ends, NIOSH is turning its attention to various future of work issues involving sensor technology, collaborative robots, exoskeletons, artificial intelligence, and advanced manufacturing.

FUTURE

NIOSH continues to carry out research on emerging workplace hazards, respond to requests for health hazard evaluations, conduct intervention studies, and publish authoritative recommendations. In the five decades since the passage of the OSH Act, NIOSH has grown. NIOSH now has facilities and laboratories in six states and the District of Columbia with a staff of nearly 2000 researchers and support personnel. In the last 50 years, the jobs workers do, the hazards they face, and the way their work is organized have also changed. After 50 years, one can take the measure of an organization by asking how well it has carried out its mission: Has it been sufficiently flexible to meet inevitable social, economic, and technological changes? Has it provided the benefits to workers that it was intended to provide? Is it well-positioned to meet ongoing workplace changes that the next 50 years will bring? After five decades of NIOSH history, the answer is yes to all three questions.

John Howard, MD

CONFLICTS OF INTEREST

The author has no conflicts of interest.

Sidebar

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DETAILS

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US Black–White Mortality Disparities: Still Unequal, Still Unjust

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ABSTRACT (ENGLISH)

Cardiovascular disease (CVD) has been the number one cause of death in the United States for at least the past four decades, killing a total of 647 457 people in 2017 alone.1 Although the overall rates of CVD mortality have been in decline for the total US population since 1980, differences between Black and White American rates have remained.2 For example, crude rates for all CVD mortality were approximately 30% higher for non-Hispanic Black persons compared with non-Hispanic White persons as recently as 2014 and have been consistent since at least 2000.2

In 2003, the US National Academies of Sciences, Engineering, and Medicine published the groundbreaking Institute of Medicine study on racial/ethnic health disparities in the United States, Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care,3 which detailed racial/ethnic health disparities across a wide spectrum of morbidities, mortality, and health care services. This report helped shine a bright light on the pervasiveness of the health disadvantages faced by racial/ethnic minorities in the United States and served to promote increased focus and funding on research efforts as well as policy solutions at the national and state levels to address these inequalities. Seven years after the Institute of Medicine report, in 2010 the US Congress passed the Patient Protection and Affordable Care Act, which, in part, aimed to reduce morbidity and mortality by expanding access to health care. Within this context, questions remain about the relative contribution ofvarious risk factors in explaining the observed Black- White CVD mortality difference, such as socioeconomic characteristics, health behaviors, and access to health care.

FULL TEXT

Cardiovascular disease (CVD) has been the number one cause of death in the United States for at least the past four decades, killing a total of 647 457 people in 2017 alone.1 Although the overall rates of CVD mortality have been in decline for the total US population since 1980, differences between Black and White American rates have

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NEW FINDINGS

Data reported by Tajeu et al. (p. 696) in this issue of AJPH provide important new insights into the state of Black-White CVD mortality rate differences in the United States. The data are from a large, prospective study of more than 30 000 non-Hispanic Black and White Americans enrolled from 2003 through 2007, with mortality follow-up through 2017. Undertaking such a large study is a challenging endeavor, and the authors should be commended for conducting such a methodologically rigorous study.

The main findings are important for two reasons. First, the authors showed that after adjustment for many individuallevel socioeconomic, psychosocial, behavioral, and CVD risk factors, CVD risk was fully attenuated for non-Hispanic Black individuals aged 65 years or older but that significant risk, 58% higher risk, remained for individuals between 45 and 64 years old. Second, they showed that 21% and 38% of the higher mortality risk for non-Hispanic Black participants, aged 45 to 64 years and 65 years or older, respectively, was attributable to differences in socioeconomic conditions. These findings suggest that a sizable portion of the differences in CVD mortality between non-Hispanic Black and White Americans could potentially be resolved through improvements in the socioeconomic conditions of non-Hispanic Black Americans.

IMPLICATIONS

The findings reported by Tajeu et al. provide insights into the scale of CVD mortality disparities faced by non-Hispanic Black individuals and the extent to which potentially modifiable factors contribute to them. At the same time, the findings raise new, unsettling questions about the persistence of socioeconomic inequalities giving rise to mortality disparities and what can be done in the current political environment to alleviate them. Despite the passage, implementation, and success ofthe Affordable Care Act in expanding health care for millions of Americans and reducing overall health care costs,4 the law has been weakened by the removal of the individual mandate for health care insurance by Congress in 2018. The law also remains under attack in the courts from the Texas v Azar, No. 19-10011 (5th Cir., filed Dec. 18, 2019) case, which charges that the law is unconstitutional. Other efforts to reduce programs aimed at improving socioeconomic conditions, such as food stamps,5 educational opportunities,6 and efforts to increase the national minimum wage,7 are also intensifying.

The findings from Tajeu et al. illustrate once again the persistence of CVD mortality disparities, which, combined with the apparent lack ofpolitical will required to solve them, should inspire moral outrage among all Americans, regardless ofpartisan affiliations. The question is, Will it? And, if so, will it be enough to create change? ÂfPU

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CONFLICTS OF INTEREST

The author has no conflicts of interest to disclose.

Sidebar

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DETAILS

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Legal Liability for Returning Firearms to Suicidal Persons Who Voluntarily Surrender Them in 50 US States

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ABSTRACT (ENGLISH)

Temporary transfers of firearms from suicidal persons is a strategy to reduce the incidence of suicide deaths. We discuss a barrier to the effective operation of voluntary temporary firearm transfer laws: the dearth of guidance on the liability for returning firearms to persons who voluntarily surrender them. We examine the laws of all 50 US states that regulate temporary surrenders of firearms and evaluate whether any provisions govern liability for returning temporarily surrendered firearms. Although 14 states create background check exceptions to permit temporary transfers of firearms from an owner to family, friends, retailers, or law enforcement, no states prescribe procedures for returning those firearms.ability for returning the firearms to people who voluntarily surrendered them. We recommend amending state laws to clarify the process and liability for returning temporarily surrendered firearms to the original owner. Such amendments would be intended to mitigate the potential chilling effect that lack of clarity and presumption of liability may impose on efficiently reducing firearm access to protect firearm owners at risk for suicide. (Am J Public Health. 2020;110: 685-688. doi:10.2105/AJPH. 2019.305545)

FULL TEXT

Headnote

Temporary transfers of firearms from suicidal persons is a strategy to reduce the incidence of suicide deaths. We discuss a barrier to the effective operation of voluntary temporary firearm transfer laws: the dearth of guidance on the liability for returning firearms to persons who voluntarily surrender them. We examine the laws of all 50 US states that regulate temporary surrenders of firearms and evaluate whether any provisions govern liability for returning temporarily surrendered firearms.

Although 14 states create background check exceptions to permit temporary transfers of firearms from an owner to family, friends, retailers, orlaw enforcement, no states prescribe procedures for returning those firearms.ability for returning the firearms to people who voluntarily surrendered them.

We recommend amending state laws to clarify the process and liability for returning temporarily surrendered firearms to the original owner. Such amendments would be intended to mitigate the potential chilling effect that lack of clarity and presumption of liability may impose on efficiently reducing firearm access to protect firearm owners at risk for suicide. (Am J Public Health. 2020;110: 685-688. doi:1 0.2105/AJPH. 2019.305545)

Suicide, often by firearm, is a major public health problem. Suicides claimed 47 173 lives in the United States in 2017, and 50% used a firearm.1 When comparing people in firearm-owning households to people not in firearm-owning households, there was no difference in terms of rates of mental illness or suicidal ideations.2,3 The risk of completed suicide is especially high for people in firearm-owning households because such individuals have immediate access to lethal means.2 Numerous medical and injuryprevention organizations have highlighted lethal means restriction as an effective intervention to reduce suicides by firearms.4

Barber and Miller noted that a lethal means-restriction strategy to reduce suicides rests on four observations.5 First, suicidal crises tend to be short lived and quickly contemplated. Second, the means generally depend on availability and access. Third, the lethality of the method available during an attempt plays a pivotal role in whether the person survives. Fourth, a large percentage ofthose who survive a nonfatal suicide attempt generally do not proceed to die by suicide. Thus, "helping people survive periods of acute suicidal risk by reducing their access to highly lethal methods is likely to help many people survive in both the short and long term."5(S265)

Firearms are a means ofsuicide requiring minimal preparation and planning. Because of the lethality of firearms, there is no chance to turn back once someone pulls the trigger.5 When a lethal method of suicide is unavailable, a person may delay or abandon their attempt.5,6 Reducing access to lethal means, such as firearms, during periods of suicidal ideation can save lives.5 Laws facilitating temporary transfer of firearms from persons at risk for harming themselves is one policy approach for saving lives. McCourt et al. focused on temporary transfers of firearms from suicidal individuals to family and friends, law enforcement, and firearm retailers as a risk mitigation tool and the barriers that state laws requiring background checks may pose to temporary transfers.7

We focus on another important source of possible concern for key players implementing temporary transfer

strategies: the rules and risks surrounding the return of firearms that were temporarily surrendered by individuals at risk for suicide death (i.e., transfer-back). We examine the key questions regarding liability for returning firearms to persons who temporarily surrender them, discuss the few existing relevant laws, and propose key areas to address in legislation.

TEMPORARY TRANSFER-RELATED LAWS

Temporary transfer laws are an increasingly prevalent strategy to limit the availability offirearms to persons at risk for suicide, as are extreme risk protection orders (ERPOs). ERPOs involve involuntary relinquishment of firearms through a court order, whereas temporary transfer laws facilitate voluntary firearm transfers. Both strategies attempt to temporarily keep firearms away from an at-risk person. The advantage of temporary transfers is that the removal can be accomplished voluntarily and informally without the more onerous burden of a concerned family member or other petitioner having to go to court to obtain an order. We focus on barriers to the effective operation of temporary transfer laws.

McCourt et al. noted how background check requirements can pose obstacles to the temporary transfer of firearms for suicidal individuals.7 Background checks are used to identify persons potentially prohibited from owning a firearm.8 Appendix A (available as a supplement to the online version of this article at http://www.ajph.org) summarizes all 50 states' background check requirements and temporary transfer-related laws as ofJuly 2019. Currently 20 states and the District of Columbia require background checks for a transferbetween private parties.8 Twelve states and the District of Columbia require background checks at the time of transfer.8 The other eight states require the transferee to have a permit, meaning a background check was conducted before transfer.8 In these laws and throughout this commentary, "transferor" refers to the person transferring the firearm, and "transferee" refers to the individual or organization receiving the firearm.

Of the jurisdictions that currently require background checks or permits, 14 states have exceptions that allow firearm owners to voluntarily transfer their firearm to another during a crisis. Persons who may temporarily hold the firearm for the at-risk person range from immediate family members to anyone at all. Some states allow transfers only to prevent "imminent death or serious physical injury."9 Maximum transfer times for temporary transfers vary from 1 to 30 days.10,11

There is a lack of evidence directly analyzing the use and effectiveness of temporary transfer laws in reducing suicides. Data on the effectiveness of having suicidal individuals relinquish their firearms in periods of crisis do exist. Swanson et al. undertook a study to determine the effectiveness of Connecticut's ERPO laws in preventing suicides.12 They determined that 21 individuals who had their firearms seized by an ERPO had later died from suicide, with 6 dying by gunshot. Based on fatality rates for different suicide methods, they extrapolated that these 21 deaths represented 142 suicide attempts. They determined that if firearms had been available to these individuals and used in more of the attempts, more ERPO individuals would have died by suicide. Their model estimated that approximately one suicide was averted for every 10 to 11 gun seizures.12

TEMPORARY TRANSFER CONCERNS AND CONFUSIONS

A large issue with most temporary transfer laws is that they do not clearly define what, if any, liability attaches to the transferee for transfer-back of firearms after the at-risk individual's crisis is over. This lack of clarity and the confusion surrounding liability is a potentially large obstacle to the willingness of key persons and entities to store firearms or aid in temporary transfers of firearms to prevent suicides. Although Congress has limited the liability of firearms manufacturers and dealers for harms committed with their products under the Protection of Lawful Commerce in Arms Act of 2005, there is no law limiting the liability of good Samaritans and key entities that temporarily hold firearms for at-risk persons to reduce the risk of suicide.

