ANNUAL REVIEWS

Annual Review of Public Health

Migrant Workers and Their Occupational Health and Safety

Sally C. Moyce¹ and Marc Schenker²

- ¹School of Nursing, Samuel Merritt University, Oakland, California 94609, USA; email: smoyce@samuelmerritt.edu
- ²Department of Public Health Sciences, University of California, Davis, California 95616, USA; email: mbschenker@ucdavis.edu



Annu. Rev. Public Health 2018. 39:351-65

First published as a Review in Advance on January 24, 2018

The *Annual Review of Public Health* is online at publhealth.annualreviews.org

https://doi.org/10.1146/annurev-publhealth-040617-013714

Copyright © 2018 Sally C. Moyce & Marc Schenker. This work is licensed under a Creative Commons Attribution 4.0 International License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. See credit lines of images or other third-party material in this article for license information



Keywords

global migration, occupational health, health disparities, immigrant labor

Abstract

In 2015, approximately 244 million people were transnational migrants, approximately half of whom were workers, often engaged in jobs that are hazardous to their health. They work for less pay, for longer hours, and in worse conditions than do nonmigrants and are often subject to human rights violations, abuse, human trafficking, and violence. Worldwide, immigrant workers have higher rates of adverse occupational exposures and working conditions, which lead to poor health outcomes, workplace injuries, and occupational fatalities. Health disparities of immigrant workers are related to environmental and occupational exposures and are a result of language/cultural barriers, access to health care, documentation status, and the political climate of the host country. Recommendations on global and local scales are offered as potential solutions to improving the health of immigrant workers.

INTRODUCTION

In 2015, 244 million people were living outside their country of origin, comprising 3.3% of the world's population, according to the United Nations (98). The International Labor Organization (ILO) estimates that approximately half of these are immigrant workers, those who leave their countries of origin in search of occupational opportunities in another, often more developed, country. These individuals represent nearly 4% of the total global population aged 15 years and over (48). However, if one also includes internal migration, the total global migrant population approaches 1 billion. The largest driver of this total is economic disparity and the search for work.

International migration is an important part of global social and economic development. Migrant laborers contribute to the economies of their home countries through sending remittances and in developing new skills that are potentially used on their return. In addition, migrants provide needed labor and skills to the host countries. However, migration is a complex issue that presents challenges in ensuring equal protection of migrant workers, particularly in relation to occupational health. This article outlines some of the current evidence of the occupational health and safety of immigrant workers and highlights some of the reasons for the disparities in health outcomes when compared with native-born workers. Finally, we offer recommendations to improve the health and safety of international migrant workers.

GLOBAL MIGRATION AT A GLANCE

Nearly half of all transnational migrants work in either North America or in Northern, Southern, or Western Europe. About 40% of global migration is between countries in the Southern Hemisphere. The Arab states are host to the highest proportion of immigrant workers, and 35.6% of the workforce in the Arab states are migrant workers. The foreign-born population in some Arab states is more than 80% and comprises almost all the working population. Workers migrating internationally come from Asia (43%), Europe (25%), and Latin America and the Caribbean (15%) (48). In the United States, there were 26.3 million immigrant workers in 2015, comprising 16.7% of the total workforce. The largest percentage are of Hispanic origin (48.8%), followed by those of Asian origin (24.1%) (10). By 2060, estimates show that the immigrant workforce in the United States will be twice as large as the native-born workforce; the highest growth is expected among Hispanics (93).

The majority (71.1%) of migrant workers worldwide are engaged in the service industry, including domestic work, food services, and administrative or professional work. Other occupational sectors include industry (manufacturing and construction) and agricultural work. The ILO estimates that women make up 44.3% of all migrant workers. Women are six times more likely than men to be engaged in domestic work abroad (48).

OCCUPATIONAL HEALTH RISKS FOR IMMIGRANT WORKERS

Migrant workers are recognized to be among the most vulnerable members of society. They are often engaged in what are known as 3-D jobs—dirty, dangerous, and demanding (sometimes degrading or demeaning)—and these workers are often hidden from or invisible to the public eye and from public policy (81). They work for less pay, for longer hours, and in worse conditions than do nonmigrants and are often subject to human rights violations, abuse, human trafficking, and violence (48). Most importantly, these precarious workers may take greater risks on the job, do work without adequate training or protective equipment, and do not complain about unsafe working conditions. This situation is the most critical for immigrant workers who lack work authorization

and are at risk for losing their jobs or even being deported. These conditions put immigrant workers at increased risk for occupational fatalities and injuries when compared with native-born workers, even those doing the same job in the same industry. Recent increases in incidents and costs of occupational injuries and fatalities have been attributed largely to immigrant workers, reflecting the increased burden of occupational injuries and fatalities shouldered by immigrant workers (28). Put another way, the proportion of fatal and nonfatal workplace injuries among immigrants has been increasing, reflecting a shift of the most hazardous jobs to the immigrant workforce.