Law enforcement and firearm retailers can be effective allies in reducing suicides by storing at-risk owners' firearms outside their home. Runyan et al. surveyed law enforcement officers and firearm retailers in eight Western states about their willingness to offer voluntary, temporary storage for suicidal individuals. They found that 77% of law enforcement officers and 67% of firearm retailers were willing to provide storage for firearm owners concerned about their own mental health.13

Pierpoint et al. investigated the barriers firearm retailers, in the same eight states, faced in providing firearm storage for suicidal individuals.14 They found that 58% of the firearm retailers surveyed cited federal laws as an obstacle to storing firearms for others, and 25% cited state laws. Around half of the retailers surveyed were not currently providing temporary storage, of whom 73% cited concerns of liability in returning the firearm, 78% cited liability in storing the firearm, and 81% cited concerns about determining the safety of returning firearms.14

Another study, by BrooksRussell et al., surveyed law enforcement agencies in the same states about barriers to providing firearm storage.15 State or federal laws were not cited by most agencies as a barrier to storage.15 However, approximately one quarter of the agencies did not provide temporary storage: 71% cited legal liability concerns in storing the firearms, 74% cited concerns of legal liability in returning the firearms, and 69% cited concerns about determining the safety of returning the firearms.15

State laws facilitating temporary transfers of firearms from suicidal individuals omit procedures for returning these firearms -and whether the person or entity temporarily holding the firearm incurs liability for returning the firearm to the person who surrendered it. State statutes are silent regarding liability for returning firearms to persons who temporarily surrendered them. Clarifying the process and legal liability surrounding the return oftemporarily surrendered firearms is an essential step to addressing a potentially major impediment to temporary transfers as a tool to prevent suicide.

LAWS AND CASES ABOUT TRANSFERBACK LIABILITY

To identify potentially relevant sources on the process of and potential liability for the return of temporarily transferred firearms to persons at risk for suicide, we conducted searches on the legal database Westlaw in July 2019 (see the box on page 687). Search terms are given in Appendix B (available as a supplement to the online version of this article at http://www.ajph.org).

Statutory Law

Many states' temporary transfer laws specify that the transfer can only be for a set amount of time. For example, Colorado's temporary transfer law allows loans of firearms for 72 hours or less.16 As McCourt et al. noted, it is not clear what occurs at the end ofthis 72-hour period, whether the period can be repeated, or whether the firearm must be returned automatically.7 Suicide attempts may occur anywhere from less than 10 minutes to weeks or months from the initial suicidal ideation.17 Thus, Colorado's statute may be problematic because a crisis may not resolve within the 72-hour period, and returning the firearm could pose a risk.

Of the temporary transfer laws that exist, only Colorado specifically addresses liability during the temporary transfer period. CRS 18-12-112(6)(h) allows temporary transfers of firearms to any person for less than 72 hours.16 The provision further warns that "a person who transfers a firearm pursuant to paragraph (h) may be liable for damages proximately caused by the transferee's subsequent unlawful use of the firearm. "16 This language refers to the liability ofthe person who decides to voluntarily surrender the firearm, rather than the person who receives and temporarily holds the firearm. The provision is silent on the process for returning the firearm and what liability attaches to the person providing temporary storage upon return of the firearm.

Among the states with temporary transfer laws, no state has legal provisions explaining the liability of persons who temporarily store the firearm and who subsequently return the firearm. The laws focus on criteria for who may receive the firearms, rather than procedures and liability for their return. For example, Oregon law defines a "transferor" as someone who intends to deliver a firearm to a transferee and says that during a temporary transfer, the transferor must have "no reason to believe the transferee is prohibited from possessing a firearm or intends to use the firearm in the commission of a crime."9 In Washington State, the temporary transfer law requires that the firearm not be transferred to a prohibited person and requires the temporary storage provider to return the firearms once the suicidal crisis 18 passes.

Case Law

Case law also generally does not address transfer-back liability for temporarily transferred firearms. Most case law involves issues involving confiscated firearms pursuant to court orders or arrests and petitions for the return of those seized firearms. A few cases involve negligence lawsuits against persons or entities for insecurely storing their

firearms or against a law enforcement employer for returning a service firearm following psychological evaluations. Although no case specifically addressed transfer-back liability, there are interesting examples of situations involving return or transfer of weapons. For example, in Cygan v. City of New York, the wife of a police officer who died by suicide sued his employer for negligence in returning his service revolver to him following a psychological evaluation.19 The court determined that the employer was not liable: the suicide occurred 18 months after the evaluation, the evaluation was prompted by paranoia rather than suicidal behavior, the surrendered weapon was returned after the employee was cleared, and the returned firearm was not the cause of the officer's suicide.19
In Com. v. Morelli the court determined that a firearm owner seeking return of confiscated firearms must produce evidence of lawful entitlement to possess the firearms and no disqualifying factors such as a felony conviction.20
In Chow v. State the court addressed a charge of illegally transferring a regulated firearm between two privateparties.21 The court determined that temporary transfers were exempt from general transfer requirements. Further, the court interpreted the relevant law to mean that parties involved in a transfer could be convicted under the provision only if they knew that the person they were transferring the firearm to was prohibited from owning the firearm or that they were directly violating the transfer procedures.21

RECOMMENDATIONS FOR CLARIFYING LIABILITY

For temporary transfer laws to work as intended, legislatures should address uncertainties about the procedures for the return of temporarily surrendered firearms and the potential liability faced by persons or entities who temporarily store firearms and then return them.
No state temporary transfer law specifically defines the liability faced by persons for returning firearms to the at-risk individual after the crisis is over or after the statutory period has expired. Many states' temporary transfer laws appear to hold transferors liable, and in violation ofstate law, if they transfer firearms to a prohibited person. But it is unclear whether the person or entity who temporarily holds the firearm for a suicidal person falls under the definition of "transferor" upon return of the firearm to the owner.
A model law for temporary transfers must explicitly state whether a person or entity who temporarily stores a firearm for a person at risk for suicide faces liability for returning the firearm and under what circumstances. Legal clarifications should specifically define the procedures governing the return ofa temporarily surrendered firearm and provide a release of liability for the individual or entity temporarily holding the firearm if procedures are followed. Requiring a mental health evaluation or interview with law enforcement before returning a firearm may aid in decreasing suicide risk but could also discourage individuals from transferring their firearms for fear of not having them returned.
Model legislation should also address extensions of the temporary transfer period if the person temporarily providing storage determines that owners are still a threat to themselves or have become prohibited persons. The law could provide that such a determination requires surrendering the firearm to the nearest law enforcement for a more extensive hearing process to address the risks and rights at stake.

CONCLUSIONS

There are widespread gaps and silences in laws regarding the liability associated with the return of firearms that were temporarily surrendered to reduce access to lethal means for persons at risk for suicide. Although nearly all would agree that temporarily holding a firearm for a potentially suicidal person should occur, regardless of specific legislation, the more difficult issue is if and when that firearm should be returned to the owner and the liability concerns surrounding that return. Surveys indicate that legal liability is a chilling factor for firearm retailers and law enforcement-key potential partners for temporarily holding firearms for persons at risk for suicide.14,15 Amending state laws to clarify the procedure and liability for returning temporarily surrendered firearms can help address a barrier to the effective operation ofthis legal strategy for saving lives. We call attention to a potentially important barrier to effective operation of temporary transfer laws. We note that substantially more empirical work is needed on other unanswered questions, such as how often temporary transfers occur, their effect on reducing suicides, and whether firearm owners would be more likely to turn to law enforcement or retailers for storage than family and friends.

CONTRIBUTORS

M.J. Gibbons had full access to all study data and takes responsibility for the integrity of the data and the accuracy of the data analysis; she drafted the article and provided administrative and material support. M. D. Fan, A. Rowhani-Rahbar, and F. P. Rivara supervised the study. All authors contributed to the concept and design of the study; data acquisition, analysis, or interpretation; and critical revision of the article.

CONFLICTS OF INTEREST

A. Rowhani-Rahbar and F. P. Rivara have received grants from the National Institutes of Health, the US Department of Justice, and Arnold Ventures and contracts from the City ofSeattle and the State of Washington for firearm research. M. J. Gibbons and M. D. Fan have no disclosures to report.

Sidebar

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DETAILS

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Policy Changes and Child Blood Lead Levels by Age 2 Years for Children Born in Illinois, 2001–2014

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ABSTRACT (ENGLISH)

Objectives. To evaluate how lowering the blood lead level (BLL) intervention threshold affects childhood lead testing policy. Methods. We geocoded 4.19 million Illinois lead testing records (2001-2016) and linked to 2.37 million birth records (2001-2014), data on housing age, industrial emissions, and roads. We used multinomial logistic regression to determine predictors of BLLs of 10 micrograms per deciliter (μg/dL) or greater, 5 to 9 μg/dL, and 4 μg/dL. Results. We found that 2.2% of children had BLLs of 10 μg/dL or greater, 8.9% had BLLs of 5 to 9 μg/dL, and 5.7% had BLLs of 4 μg/dL. Pre-1930 housing was associated with more than 2- to 4-fold increased relative risk of BLLs above all thresholds. Housing built in 1951 to 1978 was associated with increased relative risk of BLLs of 5 to 9 μg/dL (relative risk ratio [RRR] = 1.14;95% confidence interval [CI] = 1.06, 1.21) but not with increased relative risk of BLLs of 10 μg/dL or greater (RRR = 0.99;95% CI = 0.84,1.16). At a given address, previous BLLs of 5 to 9 μg/dL or BLLs of 10 μg/dL or greater were associated with increased risk of BLLs of 5 to 9 μg/dL or BLLs of 10 μg/dL or greater among current occupants by 2.37- (95% CI = 2.20, 2.54) fold and 4.08- (95% CI = 3.69, 4.52) fold, respectively. Conclusions. The relative importance of determinants of above-threshold BLLs changes with decreasing intervention thresholds. Public Health Implications. States may need to update lead screening guidelines when decreasing the intervention threshold. (Am J Public Health. 2020;110:734-740. doi: 10.2105/AJPH.2020.305566)

FULL TEXT

Headnote

Objectives. To evaluate how lowering the blood lead level (BLL) intervention threshold affects childhood lead testing policy.

Methods. We geocoded 4.19 million Illinois lead testing records (2001-2016) and linked to 2.37 million birth records (2001-2014), data on housing age, industrial emissions, and roads. We used multinomial logistic regression to determine predictors of BLLs of 10 micrograms per deciliter (μg/dL) or greater, 5 to 9 μg/dL, and 4 μg/dL.

Results. We found that 2.2% of children had BLLs of 10 μg/dL or greater, 8.9% had BLLs of 5 to 9 μg/dL, and 5.7%

had BLLs of 4 μg/dL. Pre-1930 housing was associated with more than 2- to 4-fold increased relative risk of BLLs above all thresholds. Housing built in 1951 to 1978 was associated with increased relative risk of BLLs of 5 to 9 μg/dL (relative risk ratio [RRR] = 1.14;95% confidence interval [CI] = 1.06, 1.21) but not with increased relative risk of BLLs of 10 μg/dL or greater (RRR = 0.99;95% CI = 0.84,1.16). At a given address, previous BLLs of 5 to 9 μg/dL or BLLs of 10 μg/dL or greater were associated with increased risk of BLLs of 5 to 9 μg/dL or BLLs of 10 μg/dL or greater among current occupants by 2.37- (95% CI = 2.20, 2.54) fold and 4.08- (95% CI = 3.69, 4.52) fold, respectively.

Conclusions. The relative importance of determinants of above-threshold BLLs changes with decreasing intervention thresholds.

Public Health Implications. States may need to update lead screening guidelines when decreasing the intervention threshold. (Am J Public Health. 2020;110:734-740. doi: 10.2105/AJPH.2020.305566)

Lead exposure remains a significant threat to children's health in the United States. In 2014 alone, there were 37 824 cases of confirmed blood lead levels (BLLs) of 5 micrograms per deciliter (mg/dL) or greater among the 30 states that reported data to the Centers for Disease Control and Prevention (CDC).1 Lead is a neurotoxin that irreversibly damages the developing brain.2 Exposure in childhood is associated with decreased IQ3 and educational attainment4,5 and increased risk of delinquency.4,6 The most commonly cited risk factor for lead exposure is the age of housing.7 Lead was used as an additive in paint until a federal ban in 1978; however, because of a series of voluntary industry standards and local public health campaigns, the popularity of lead paint began declining around the 1930s and the concentration of lead in paint decreased significantly after 1950.8 Another commonly cited source of lead exposure is drinking water, which may be contaminated by flowing through lead service lines and lead residential pipes which were in use throughout most of the 20th century.9 Lead was also used as an additive in gasoline until 199510 and is still released during some industrial processes involving heavy metals.11 Therefore, proximity to roadways and industrial sites may be associated with lead exposure. The relative impact of these different exposure sources is not well understood.12

Until 2012, the CDC designated 10 mg/dL as the "BLL of concern." In 2012, the CDC began designating a "reference BLL" as a guide for policymaking, which was initially set at 5 mg/dL, based on the 97.5th percentile ofBLLs in the National Health and Nutrition Examination Survey, but more recent data indicate that the 97.5 th percentile of BLLs is now 3.5 mg/dL.13 While there is consensus that there is no safe level oflead,14 many states use this CDC reference level as the threshold that triggers interventions such as case management and environmental inspections.

Although federal guidelines mandate that all children on Medicaid must be screened for lead exposure at ages 1 and 2 years, state and local health departments set their own guidelines for children not on Medicaid. While some states have adopted universal testing,15 neither the CDC nor the US Preventive Services Task Force has recommended the practice.16,17 Many states, including Illinois, mandate testing only in certain zip codes that are designated high risk; an understanding of exposure sources is necessary to accurately define risk. However, as the intervention threshold decreases, the distribution and relative importance of different predictors oflead exposure may also change.

As part of a comprehensive evaluation of lead screening policies in Illinois, we used geospatial analysis oflead testing and exposure data to investigate the relative importance of different sources oflead exposure in predicting above-threshold BLLs in the setting of changing intervention thresholds. We linked 16 years of lead tests administered to more than 1 million children to Illinois birth records and geocoded the test address, allowing us to integrate exposure data, including housing age, industrial emissions, and the location of major roads. Using multinomial logistic regression analysis, we identified demographic and exposure variables associated with 3 outcomes: BLLs above the intervention threshold in Illinois during our sample period (10 mg/dL), BLLs between 5 and 9 mg/dL, and BLLs at a potential future level of reference of 4 mg/dL. To the best of our knowledge, this article is the first to show the implications of decreasing BLL thresholds for lead screening policy.

METHODS

We obtained birth records for all 2.37 million children born in Illinois between 2001 and 2014 from the Illinois Department of Public Health. Birth records included demographic information such as race, ethnicity, parental education level, and parental age. We also obtained records of all 4.19 million lead tests performed on these children between 2001 and 2016. In Illinois, there are 3 groups of children for whom doctors are required to complete blood lead tests: children who are on Medicaid, who comprise 41.6% of the population aged younger than 6 years according to the 2017 American Communities Survey; children who live in 1 of the 43.5% of zip codes designated high-risk by the Illinois Department ofPublic Health, including the entire city of Chicago; and children who screen positive on a risk assessment questionnaire provided by the Illinois Department of Public Health. The distribution ofhigh-risk zip codes in Illinois is mapped in Figure 1a. The screening rate in our sample was 43.0%.

Matching

Overall, we successfully matched 89.4% of all lead tests to a birth record and this rate improved steadily throughout the study period as shown in Figure A (available as a supplement to the online version of this article at http://www.ajph.org). We linked the lead testing and birth data sets by using a custom fuzzy matching algorithm based on the Jaro-Winkler string distance18 of first name, last name, and date of birth with manual review of optimal cutoffs. Each lead test record contained the name and address of the child, the date of the blood draw, the type of test (venous or capillary), the test result, and identifiers for the testing laboratory.

Certain laboratories reported all values below a certain threshold as the cutoff value, implying a minimum reporting limit. We determined the minimum reporting cutoffs for each laboratory test type-year combination by manual review of BLL histograms. The distribution of BLLs is skewed to the right; therefore, an absence of tests below a certain value for a given laboratory likely indicates that the laboratory has a minimum reporting limit. We recoded all test results that were reported at those limits to the average test result below the cutoff in that year-test type group among laboratories without cutoffs. We recoded all the corrected test results to values less than 3.8 mg/dL. We plotted a histogram of laboratory cutoffs in Figure B and we replicated our analysis with unadjusted test results in Table A (available as supplements to the online version of this article at http://www.ajph.org).

We only used tests before the age of 2 years because younger children spend more time in the home and are likely to be maximally exposed to lead hazards at home. For each child, we used the highest venous test if available. If children had only capillary tests, we used the highest confirmed capillary test- that is, a capillary test followed by another test within 3 months.19 Absent venous or confirmed capillary test, we used the highest unconfirmed capillary test. We replicated our analysis using only venous tests in Table B (available as a supplement to the online version ofthis article at http://www.ajph.org).

We standardized and geocoded all test addresses with ArcGIS (ESRI, Redlands, CA). We obtained data on housing age from parcel data provided by the Zillow Transaction and Assessment Database.20 Among the 1 201 801 children with a lead test by age 2 years, we successfully geocoded testing addresses of928 371 and linked parcel data of 640 347. The geocoding rate improved throughout the study period as shown in Figure C (available as a supplement to the online version of this article at http:// www.ajph.org). Median housing age by zip code is mapped in Figure 1b. We obtained income data for each census block group from the 2015 American Community Survey21 and defined each census block group as low income if the median household income was less than $40 000.

We also collected Toxic Release Inventory (TRI) data maintained by the Environmental Protection Agency, which details industrial lead emissions, including geocodes for the point sources.22 These data are consistently available since 2001; hence, we started our sample that year. In addition, we obtained the location of major roadways, defined as state and interstate highways, from the Illinois Department of Transportation.23 We calculated the distance from lead-emitting facilities and roadways to each child's address. We performed data cleaning, linkage, analysis, and plotting in R version 3.4 (R Foundation, Vienna, Austria) and Stata version 15.1 (StataCorp LP, College Station, TX).

Data Analysis

We investigated correlates ofabovethreshold BLLs at different thresholds by estimating the following multinomial logistic regression model:

(1) (ProQuest: ... denotes formula omitted.)

where BLL¦yzt =x is a categorical variable that is 1 if child i had a BLL of 4 mg/dL, 2 if the child had a BLL of 5 to 9 mg/dL, and 3 if the child had a BLL of 10 mg/dL or greater. Although some have suggested 3.5 mg/dL as a future reference level, we used 4 mg/dL as a hypothetical cutoff because during our study period, the Illinois lead program stored test results truncated to the nearest integer. The subscripts y, z, and t denote the birth cohort, zip code, and the year of test, respectively. Vintagei is a vector of indicators for decade of construction of housing at testing address for child i, which was initially stratified by decade to generate Figure 2, and subsequently stratified as 1930 or before, 1931 to 1950, 1951 to 1977, and 1978 or after to generate the tables; TRIiy is a vector of cumulative industrial lead emissions at given distances from the child up to birth year y; Roadi is a vector of indicators for major roads at given distances from the child's testing address; and X_i is a vector of child and mother characteristics, including indicators for previous instances of above-threshold BLLs at the child's testing address, race, ethnicity, age, Medicaid status, education and age of the mother as recorded in the birth certificate, and median income in the child's census block group.

We included vectors of indicators for the child's birth cohort (Xy), the combination of testing laboratory and year of test (1t), and month oftest (tt). By controlling for the combination of testing laboratory-year fixed effects, we partialled out systematic measurement or reporting bias. We report relative risk ratios (RRRs) and 95% confidence intervals (CIs) for all coefficients. We tested for equality of the coefficients for the 3 outcomes by using the %2 test and used the Benjamini-Hochberg procedure to account for multiple testing.24 Zz is a vector of zip code-level means of all the other regressors included in the model. This modeling choice of random effects has been proposed to solve the incidental parameters problem induced by including fixed effects in nonlinear regressions.25,26 By controlling for zip code random effects, we partialled out average housing conditions in each neighborhood, reducing the risk that our results were affected by selection bias and sorting. We report a version of this model that does not include zip code random effects in Table C, without adjustment oflaboratory reporting thresholds in Table A, with only venous measurement in Table B, and with data only from the second half of the sample period (2009-2016) in Table D (available as supplements to the online version of this article at http://www.ajph.org).

RESULTS

Table 1 shows summary statistics of relevant variables in our study group. Based on mother's race, children in our sample were 66.8% White, 21.8% Black, and 3.8% Asian. More than a third of our sample (36.6%) lived in census block group with a median income less than $40 000, and almost half of the children (47.9%) had mothers with a highschool diploma or less education. Many children lived in old housing, with 45.6% living in housing built before 1930, 8.3% living in housing built between 1931 and 1950, and 30.2% living in housing built between 1951 and 1978. Figure 1b shows a map of median housing age by zip code, showing that the oldest housing is concentrated within the city ofChicago and in the western part of the state, while the Chicago and St Louis, Missouri, suburbs have predominantly newer housing. The current definition of high-risk zip codes for the purposes of lead screening appears to correlate well with the oldest housing. Only 3.4% of children lived within 30 meters of a major road and even fewer (0.3%) lived within 250 meters of a facility with any lead emissions.

Among tested children, 2.2% had their highest BLL at 10 mg/dL or greater, 8.9% had it at 5 to 9 mg/dL, and 5.7% had it at 4 mg/dL. Table 2 presents our regression coefficients expressed in RRRs. Several demographic factors were associated with increased relative risk of above-threshold BLLs. Being Black was associated with increased relative risk of above-threshold BLLs. By contrast, Hispanic ethnicity was associated with lower risk of above-threshold BLLs, and being Asian had no association with relative risk of abovethreshold BLLs.