Worldwide, immigrant workers have higher rates of negative occupational exposures, leading to poor health outcomes, workplace injuries, and occupational fatalities. Globally, in 2014, the ILO estimated that there were 2.3 million occupational fatalities from a variety of different sources (92). The higher rates of occupational fatalities among immigrant workers may be attributed to a variety of factors, including inherent risks in the jobs themselves and the lack of training and protection for immigrant workers. In the United States, immigrant workers are overwhelmingly employed in the service sector; natural resources, construction and maintenance (NRCM); agriculture; and production, transportation, and material movement: industries that report much higher rates of injury compared with other industries (10). In Canada, the pattern of employment is similar, and most immigrants work in agriculture. Like the United States, Canadian agriculture is one of the most dangerous industries and has the highest rates of occupational injuries and fatalities (80). In contrast, in Australia, native-born workers are more likely to work in agriculture and construction, likely due to the push for "skilled" or professional migration to Australia, referring to workers with skills that will contribute to the Australian economy. Consequently, occupational injury may be higher among native-born than foreign-born workers in Australia (85).

Using the European Working Conditions Survey, an analysis of nearly 30,000 workers in 31 European countries reveals higher rates of negative occupational exposures among migrants when compared with native workers. Migrant workers were more likely than native workers to be exposed to high temperatures, loud noises, strong vibrations, and fast work speeds and to stand for long periods of time. These individuals often worked without contracts and had unfavorable work schedules (88). The industries most likely to employ migrant workers are often those that carry the most risk for adverse worker health. According to the US Census of Fatal Occupational Injuries, immigrant workers were 15% more likely to be fatally injured on the job than were their native-born counterparts (12).

Migrant workers are less likely to have a permanent job contract than are native-born workers, and studies have shown greater reporting of poorer health to be associated with the lack of a permanent job contract (91).

Environmental Exposures

Many of the health risks for immigrant workers are due to environmental hazards inherent in the occupational setting. Migrant workers tend to be employed in jobs that carry increased exposure to environmental toxins, including extreme temperatures, pesticides, and chemicals.

Temperature. Immigrant workers employed in natural resources, construction, and maintenance often work outside and are subject to extreme weather exposure, which can increase their risk of lightning strikes, sun exposure, heat-related illness and death, snake bites, and tick-borne diseases (83). In the fishing industry in Alaska, an estimated three-quarters of the workforce is made up of immigrants. These workers experience high rates of injury related to cold temperatures and frequent contact with ice cold water (33). On the other hand, heat-related illness is a common

result of high ambient temperatures for workers in agriculture where farmworkers are four times more likely than workers in other industries to experience heat-related illnesses (40). Agriculture has a mortality rate from heat illness that is 20 times that of all other occupations (48). In the Center for Disease Control and Prevention analysis of heat-related deaths among agricultural workers, all the deaths for whom a place of birth was known were among immigrant workers (16).

Pesticides. Among the 2 million agricultural workers in the United States, an estimated 10,000–20,000 pesticide injuries are medically treated each year (66). The US agricultural workforce is overwhelmingly immigrant. Approximately 65% of US farmworkers are Latino, and that number increases to ~90% in California, the substantial majority of whom are immigrants. In a sample of 284 farmworkers in North Carolina, Arcury and colleagues found detectable levels of pesticides in urine in as many as 97.4% of the sample (3). Exposure to pesticides in agricultural communities around the world is linked to poor health outcomes, including respiratory illness, dermatitis, cancer, and reproductive disorders (34, 35, 78).

Chemicals. Exposure to dangerous chemicals is common in many of the industries in which immigrants work. For example, workers employed as housekeepers in residences or in hotels are exposed to chemicals in cleaning agents that can lead to dermatitis, respiratory diseases, and cancer (43). Hotel cleaners regularly work with hazardous chemicals containing ammonia and other irritating solvents (44). Immigrants who work in nail salons are exposed to formaldehyde, toluene, and dibutyl phthalate (31). Chemicals used in the dry cleaning business have been linked to negative health outcomes (17, 50, 60). Construction workers are exposed to chemicals from paints (76). All three of these industries—hotel cleaners, nail salons and dry cleaning—are dominated by immigrant workers, which again fits the pattern of immigrant workers populating the most hazardous occupations, often without adequate training and protection.