The association between housing construction decade and RRR of abovethreshold BLLs is plotted in Figure 2. Table 2 shows that, relative to housing built after 1978, housing built between 1950 and 1978 was not associated with increased relative risk of BLLs of 10 mg/dL or greater (RRR = 0.99; 95% CI = 0.84, 1.16) but was associated with increased relative risk of BLLs of 5-9 mg/dL (RRR 1.14; 95% CI = 1.06, 1.21) and BLLs of 4 mg/dL (RRR= 1.26; 95% CI= 1.19, 1.34). The association between housing age and risk of above-threshold BLLs was strongest for housing built before 1930, which was associated with increased risk of BLLs of 10 mg/dL or greater (RRR = 4.06; 95% CI = 3.49, 4.71), 5 mg/dL or greater (RRR = 2.65; 95% CI = 2.44, 2.89), and 4 mg/dL or greater (RRR = 2.28;

95% CI = 2.13, 2.45). We also found that previous instances of above-threshold BLLs at a given address were significantly associated with above-threshold BLLs among later residents. A previous resident having a BLL of 5 to 9 mg/ dL increased the relative risk of current resident having a BLL of 5 to 9 mg/dL by 2.37(95% CI = 2.2, 2.54) fold while a previous BLL of 10 mg/dL or greater increased the relative risk of a current resident having BLL of 10 or greater by 4.08- (95% CI = 3.69, 4.52) fold.

Moreover, proximity to state and interstate highways did not significantly increase the relative risk of above-threshold BLLs. Finally, an increase of cumulative air lead emissions within 250 meters of a child's home was associated with higher relative risk of abovethreshold BLLs at all thresholds (RRR for BLL >10 mg/dL= 1.0027; 95% CI= 1.0016, 1.0037 per ton of emissions).

Ourresults were stable in models using data without adjustment for laboratory reporting thresholds (Table A) and with venous tests only (Table B). Using a model that did not account for zip code random effects (Table C) produced larger RRRs for demographic variables and housing age. Using data from the second half of the sample period (Table D) generated consistent RRRs compared with the entire sample period, with the exception that being Black was not associated with increased relative risk of BLL of 10 mg/dL or greater, but continued to be associated with increased relative risk of BLLs of 4 mg/dL or greater.

DISCUSSION

As childhood lead levels continue to decrease around the nation, the CDC reference level is likely to be decreased,13 prompting state and local health departments to evaluate whether to lower the intervention threshold that triggers environmental inspection and case management.

Our exposure analysis revealed that the relative importance of exposure sources also changes as the exposure threshold decreases. We found that housing built between 1950 and 1978 did not appear to significantly increase the relative risk ofBLLs of10 mg/dL or greater but did increase the relative risk of BLLs of 5 to 9 mg/dL and 4 mg/dL. Therefore, states may want to take into account the prevalence of any pre-1978 housing when determining which zip codes are high risk under a lower intervention threshold. Focusing solely on housing built before 1950, as recommended by the current CDC guidelines,17 may result in missing children with BLLs above the lower intervention thresholds. Regardless of the intervention threshold, housing built before 1930 is associated with exceptionally high risk of abovethreshold BLLs compared with housing built after 1978. The dramatic increase in relative risk of above-threshold BLLs for housing built before 1930 is consistent with surveys of the housing stock that indicate that lead hazards are much more prevalent in the oldest housing.27 Thus, policymakers may need to develop nuanced programs aimed at the most at-risk children under any threshold. For example, housing built before 1930 could be targeted for preventive remediation, which was recently shown to reduce mean BLLs only in the highest-risk children,28 while housing built between 1930 and 1978 could be targeted for blood lead screening.

We also showed that previous instances of both BLLs of 5 to 9 mg/dL and 10 mg/dL or greater at an address were associated with increased relative risk of above-threshold BLLs of the current occupants. During the study period, a BLL of 10 mg/dL would have triggered visits from case management, an environmental inspection, and mandated remediation oflead hazards iffound. In reality, remediation of lead hazards often does not occur or may take many months to complete.29 This lack of compliance may explain why children living in housing with previous BLLs of10 mg/dL or greater remain at risk for exposure. Illinois has recently decreased the intervention threshold from 10 to 5 mg/dL, and our findings suggest that homes where BLLs of 5 to 9 mg/dL were previously detected may continue to put children at increased risk for BLLs above the new threshold if they are not remediated in a timely fashion.

We found that being Black, along with several other demographic variables such as having a mother with low education levels and living in a low-income area, was associated with increased relative risk of abovethreshold BLLs, which is consistent with the existing literature.13,30 We found that these demographic effects on BLLs persisted after we controlled for neighborhood characteristics and housing age, suggesting that even within a given zip code and for a given housing age, families from disadvantaged backgrounds may be living in the most dangerous housing. In the version of our model run on the subsample of children born between 2009 and 2016 (Table D) we found that being Black appeared to no longer be associated with BLL of 10 mg/dL or greater but

continued to be associated with BLLs of 4 mg/dL or greater. This finding implies that while disparities in severe lead poisoning may have shrunk in recent years,13 disparities persist in rates of moderately elevated BLLs.

Our results indicate that current air lead emissions from industrial sources did not significantly contribute to BLLs except for children living very close to lead-emitting facilities. Because of the high weight of lead particles, the amount of lead deposited in soil from air emissions decays rapidly within 100 meters of the source.31 Therefore, most children in our sample may not live close enough to facilities for these effects to become significant. Roadway emissions constituted another important source of lead in soil because gasoline contained lead until 1996. We found that that proximity to state and interstate highways was not associated with increased risk of above-threshold BLLs in our sample. While significant lead hazards remain in urban soil,32 a more detailed model including data on historical traffic density may be required to analyze these effects of roadways on lead exposure. While older studies have found a strong correlation between proximity to roadways and BLL,33 a recent analysis found that the association between proximity to roadways and BLLs is weakening over time,5 which could be related to a range of factors including decreasing soil lead concentrations, changes in the built environment, or changes in behavior. In addition, our analysis does not include data on historical traffic density, which may modify the association between above-threshold BLLs and proximity to state and interstate highways.

Limitations

This study is one of the largest populationlevel analyses of the importance of different lead exposure sources to date. However, there are several limitations to our work in addition to the lack of local road and traffic data. First, we did not examine the effects of lead in drinking water, a source of exposure that gained significant attention during the crisis in Flint, Michigan.34 Lead in water may originate from lead in mains, service lines, or residential pipes,9 but there are little available data on each source. Given historical patterns oflead pipe use, we believe that the inclusion of housing vintage in our model partially accounts for the effects of water lead levels.35 We performed a separate analysis including only children born in Chicago, where lead service lines were mandated until 1986,35 and did not find a significant decrease in risk of BLLs of 5 mg/dL or greater for housing built after 1986 relative to housing built in 1978 (Figure E, available as a supplement to the online version of this article at http://www. ajph.org), suggesting that lead in these service lines did not make a significant contribution to children's risk of above-threshold BLLs. This is consistent with previous studies that have found that lead in water accounted for less than 10% of total exposure among children with high lead levels.12 Second, we conducted our analysis by using the address at the time oftest, but not all of children's exposure occurs in the home. We attempted to minimize this limitation by focusing on younger children aged 0 to 2 years. Third, while children's Medicaid enrollment status was reported on the lead test, this variable may be incompletely reported given that 41.6% of Illinois children are on Medicaid, compared with only 25.8% in our sample.

Public Health Implications

Our results suggest that states may need to re-evaluate their screening guidelines for non-Medicaid-eligible children when they lower the intervention threshold because the determinants of lead exposure may change. When determining which zip codes are high-risk, focusing on pre-1950 housing is reasonable when the threshold is 10 mg/dL, but when the threshold decreases to 5 mg/dL, all children living in pre-1978 housing appear to be at risk for above-threshold BLLs. Regardless of the intervention threshold, children living in pre-1930 housing are at an exceptionally elevated risk for abovethreshold BLLs, suggesting that policymakers should consider devoting additional resources to families living in these homes.

Using individual data geocoded at the test address and controlling for a variety of random and fixed effects, we show that even after controlling for the age of housing and the neighborhood they live in, Black children, children with low parental education level, and children living in low-income neighborhoods are at increased risk for abovethreshold BLLs. Although there has been progress toward reducing racial disparities in above-threshold BLLs, our findings indicate that significant disparities in risk ofhigh BLLs remain. This result highlights the continued need for considering race when allocating resources for childhood lead poisoning prevention. >4jPI-l

CONTRIBUTORS

All authors contributed to design of the study, data analysis, and editing of the final article. A. Abbasi composed the initial draft ofthe article. A. Abbasi and L. Gazze were responsible for conceptualization and oversight of the study.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest relevant to this article.

HUMAN PARTICIPANT PROTECTION

This study was approved by the University of Chicago institutional review board'.

Sidebar

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DETAILS

Subject:	Blood; Public health; Housing; Intervention; Children; Air pollution; Blood levels; Risk; Statistical analysis; Industrial emissions; Industrial plant emissions; Thresholds; Age; Confidence intervals; Testing laboratories; Children &youth; Lead content; Lead poisoning; Childhood; Disease control; Medicaid; Postal codes
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The Occupational Safety and Health Administration at 50: Protecting Workers in a Changing Economy

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ABSTRACT (ENGLISH)

The passage of the Occupational Safety and Health Act of 1970 brought unprecedented changes in US workplaces, and the activities of the Occupational Safety and Health Administration (OSHA) have contributed to a significant reduction in work-related deaths, injuries, and illnesses. Despite this, millions of workers are injured annually, and thousands killed. To reduce the toll, OSHA needs greater resources, a new standardsetting process, increased civil and criminal penalties, full coverage for all workers, and stronger whistleblower protections. Workers should not be injured or made sick by their jobs. To eliminate work injuries and illnesses, we must remake and modernize OSHA and restructure the relationship of employers and workers with the agency and each other. This includes changing the expectation of what employers must do to protect workers and implementing a requirement that firms have a "duty of care" to protect all people who may be harmed by their activities. Only by making major changes can we ensure that every worker leaves work as healthy as they were when their work shift began. (Am J Public Health. 2020;110:631-635. doi: 10.2105/AJPH.2020.305597)

FULL TEXT

Headnote

The passage of the Occupational Safety and Health Act of 1970 brought unprecedented changes in US workplaces, and the activities of the Occupational Safety and Health Administration (OSHA) have contributed to a significant reduction in work-related deaths, injuries, and illnesses. Despite this, millions of workers are injured annually, and thousands killed.

To reduce the toll, OSHA needs greater resources, a new standardsetting process, increased civil and criminal penalties, full coverage for all workers, and stronger whistleblower protections. Workers should not be injured or made sick by their jobs. To eliminate work injuries and illnesses, we must remake and modernize OSHA and restructure the relationship of employers and workers with the agency and each other.

This includes changing the expectation of what employers must do to protect workers and implementing a requirement that firms have a "duty of care" to protect all people who may be harmed by their activities. Only by making major changes can we ensure that every worker leaves work as healthy as they were when their work shift began. (Am J Public Health. 2020;110:631-635. doi: 10.2105/AJPH.2020.305597)

The Occupational Safety and Health Administration (OSHA) is both a great success and a failure. Fifty years after the agency began operations is an opportune moment to both recognize the contribution it has made to the prevention of work injuries and illnesses and acknowledge the gaps in the law that still permit millions of workers to be hurt every year. More importantly, now is the time to launch an initiative to reimagine OSHA to ensure that all workers have the real opportunity to leave work as healthy as they were when their work shift began.

On December 29, 1970, President Richard Nixon signed into law the Occupational Safety and Health Act of 1970 (OSH Act), creating OSHA. For the first time, workers in the United States had the right to a safe work environment, and their employers had the legal obligation to provide it. Although the existence of OSHA and the responsibilities of employers are largely an accepted part of the workplace environment, the revolutionary nature of the OSH Act and the unprecedented changes it produced in the nation's workplace have largely been forgotten.

There is little question that OSHA's efforts have saved tens of thousands of lives and prevented millions of injuries. In the first year of OSHA's existence, 38 workers were killed on the job every day; now, with a workforce more than twice as large, that figure has dropped to 14 each day.1 There has also been a significant drop in workplace injuries. There is extensive evidence that OSHA standards are effective in preventing injuries and illnesses and that OSHA inspections lead to decreases in injuries for several years after a workplace is inspected.2-6

But the challenge for preventing work-related injuries, illnesses, and deaths remains large, and the toll is significant. More than 5000 workers are killed on the job every year, and the fatal injury rate has stopped decreasing. Currently, employers report that more than 3 million workers are injured on the job each year, and, according to the Bureau of Labor Statistics, this is a significant undercount of the actual number of injuries.7 The rates of fatal and nonfatal injury are no longer decreasing, and changes in the workplace and the workforce have made OSHA's tools and approaches increasingly less effective. The injury rates in many industries, such as agriculture, logging, and health care, remain alarmingly high. There are no reasonably accurate estimates of the number of work-related illnesses that occur each year, although perhaps 50 000 workers die annually from past exposures to toxic substances.8,9

Much of the burden of these conditions falls on low-wage workers, making work injuries and illnesses a component of the growth in the nation's economic inequality: injuries and illnesses block many low-wage workers from entering the middle class and even push some better paid workers into poverty. The failure of the workers' compensation system to provide adequate benefits for many of these workers forces them into taxpayer-supported programs such as Social Security Disability 10,11 Insurance.

The OSH Act generated a new and controversial federal government power: the right of government inspectors to enter private sector workplaces and require that hazards be controlled. But much of that initial promise was unfulfilled because of budget restrictions, judicial rulings, executive orders, appropriations riders, and strong opposition from the business community. Perceived government interference in the property rights ofbusiness owners has made OSHA the target of political and legal opposition for its entire history. As a result, the agency took a legalistic approach to workplace conditions, focusing primarily on compliance with its often limited and out-of-date regulations, unable to address the power dynamics at the workplace that has allowed the continued presence of hazardous working conditions.

The weaknesses now facing OSHA are significant and well recognized. OSHA's standardsetting process is broken; it takes years or even decades, and huge resources, to issue new standards able to withstand strong antiregulatory political opposition and well-funded industry lawsuits. The result is that the agency has few up-to-date standards for protecting workers from chemical exposures or safety hazards.

These limitations are compounded by a severe lack of resources. OSHA's annual budget is less than $600 million, a fraction of the Environmental Protection Agency's $8 billion budget. Federal OSHA, along with the 22 state plans covering private sector workers and 6 additional state plans that cover only private sector workers, have jurisdiction

over between 7 million and 8 million workplaces where more than 130 million workers are employed. Federal OSHA and state plans combined have only around 2000 inspectors. And the problem has gotten worse. In 1980, OSHA had 14.8 inspectors for every million covered workers; by 2018, that ratio had dropped to 5.6. With current staffing, it would take federal OSHA 165 years to visit every establishment in its jurisdiction just 1 time.12

When inspectors do find hazards, OSHA's small monetary penalties and weak criminal sanctions hardly deter employers who attempt to cut corners by endangering workers. Although the law, as originally envisioned, provides robust opportunity for worker involvement in the enforcement process, the OSH Act's language intended to prevent retaliation against employees who exercise those rights are weak and outdated. Fifty years after the OSH Act was passed, large swaths of the American workforce still lack even the basic right to a safe workplace. Eight million public employees do not have OSHA protections despite the hazardous work they perform every day. Agricultural workers on small farms also lack OSHA protections.

Finally, the OSH Act was originated overhalfa century ago to address working conditions and employee-employer relationships that are radically different from those that exist today. It was enacted in an economy that was dominated by highly unionized manufacturing and construction sectors. The political power of public sector employees was so insignificant that public sector workers were not even covered under the OSH Act. The law was passed largely because ofunion organizing, and the substantial worker participation rights written into the law generally assumed union involvement in OSHA inspections and other activities.

Today, we live in a much different world. Manufacturing employment has shrunk significantly, with the concomitant rise of employment in the retail, service, and government sectors and the different mix of hazards that accompany them. However, with much smaller employment in the manufacturing sector, and with only 1 in 16 private sector workers represented by a union,13 most workers are unable to exercise their rights under the law, and union-associated safety and health activities directly affect conditions for only a small percentage of workers. Evidence and common sense show that a stronger labor movement, with activist unions representing a far larger proportion of the workforce, would result in safer workplaces.14

Not only has the structure of the economy changed significantly since 1970, but the traditional employer-employee relationship that was common in 1970 is far less common. Today, individuals may work for dozens of different companies throughout their lives, with an increasingly large share employed in nontraditional employment relationships. Contractors and subcontractors perform all types of work, and many employers falsely claim that their employees are "independent contractors," enabling them to avoid OSHA coverage and other employer obligations. Staffing agencies provide temporary workers in every type of industry, and new sorts of staffing arrangements seem to be appearing on a regular basis. Millions of workers are involved in jobs in the "gig economy," in which their employment is mediated through online platforms. We're increasingly seeing the fissuring of employment with employees of multiple employers, as well as independent contractors, working together in the same workplace.15

The resulting fissured workplace is a far more dangerous place. Employers often fail to communicate about hazardous working conditions with other employers at the same site and, especially for temporary workers and day laborers, provide little or no safety training. These workers are often unaware of the protections that are supposed to be provided on the job or who is responsible for providing those protections and, given their precarious status, are often concerned that identifying hazards or reporting injuries may result in job loss. Current labor law, created many decades ago, often makes it challenging for enforcement agencies to determine which employer (if any) is responsible for providing a safe workplace,

Workers in the gig economy face even greater challenges in ensuring their health and safety. Corporations, such as Uber and TaskRabbit, that employ technology systems (called "platforms") that assign workers to work activities are attempting to classify workers as independent contractors, who as a result have no OSHA coverage. When successful, these firms have little or no legal responsibility to provide safe work and bear no workers' compensation costs or legal liability when these workers are injured. Further, a significant proportion of workers in dangerous industries, including agriculture, construction, and meat and poultry processing, are undocumented, and some are non-English speaking.16 Especially in the current political climate, many are hesitant to refuse hazardous work or

even raise their voices to contact OSHA when they identify hazards.
These changes in the structure ofthe American economy, in the workplace, and in employer- employee relationships are so significant that the case can be made that we have reached the limits of the (limited) effectiveness of OSHA's current approach as it was originated half a century ago.
We highlight 4 steps that would prevent a significant number of injuries, illnesses, and fatalities. Some of these and others have been proposed in the Protecting America's Workers Act, legislation that has been introduced multiple times since 2004 but never passed by Congress.17
DEVELOP A NIMBLE STANDARD-SETTING PROCESS
Standards are OSHA's most important and effective tool for protecting the safety and health of workers because standards alter the behavior of many employers across 1 or many industries. Standards, by definition, are norm setting: they change expectations of employer behavior. Many employers make great effort to be law abiding and, therefore, to meet the legal standards promulgated by OSHA.
The American economy is huge and changing rapidly, and it takes a nimble rule-making process to keep up with hazards accompanying new technologies and chemicals. Unfortunately, OSHA's regulatory process is far from nimble. OSHA's standards writing staff is nowhere near large enough to fill the need for new or updated standards, and the agency's processes for developing new standards or updating old ones are among the most burdensome and resource intensive of any agency in the federal government.
In particular, most OSHA chemical exposure standards are inadequately protective and outof-date. More than 90% of current permissible exposure limits date to industry consensus standards set in the 1960s, and there are no permissible exposure limits for the vast majority of chemicals used in today's workplace; OSHA's attempts to address this have been unsuccessful.18 As a result of OSHA's inability to issue adequate chemical standards, along with the accompanying difficulty of using OSHA's general duty clause to issue citations where no standard exists, means that the agency conducts relatively few inspections to monitor chemical exposures.
A sizable portion of OSHA's safety standards are also antiquated. Many were issued in the early 1970s and were based on industry consensus standards. But industry associations have moved forward to update those consensus standards every few years; OSHA has not. Although many employers and, especially, equipment manufacturers strongly desire new safety standards to ensure that their workers are able to work safely, OSHA does not have adequate staff to update standards on newer technologies.
In addition, OSHA has no standards on hazards that cause large numbers of injuries and illnesses, including ergonomic hazards, the source of perhaps one third of all conditions reported on OSHA logs12; heat exposure, even though dozens of workers die from heat exposure every summer and, this number is likely to rise with the climate crises19; and workplace violence, which affects many workers in health and social service employment.20 In addition, OSHA's noise standard is out-of-date and unprotective, and the agency's hearing protection enforcement policy makes it even more unlikely that an employer will be cited in most situations in which hazardous levels of noise are present.21 OSHA has few standards that protect the highly dangerous area of oil and gas drilling, nor do OSHA standards cover many hazards in agriculture.
To be effective, OSHA must be able to issue many new standards quickly. Those who envisioned the law in the 1960s would undoubtedly be aghast at the decade or more it often takes OSHA to issue a single standard. For chemical hazards, a shortterm solution would be for OSHA to issue regulations requiring employers to consider the safe use directions and warnings provided by manufacturers on labels and safety data sheets, applying the hierarchy of controls and the general approach of OSHA's comprehensive chemical exposure standards-including, as appropriate, labeling, education, and training and medical surveillance. Employers could choose not to follow these directions but only by showing their alternative approach is at least as protective. A short-term fix for OSHA's safety standards is to allow OSHA to easily adopt voluntary consensus standards, including updates of American National Standards Institute and other consensus standards, if the consensus panel is representative of the industry; structured to give adequate weight to the voices of workers; and provides adequate, enforceable protections.
INCREASE DETERRENCE

The main principle underlying OSHA's enforcement efforts is deterrence: encouraging or requiring employers to eliminate exposure to hazards that cause injury or illness-before workers are injured, made ill, or killed. Enforcement inspections, OSHA's main tool of deterrence, are effective in preventing injuries at inspected workplaces for several years after the inspection.2-6 Knowledge that OSHA inspects and issues penalties drives employers to abate hazards before an inspector actually appears at the establishment's door, magnifying the deterrent effect of inspections.22 OSHA also has extensive cooperative programs to assist small employers to make their workplaces safer and recognition programs for employers who commit to going beyond OSHA requirements; although useful, these programs affect relatively few workplaces and make only a small contribution to preventing injuries in other worksites.

OSHA has 2 penalties it can employ against employers who violate the law and endanger workers: civil monetary penalties and criminal penalties. Monetary penalties are effective only if employers believe they may receive a significant penalty for allowing a hazard to go unabated. Otherwise they become just a (small) cost of doing business. But given the tiny size of the OSHA inspectorate, it is highly unlikely that an employer will ever see an OSHA inspector unless a worker is killed or severely hurt. And when OSHA does inspect, monetary penalties are so small for all but the smallest employers that the impact is unlikely to motivate many employers to address unsafe conditions.

In 2015, Congress raised the maximum OSHA penalty from $7000 to $12 471 -adjusting for the rate of inflation since 1990 (when monetary penalty levels were previously set)-and Congress now requires the maximum be adjusted annually for inflation; however, OSHA penalties remain ineffective as deterrents, especially for large corporations. Although it is possible in some rare egregious cases for OSHA to levy penalties in the millions of dollars, even those sizable fines are too inconsequential to act as a deterrent for the largest corporations.

Criminal penalties with jail time for corporate directors are arguably more effective penalties, especially for large companies, but the current law provides for criminal prosecution only in instances in which a worker is killed and the employer has been cited for a willful violation of an OSHA standard. Even in these cases, the crime is considered a misdemeanor, punished by a maximum of 6 months in prison. The high bar and low penalty mean that federal prosecutors use this provision in the rarest of occasions, making it almost meaningless as a deterrent.

Given the low odds of an inspection, the relatively low costs of penalties following inspections even when many violations are found, and the externalization of costs of not abating hazards, it is not surprising that many employers fail to prioritize the control or elimination of workplace hazards. Changing the calculus involving each ofthese factors will increase the effectiveness of OSHA's enforcement program and will prevent workplace injuries.

PROVIDE FULL OSHA COVERAGE FOR ALL WORKERS

Fifty years after passage of the OSH Act, millions of workers still do not enjoy the right to a safe workplace, and employers have no legal obligation to provide safe working conditions. In those cases, when a worker is killed, no investigation occurs, no penalties are applied, and no lessons are learned.

The largest gap in OSHA coverage involves public sector workplaces. Under the OSH Act, public employees are not covered by federal OSHA even though they do work that is as dangerous or more dangerous than private sector work. The 21 states that run their own OSHA programs with matching federal funding, and Puerto Rico, which does as well, are required to cover their public sector workers, and other states may cover only their public employees with federal oversight and matching funding. Only 5 states and the Virgin Islands have taken advantage ofthis option; almost 50 years after private sector workers were given the right to a safe workplace, 8 to 9 million public sector workers in 24 states and the District of Columbia remain employed in OSHA-free zones.

Workers on small farms are at greatly increased risk of dying on the job. Yet every year, Congress includes language in the annual appropriations legislation that prohibits federal OSHA from expending any funds to inspect or enforce on farms with 10 or fewer workers. When OSHA receives a complaint from a desperate worker or a report of a farmworker killed in a confined space or drowned in a manure pit, the first question OSHA must ask is how many workers are employed by the farm. If it is a small farm, OSHA is prohibited not only from any enforcement actions but even from making a telephone call to ask what happened or giving advice on how to prevent the next death.

Only some state plan states set aside nonfederal funds to inspect small farms.

STRENGTHEN OSHA'S WHISTLEBLOWER PROTECTIONS

The people with the greatest knowledge of the presence of workplace hazards are the workers who are exposed to those hazards. To help protect themselves and their co-workers, workers must be able to discuss their concerns with their coworkers, raise their concerns with their employers, and alert OSHA or other government agencies about the presence of these hazards, all without fear of retaliation. Workers' rights under the law are meaningless without an effective way to prevent employers from retaliating against workers for exercising their rights. Unfortunately, the whistleblower protection provisions in the OSHA law are very weak and outdated, especially in comparison with the protections provided in more recent legislation protecting workers who voice safety or health concerns. Under section 11(c) of the OSH Act, for example, workers must file their claim within 30 days of the retaliation, the burden of proof is unnecessarily rigorous, OSHA cannot order preliminary reinstatement of wrongly discharged employees, and there is no individual right of action.23

Implementation of these recommendations would be useful, but given the changes in the structure ofthe US economy and in employer-employee relationships over the past half century, we also need to modernize the institutions charged with ensuring the safety and health of workers. If we truly want to eliminate work injuries, we must take steps to restructure OSHA and the relationship of employers and workers with the agency and, more importantly, with each other. Stronger unions enable workers to be less dependent on government intervention to make their workplaces safer. As we consider ways to reshape our system of worker protections, it must be done so that workers have more power at the workplace, so they can protect themselves rather than relying solely on an inevitably underfunded and politically vulnerable government agency.

The OSH Act is based on the concept of compliance with OSHA standards and regulations. However, it is widely recognized that many fatalities and serious injuries will not be prevented by simply complying with all OSHA standards, nor will there ever be OSHA standards to cover every hazard. Employers who are truly committed to preventing injuries and illnesses (like many of those in OSHA's cooperative programs) go beyond simple compliance with OSHA standards. They understand the need for dynamic safety and health management systems, continuous improvement processes whose objective is to find and fix all workplace hazards-even those for which there are no OSHA standards-before workers are hurt.

It is sometimes said, "Every company has a safety and health management system. Many of them just don't know it." And many of those are based on hope and luck. These employers hope their employees are lucky enough to avoid serious injuries or illnesses. Among safety and health experts, it is axiomatic that safety and health management systems, in which managers have demonstrated commitment and workers are empowered participants, are the key to successful prevention of work injuries and illnesses. Many professionals feel that a safety and health management system requirement should have been the first standard OSHA issued. To increase its effectiveness, OSHA needs to require employers to actively implement safety and health management systems.

In addition, because under the OSH Act, employers are solely responsible for providing safe workplaces to their employees, OSHA's definitions of "employer" and "employee" from 1970 are antiquated in light ofthe dramatic fissuring of workplace employer-employee relationships seen in recent years.

Rather than link safety responsibility solely to the employer-employee relationship, a preferable regulatory approach, as adopted in Australia and New Zealand, is to require a "duty of care" of all businesses. Under this model, all "persons conducting a business or undertaking" (called "duty holders") have a primary duty to ensure, as far as reasonably practicable, that the health and safety of their workers-as well as other workers influenced or directed by that business, consumers, and the general public- are not put at risk by that business's activities.

There is no question that because of OSHA, countless workers have returned safely to their families at the end of their work shift. But we can do better. The political winds have blown against OSHA for decades, and only through a major change in the political direction of the country are we likely to see protecting worker safety and health made a public health (and political) priority. However, given the unacceptable toll of preventable work injuries, illnesses, and deaths, as well as the changes in the workforce and work relationships, it is imperative that we examine and

restructure OSHA and the nation's efforts to protect the safety and health of the nation's greatest resource: our workers.

CONTRIBUTORS

Both authors contributed to the conceptualization, writing, and editing of this analytical essay.

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CONFLICTS OF INTEREST

The authors have no conflicts ofinterest to declare.

HUMAN PARTICIPANT PROTECTION

No protocol approval was necessary because we do not describe a study involving human participants.

Sidebar

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DETAILS

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Straining the System: Novel Coronavirus (COVID-19) and Preparedness for Concomitant Disasters

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ABSTRACT (ENGLISH)

Just a few weeks before the first confirmed case of novel coronavirus (COVID-19) was reported in the United States, the US Centers for Disease Control and Prevention (CDC) issued a bold promise to the nation: the agency will use its scientific expertise to bring a new level of preparedness in the United States and global health security against current and growing threats, finally eliminate certain diseases, and bring an end to the devastation of epidemics.1 The current outbreak of COVID-19 reminds us how urgent this promise is and just how critical it is to continue to sustain and strengthen our nation's public health infrastructure. The unprecedented pace of the public health response to COVID-19 has only been possible because of prior investments in public health preparedness. To accelerate our pace and meet the challenges of current and future health threats, we must advance our world-class data and analytics capabilities; maintain and expand our state-of-the-art public health laboratory capacity; continue building a workforce of trusted, expert, public health professionals; sustain our capacity to rapidly respond to outbreaks at their source; and assure a strong global and domestic preparedness capacity.

FULL TEXT

Just a few weeks before the first confirmed case of novel coronavirus (COVID-19) was reported in the United States, the US Centers for Disease Control and Prevention (CDC) issued a bold promise to the nation: the agency will use its scientific expertise to bring a new level of preparedness in the United States and global health security against current and growing threats, finally eliminate certain diseases, and bring an end to the devastation of epidemics.1 The current outbreak of COVID-19 reminds us how urgent this promise is and just how critical it is to continue to sustain and strengthen our nation's public health infrastructure. The unprecedented pace of the public health response to COVID-19 has only been possible because of prior investments in public health preparedness. To accelerate our pace and meet the challenges of current and future health threats, we must advance our world-class data and analytics capabilities; maintain and expand our state-of-the-art public health laboratory capacity; continue building a workforce of trusted, expert, public health professionals; sustain our capacity to rapidly respond to outbreaks at their source; and assure a strong global and domestic preparedness capacity.

WORLD-CLASS DATA AND ANALYTICS

Advancing world-class data and analytics to support public health decision-making is vital to our disease surveillance and response activities. It is unacceptable that today across the United States many clinicians and public health professionals use 20th century technology to protect and promote the public's health. Think about this: in the year 2020, we still depend on facsimile machines (faxes) to report information about communicable disease cases to state and territorial public health authorities and follow up with paper forms. Critical health data are still managed on paper records or in spreadsheets that require extensive manual data entry and analysis. While we have improved in some areas, the uneven distribution of information technology across the country calls for an upgrade and modernization of the public health data enterprise. The US Congress' recent $50 million down payment on a 21st century public health data superhighway is a start,2 but to put that figure in context, that is about the cost of installing one electronic health records system in one medium-sized health system.

LABORATORY SCIENCE

The CDC's public health laboratory capacity is second to none, and our state and territorial labs complement that national capability, but the CDC must continue to keep pace with scientific advancements in laboratory science and bring partner laboratories along too. The only way that the CDC was able to quickly develop a test for COVID-19 was by having world-class laboratories and a cadre of skilled laboratorians capable of rapidly taking genomic sequence data and developing assays. The outbreak of COVID-19 was recognized by public health authorities in China at the end of December 20 19, and days later genomic sequence data for the putative etiologic agent were published by Chinese health authorities. Within a week, a diagnostic polymerase chain reaction was developed,

validated, and published by the CDC, just in time to confirm the first cases in the United States. We can only do such quick work with sustained and enhanced laboratory capacity at the CDC as well as at state and territorial health departments.

WORKFORCE OF EXPERT PRACTITIONERS

Public health professionals are our biggest asset, and governmental public health agencies need to be able to accelerate the expansion of a workforce of expert practitioners to serve as disease investigators and health ambassadors here in the United States and around the world. The CDC's Epidemic Intelligence Service (EIS) officers have been instrumental in responding to every modern public health emergency in recent history. EIS officers are critical to federal, state, tribal, and local capacity to detect and respond to health threats, and yet we are training fewer officers today than ever because of funding reductions (at its height, the CDC trained 80 disease detectives a year). Currently, there are only 62 available slots in next year's cohort. Likewise, cuts at the state and local level have resulted in fewer public health professionals across all functional areas, including public health preparedness experts, epidemiologists, disease investigation specialists, and many others.3 Further reductions may create uneven response capacity and readiness in the future, potentially compromising our nation's health security at a time when it is needed the most.4

INTERNATIONAL COLLABORATION AND DOMESTIC HEALTH SECURITY

Many ofthe infectious diseases that threaten the United States emerge outside the country, including the Zika virus, SARS (severe acute respiratory syndrome), MERS (Middle East respiratory syndrome), H1N1 and other influenzas, Ebola, and of course COVID-19. Responding to these diseases at their source, rather than awaiting their arrival on our shores, is the best and most prudent public health approach. CDC teams and state and territorial health officials work closely with world health experts in various countries overseas. The CDC embeds staff in, or partners with, ministries of health in more than 60 countries as well as in most state and territorial health departments and many tribal, county, and city public health agencies. Increasing the number of CDC public health advisors and technical specialists who can work side-byside with staff in ministries of health and other governmental public health agencies means a higher likelihood of detecting threats and preventing a disease's spread. An outbreak anywhere across the globe is a potential danger to our health security: almost any place on earth is within a 24-hour flight from a major US airport. The outbreak in Wuhan, China, reminds us just how interconnected the world is and the threats that global travel pose for our nation's health security.

RESTORING PREPAREDNESS INVESTMENTS

Our global interconnectedness is why the CDC needs a strong global health security capacity and complementary domestic public health preparedness capabilities. After the events of September 11, 2001 and the anthrax attacks that same October, Congress invested significant resources in federal, state, and local public health preparedness programs. In 2018, Congress also established the Infectious Disease Rapid Response Reserve Fund to provide needed resources to public health departments during outbreaks and other emergencies. The United States has a robust emergency response capacity in federal, state, territorial, local, and tribal public health agencies, and this capacity has been built in large part by these investments. However, from federal fiscal year (FFY) 2002 to FFY2019, the budget for CDC's Public Health Emergency Preparedness cooperative agreement has been reduced by almost one third (from $940 million to $675 million),5 and public health threats, like COVID-19, continue to increase. As a result, the entire public health system is strained during large scale outbreaks and epidemics. Congressional leadership to bring our public health preparedness investments back to at least FFY2002 levels should be a common-sense priority for federal legislators, regardless of political party.

PREPAREDNESS FOR CONCOMITANT DISASTERS

Imagine a scenario that involves having to effectively respond to a severe influenza season, control multiple domestic outbreaks ofhepatitis, respond to the health impacts of an earthquake, prepare for severe weather emergencies, and prevent the spread of a novel coronavirus, simultaneously. Indeed, that is not a scenario: it is where we are today. As public health leaders, health officials take the responsibilities of preventing disease and protecting the health of the nation extremely seriously. Governmental public health agencies share a unique and

important mission: they work to keep America healthy 24 hours a day, 7 days a week. Outbreaks like the COVID-19 are critical reminders of the significance of public health readiness and the need for continued strengthening of public health agencies' core response capabilities. COVID-19 also reminds us of the importance of realizing the CDC's bold promise to all Americans with adequate investments in the governmental public health system. Â1PU

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Both authors contributed equally to the preparation of this editorial.

CONFLICTS OF INTEREST

The authors have no conflicts ofinterest to report.

Sidebar

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DETAILS

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Farley, S. M., DrP.H., Sisti, J., ScD., Jasek, J., M.P.A., & Schroth, K. R. J., J.D. (2020). Flavored tobacco sales prohibition (2009) and noncigarette tobacco products in retail stores (2017), new york city. American Journal of Public Health, 110(5), 725-730. doi:https://doi.org/10.2105/AJPH.2019.305561

Objectives. To assess explicit- (products clearly labeled flavored) and emergent concept- (products implying flavoring but not clearly labeled) flavored tobacco product availability following New York City's flavor restriction. Methods. We examined explicit- and concept-flavored tobacco product availability, with 2017 New York City Retailer Advertising of Tobacco Survey data (n = 1557 retailers). We assessed associations between block group-level demographic characteristics and product availability by using logistic regression. Results. Most retailers sold explicit-flavored (70.9%) or concept-flavored (69.3%) products. The proportion of non-Hispanic Black neighborhood residents predicted explicit- and concept-flavored product availability, as did having a high school within a retailer's block group for concept-flavored products. Conclusions. Explicit- and concept-flavored other tobacco products persisted throughout New York City, despite 2009 legislation restricting sales. Public Health Implications. Making local sales restrictions or federal production bans inclusive of all explicit and concept flavors would reduce retailer and industry evasion opportunities and protect the health of youths and others.

Seminario, M. M., M.S. (2020). The occupational safety and health act at 50-A labor perspective. American Journal of Public Health, 110(5), 642-643. doi:https://doi.org/10.2105/AJPH.2019.305541

In 1970, Congress passed the Occupational Safety and Health Act (OSH Act), with the goal of providing workers a safe and healthful place to work. The law did not just happen-it took decades of struggles by unions and workers and only came following workplace and environmental tragedies, part of a wave of federal legislation to protect workers, the public, and the environment from harm. And like many of the laws enacted at the time, it was based upon a foundation of setting and enforcing protective standards, with the federal government-in this case the Department of Labor-given the responsibility to carry out the law in collaboration with the states. In addition, the OSH Act gave workers and their representatives important new rights, including filing complaints, requesting onsite inspections, accessing information, and seeking new protective standards.The law has been described as radical and revolutionary, fundamentally changing the balance of power between the government and employers and between workers and employers on a central workplace issue. While the law established a framework and structure for the government to exercise authority and power to advance new protections and oversee compliance, it did not establish a framework and structure for safety and health in the workplace. There were no requirements for the establishment of workplace safety and health programs, safety and health committees, worker safety and health representatives, or basic core safety and health training for workers. That was left to collective bargaining between unions and employers and future regulatory efforts.

Greenfield, D., J.D. (2020). Safety and health at the heart of the past, present, and future of work: A perspective from the international labour organization. American Journal of Public Health, 110(5), 646-647. doi:https://doi.org/10.2105/AJPH.2020.305633

Every year, 2.78 million workers die from occupational accidents and work-related diseases, and an additional 374 million workers suffer from nonfatal occupational accidents.1 Lost workdays represent almost 4% of the world's gross domestic product, rising to 6% in some countries.2For centuries, the workplace has posed risks and hazards for workers. In emphasizing the essential role of social justice in achieving lasting peace, the International Labour Organization (ILO) constitution calls on member states to improve working conditions, including "the protection of the worker against sickness, disease and injury arising out of his employment."3Although workers continued to experience risks to their safety and health, heightened global knowledge had a significant impact on how organizations such as the ILO tackled these challenges globally.4 Scientific and professional understanding ofthe nature of work and its relationship to the safety, health, and well-being of workers opened a venue for progress in industrialized nations. Occupational hygiene, along with occupational medicine, toxicology, and epidemiology, continued to grow rapidly, as did disciplines associated with safety design and engineering.

Learner, E. R., PhD., Kreisel, K., PhD., Kirkcaldy, Robert D,M.D., M.P.H., Schlanger, Karen,PhD., M.P.H., & Torrone, E. A., PhD. (2020). Gonorrhea prevalence among young women and men entering the national job training program, 2000–2017. American Journal of Public Health, 110(5), 710-717. doi:https://doi.org/10.2105/AJPH.2019.305559

Objectives. To examine long-term gonorrhea prevalence trends from a sentinel surveillance population of young people at elevated risk for gonorrhea. Methods. We analyzed annual cross-sectional urogenital gonorrhea screening data from 191 991 women (2000-2017) and 224 348 men (2003-2017) 16 to 24 years of age entering the National Job Training Program, a US vocational training program. We estimated prevalence among women using an expectation-maximization algorithm incorporated into a logistic regression to account for increases in screening test sensitivity; log-binomial regression was used to estimate prevalence among men. Results. The adjusted gonorrhea prevalence among women followed a U-shaped curve, falling from 2.9% to 1.6% from 2000 through 2011 before rising to 2.7% in 2017. The prevalence among men declined from 1.4% to 0.8% from 2003 through 2017. In the case of both women and men, the prevalence was highest across all study years among those who were Black or American Indian/Alaska Native and those who resided in the South or Midwest. Conclusions. Trends among National Job Training Program enrollees suggest that gonorrhea prevalence is rising among young women while remaining low and steady among young men. (Am J Public Health. 2020;110:710-717. doi:10.2105/AJPH.2019. 305559)

Boden, L. I. (2020). The occupational safety and health administration at 50-the failure to improve workers' compensation. American Journal of Public Health, 110(5), 638-639. doi:https://doi.org/10.2105/AJPH.2019.305549

In the 1950s and 1960s, it was widely recognized that workers’ compensation was failing in its mission to provide economic security for injured workers. After decades of concern, Congress called for a formal review of these state-based programs in the Occupational Safety and Health Act of 1970. Congress gave this responsibility to the National Commission on State Workmen’s Compensation Laws (“National Commission”). In 1970, 19 states did not require any employers to provide workers’ compensation coverage. Other states mandated coverage for only a fraction of workers. Only about half the states provided benefits to cover two thirds of lost wages, and in most states the maximum weekly benefit was less than the national poverty level for a family of four. In addition, programs frequently did not cover all injuries and provided even less comprehensive coverage for occupational diseases.

Weil, D. (2020). The future of occupational safety and health protection in a fissured economy. American Journal of Public Health, 110(5), 640-641. doi:https://doi.org/10.2W5/AJPH.2019.305550

There have been innumerable recent conferences, workshops, and convenings on the "future of work." These seances typically focus on issues such as robotics, artificial intelligence, and platform business models like Uber and Lyft. But these topics regarding the future of work affect a relatively small part of the workforce, and speculations on the impacts oftechnology usually prove wildly off the mark.A focus on changes that have an impact on the present workplace and that will continue to do so is far more useful. Millions of workers in the United States have jobs that do not pay enough, provide few-if any-benefits, and lack opportunities for economic advancement. Germane to this Special Section, those jobs also expose workers to a wide variety of significant health and safety risks-often falling outside the boundaries of Occupational Safety and Health (OSH) Act protections.These conditions arise in part because businesses have found myriad ways to maintain control over (and capture economic benefit from) services and products while shedding the messy role of employing workers to others. This change in both the present and future structure of work is what I have termed the "fissured workplace," a phrase that is meant to encompass outsourcing, contracting, and subcontracting; franchising in its many forms; and, most recently, platform business models.1 The fissured workplace model has allowed businesses to shift risks and responsibilities onto workers and incentivize the misclassification of employees as independent contractors.

Jester, Barbara J,R.N., M.S.N., Uyeki, Timothy M, MD,M.P.H., M.P.P., & Jernigan, Daniel B,M.D., M.P.H. (2020). Fifty years of influenza A(H3N2) following the pandemic of 1968. American Journal of Public Health, 110(5), 669-676. doi:https://doi.org/10.2105/AJPH.2019.305557

In 2018, the world commemorated the centennial of the 1918 influenza A(H1N1) pandemic, the deadliest pandemic in recorded history; however, little mention was made of the 50th anniversary of the 1968 A(H3N2) pandemic. Although pandemic morbidity and mortality were much lower in 1968 than in 1918, influenza A(H3N2) virus infections have become the leading cause of seasonal influenza illness and death over the last 50 years, with more than twice the number of hospitalizations from A(H3N2) as from A(H1N1) during the past six seasons. We review the emergence, progression, clinical course, etiology, epidemiology, and treatment of the 1968 pandemic and highlight the short- and long-term impact associated with A(H3N2) viruses. The 1968 H3N2 pandemic and its ongoing sequelae underscore the need for improved seasonal and pandemic influenza prevention, control, preparedness, and response efforts. (Am J Public Health. 2020;110:669-676. doi: 10.2105/ AJPH.2019.305557)

Rothstein, M. A., J.D. (2020). The occupational safety and health act at 50: Introduction to the special section. American Journal of Public Health, 110(5), 613-614. doi:https://doi.org/10.2105/AJPH.2020.305623

This special section of AJPH commemorates the 50th anniversary of the OSH Act by reviewing the past, assessing the present, and proposing the future direction of occupational safety and health regulation. It features an incomparable group of experts presenting their views on a range of important issues. The OSH Act is a public health law, an employment law, and an environmental law. It has unprecedented scope by setting minimum safety and health standards for substantially all private sector workplaces. The OSH Act prescribes notice and comment rulemaking for new standards, requires preinspection compliance by employers, authorizes the secretary of labor to assess civil monetary penalties and impose abatement orders for noncompliance, and establishes administrative adjudications of contested enforcement proceedings by an independent agency of commissioners and administrative law judges.

Kamoli, Talar, RN, MSN,P.H.N., C.I.C., Foo, Chelsea,M.P.H., C.I.C., Oyong, Kelsey,M.P.H., C.I.C., & Terashita, Dawn,M.D., M.P.H. (2020). Influenza vaccination coverage of health care personnel in los angeles county hospitals, 2016–2017. American Journal of Public Health, 110(5), 693-695. doi:https://doi.org/10.2105/AJPH.2019.305555

The objective of the Los Angeles County, California (LAC), health care personnel (HCP) influenza vaccination improvement intervention was to increase HCP influenza vaccination coverage during the 2016-2017 influenza season via targeted outreach to LAC acute care hospitals. We selected 13 facilities for intervention and received tailored recommendations from a menu of evidence-based practices. Following the season, each hospital in the intervention group experienced a significant increase in vaccination coverage, which increased the LAC countywide average for all hospitals by 5%, from 74% to 79%. (Am J Public Health. 2020;110:693-695. doi:10.2105/ AJPH.2019.305555)

Fiala, S. C., M.P.H. (2020). My year with AJPH: Insights from a student editor. American Journal of Public Health, 110(5), 606. doi:https://doi.org/10.2105/AJPH.2019.305553

Yi, Y., M.A., Edwards, F. R., PhD., & Wildeman, C., PhD. (2020). Cumulative prevalence of confirmed maltreatment and foster care placement for US children by Race/Ethnicity, 2011–2016. American Journal of Public Health, 110(5), 704-709. doi:https://doi.org/10.2105/AJPH.2019.305554s

Objectives. To estimate the cumulative prevalence of confirmed child maltreatment and foster care placement for US children and changes in prevalence between 2011 and 2016. Methods. We used synthetic cohort life tables and data from the Adoption and Foster Care Analysis and Reporting System and the National Child Abuse and Neglect Data System and population counts from the Centers for Disease Control and Prevention. Results. US children's cumulative prevalence of confirmed maltreatment remained stable between 2011 and 2016 at about 11.7% (95% confidence interval CI] = 11.6%, 11.7%) of the population and increased by roughly 11% for foster care placement from 4.8% (95% CI = 4.8%, 4.8%) to 5.3% (95% CI = 5.3%, 5.4%). American Indian/Alaska Native children experienced the largest change, an 18.0% increase in confirmed maltreatment risk from 13.4% (95% CI = 13.1%, 13.6%) to 15.8% (95% CI = 15.6%, 16.1%) and a 21% increase in foster care placement risk from 9.4% (95% CI = 9.2%, 9.6%) to 11.4% (95% CI = 11.2%, 11.6%). Conclusions. Confirmed child maltreatment and foster care placement continued to be experienced at high rates in the United States in 2012 through 2016, with especially high

risks for American Indian/Alaska Native children. Rates of foster care have increased, whereas rates of confirmed maltreatment have remained stable. (Am J Public Health. 2020;110:704-709. doi:10.2105/AJPH.2019.305554)

Hess, L. H., PhD., Winfree, K. B., PhD., Muehlenbein, C. E., M.P.H., Zhu, Yajun E,M.S., M.B.A., Oton, A. B., M.D., Princic, N., M.S., & Aggarwal, H., PhD. (2020). DEBUNKING MYTHS WHILE UNDERSTANDING LIMITATIONS. American Journal of Public Health, 110(5), 1. doi:https://doi.org/10.2105/AJPH.2020.305603

Ledesma, E., M.P.H., & Ford, Chandra L, PhD,M.P.H., M.L.I.S. (2020). Health implications of housing assignments for incarcerated transgender women. American Journal of Public Health, 110(5), 650-654. doi:https://doi.org/10.2105/AJPH.2020.305565

Transgender women (i.e., persons who were assigned male sex at birth but who live and identify as female) experience forms of discrimination that limit their access to stable housing and contribute to high rates of incarceration; once incarcerated, the approaches used to assign them housing within the jail or prison place them at risk for abuse, rape, and other outcomes. Yet, a paucity of studies explores the implications of carceral housing assignments for transgender women. Whether the approaches used to assign housing in jails and prisons violate the rights of incarcerated transgender persons has been argued before the US federal courts under Section 1983 of the US Constitution, which allows persons who were raped while incarcerated to claim a violation of their Eighth Amendment rights. Reforms and policy recommendations have been attempted; however, the results have been mixed and the public health implications have received limited attention.

Barna, M. (2020). US hospitals stepping up to end youth violence. American Journal of Public Health, 110(5), 608. doi:https://doi.org/10.2105/AJPH.2020.305617

Baker, Beth,M.D., M.P.H., Kesler, Denece,M.D., M.P.H., & Guidotti, Tee, MD,M.P.H., D.A.B.T. (2020). Occupational and environmental medicine: Public health and medicine in the workplace. American Journal of Public Health, 110(5), 636-637. doi:https://doi.org/10.2105/AJPH.2020.305625

Occupational medicine is unique in medicine because it focuses on the interface of the workplace and health. Occupational medicine physicians combine individual patient care with prevention and a population-based health approach and may be engaged in all aspects of workers' health and the workplace. They may spend more time addressing issues in healthy workers, workers' groups, employers, or companies because only 45% of their time is used to address injured or ill patient issues.1 Important occupational health issues that need to be addressed worldwide include working conditions; the built environment; and chemical, biological, physical, and psychosocial hazards.2 Today, the specialty encompasses workers' wellness, disease prevention, and environmental issues in addition to occupational injury and illness care.

Berk-Krauss, J., Stein, Jennifer A,M.D., PhD., Weber, Jeffrey,M.D., PhD., Polsky, David,M.D., PhD., & Geller, Alan C,R.N., M.P.H. (2020). New systematic therapies and trends in cutaneous melanoma deaths among US whites, 1986–2016. American Journal of Public Health, 110(5), 731-733. doi:https://doi.org/10.2105/AJPH.2020.305567

Objectives. To determine the effect of new therapies and trends toward reduced mortality rates of melanoma. Methods. We reviewed melanoma incidence and mortality among Whites (the group most affected by melanoma) in 9 US Surveillance, Epidemiology, and End Results registry areas that recorded data between 1986 and 2016. Results. From 1986 to 2013, overall mortality rates increased by 7.5%. Beginning in 2011, the US Food and Drug Administration approved 10 new treatments for metastatic melanoma. From 2013 to 2016, overall mortality decreased by 17.9% (annual percent change APC]= -6.2%; 95% confidence interval CI]= -8.7%, -3.7%) with sharp declines among men aged 50 years or older (APC = -8.3%; 95% CI= -12.2%, -4.1%) starting in 2014. This recent, multiyear decline is the largest and most sustained improvement in melanoma mortality ever observed and is unprecedented in cancer medicine. Conclusions. The introduction of new therapies for metastatic melanoma was associated with a significant reduction in population-level mortality. Future research should focus on developing even more effective treatments, identifying biomarkers to select patients most likely to benefit, and renewing emphasis on public health approaches to reduce the number of patients with advanced disease. (Am J Public

Health. 2020;110: 731-733. doi:10.2105/AJPH.2020.305567)

Kingsbury, D., Puac-Polanco, V., & Dávila, M. G. (2020). Global news. American Journal of Public Health, 110(5), 607. doi:https://doi.org/10.2105/AJPH.2020.305629

Krisberg, K. (2020). Census count implications for public health. American Journal of Public Health, 110(5), 608. Retrieved from https://www.proquest.com/scholarly-journals/census-count-implications-public-health/docview/2392008267/se-2?accountid=211160

Freeman, Amy L,PhD., M.P.H., Li, T., M.S., Kaplan, S. A., J.D., Ellen, I. G., PhD., Gourevitch, Marc,M.D., M.P.H., Young, A., L.C.S.W., & Doran, Kelly M,M.D., M.H.S. (2020). Community health worker intervention in subsidized housing: New york city, 2016–2017. American Journal of Public Health, 110(5), 689-692. doi:https://doi.org/10.2105/AJPH.2019.305544

From April 2016 to June 2017, the Health + Housing Project employed four community health workers who engaged residents of two subsidized housing buildings in New York City to address individuals' broadly defined health needs, including social and economic risk factors. Following the intervention, we observed significant improvements in residents' food security, ability to pay rent, and connection to primary care. No immediate change was seen in acute health care use or more narrowly defined health outcomes. (Am J Public Health. 2020; 110: 689-692. doi:10.2105/AJPH. 2019.305544)

Löwy, I., PhD, & Corrêa, Marilena Cordeiro Dias Villela, MD, PhD. (2020). The "abortion pill" misoprostol in brazil: Women's empowerment in a conservative and repressive political environment. American Journal of Public Health, 110(5), 677-684. doi:https://doi.org/10.2105/AJPH.2019.305562

In the aftermath of the introduction of severe restrictions on abortion in several US states, some activists have argued that providing widespread access to an abortive drug, misoprostol, will transform an induced abortion into a fully private act and therefore will empower women. In Brazil, where abortion is criminalized, the majority of women who wish to terminate an unwanted pregnancy already use the illegal, but easily accessible, misoprostol. We examine the history of misoprostol as an abortifacient in Brazil from the late 1980s until today and the professional debates on the teratogenicity of this drug. The effects of a given pharmaceutical compound, we argue, are always articulated, elicited, and informed within dense networks of sociocultural, economic, legal, and political settings. In a conservative and repressive environment, the use of misoprostol for selfinduced abortions, even when supported by formal or informal solidarity networks, is far from being a satisfactory solution to the curbing of women's reproductive rights.

Fleegler, Eric W,M.D., M.P.H., & Madeira, Jody Lynee, PhD,J.D., M.S. (2020). First, prevent harm: Eliminate firearm transfer liability as a lethal means reduction strategy. American Journal of Public Health, 110(5), 619-620. doi:https://doi.org/10.2105/AJPH.2020.305635

The US suicide rate is at its highest since World War II1; suicides are the second leading cause of death among persons aged 10 to 34 years and the 10th leading cause in the United States overall. By 2017, the number of suicide deaths had risen to 47 173 and, when combined with opioid overdoses, produced a three-year decline in US life expectancy for the first time in 50 years.2In the United States, firearms are used in less than 6% of suicide attempts but are the mechanism of death in more than 50% of completed suicides.3 State suicide rates vary more than threefold, with the majority of the difference accounted for by firearm suicides. Although the preponderance of suicide attempts involve intentional overdoses, firearms have a 55-fold higher lethality rate,4 making it imperative to understand mechanisms for preventing firearm suicide attempts.The commentary by Gibbons et al. (p. 685), in this issue of AJPH, speaks to the challenges of one key mechanism of firearm suicide reduction, namely the temporary surrender of firearms. Extreme risk protective order legislation has become the de jour mechanism, with 18 states enacting such laws as of February 2020. These laws remove firearms from owners via an involuntary mechanism and necessitate families' engagement with a complicated court system. The use of these laws has been highly variable. In a period of a year and a half, Florida had more than 2000 "red-flag" orders, whereas over a similar

period California had less than 200-but each state has roughly 2.5 million firearm-owning households.5,6