Working Conditions

Occupational sectors that employ immigrant workers tend to include work that is physically demanding. These demands increase the risk of injuries and fatalities because working conditions may be unsafe or unregulated. In addition, the precarious position of immigrants prevents them from making changes to their working conditions when an unsafe or hazardous condition is identified.

Physical hazards. According to the Canadian Center for Occupational Safety and Health, a hotel housekeeper changes body position every three seconds while cleaning a guest room. Hotel housekeeping results in the potential for muscle strain related to body position, repetitive motion, fast-paced work, and heavy lifting of cleaning equipment, such as industrial-strength vacuum cleaners (14, 43). Hotel cleaners report injuries from lifting heavy beds or from exposure to bodily secretions or needles when cleaning bathrooms (76). Workers employed in the agriculture and farming sectors experience high rates of musculoskeletal injury (83) resulting from handling large farm animals, exposure to hazardous equipment, crush injuries, repetitive motion, and falls (15, 39, 54, 55). Workers employed in construction are subject to hazards from work involving high elevations, large cutting tools, and heavy lifting (76). Falls accounted for 43% of fatal injuries in the construction industry (24). Fatalities often occur as a result of machinery, resulting in 770 annual average deaths in the US construction industry. Most of these fatalities occur from heavy equipment, tractors, or other machines used in construction, and rates are highest in the agricultural, forestry, and fishing sectors (59).

Workplace demands. Immigrants are often employed in precarious or insecure jobs, meaning there is no employment contract. This lack of a guaranteed paycheck and the risk of losing the job create uncertainty for the worker and results in the worker often accepting the dangers or risks of the job without complaint for fear of losing employment (52). Workers may experience high levels of stress related to a fast-paced work environment. For example, immigrant workers in poultry report that their supervisors are only interested in getting the job done quickly and cheaply, without regard to worker safety (82). The demand for quick work often results in increased rates of injury from repetitive motion or accidents and psychological stress for workers (52). Immigrant workers report pressure to continue working without breaks and being made to feel humiliation for taking bathroom breaks (58). Workplace stress is associated with poor mental health outcomes among immigrant workers (43, 94). This stress may be further exacerbated by fear of job loss or deportation, particularly among those without job authorization.

Lack of safety standards. Regulations to protect workers exist in many of the industries that employ immigrants. However, these safety standards are not always followed. For example, immigrant workers on some poultry farms report that personal protective equipment (PPE) is often supplied by employers, but it may be up to the worker to purchase the equipment (82). In addition, workers themselves do not always follow safety rules, electing not to wear PPE due to poor fit or the belief that the equipment interferes with the work (5, 26). For example, despite federal legislation requiring farmers to supply PPE, migrant workers in Australia's agricultural sector report low levels of compliance with wearing PPE (97). Safety trainings may be missed owing to the often migratory behavior of immigrant workers (3) or may not be available in the worker's native language (55). Limitations in English language ability may contribute to poor health outcomes or greater disparities, as workers who have lower levels of English language mastery work in riskier jobs and may not understand safety trainings (72).

Workplace abuse. Abuses in the workplace take multiple forms, from outright physical abuse or harassment to what has been termed benign neglect when managers fail to implement or enforce safety measures (38). The actual or perceived lack of legal protection for immigrant workers often results in their exposure to abuse in the workplace. In interviews with Mexican and Indian immigrants to Canada, workers often reported that they worked with aggressive, abusive bosses (80). The threat of physical violence and exposure to verbal abuse contributed to workers' acquiescence to working longer hours or working in unsafe conditions. The occurrence of physical, mental, and sexual abuse has been reported in many different fields employing immigrant workers (33, 63, 70, 75). For example, a qualitative study of Latina hotel workers reports that immigrants were vulnerable to disrespect, unfair work assignments, and verbal abuse from managers (45). In Portugal, migrant domestic workers often experienced workplace abuses, including delayed payment, sexual harassment, withholding of food, and discrimination (27).

Abuses suffered in the work environment lead to negative mental health outcomes. Female immigrant workers report mood instability and depression related to work conditions, including exploitation and low levels of control combined with stressors at home related to gendered responsibilities and unequal division of home labor (87). In an analysis of a subset of 1,397 Filipino immigrant workers who participated in the Filipino American Community Epidemiology Study, Tsai and colleagues (95) found a statistically significant association between mental health problems and concerns of employment, including frequency of distressing events at work and a measure of employment concerns related to immigrant status or racial stereotypes. Participants in the sample who reported feeling social discrimination were also likely to experience mental health problems and substance abuse problems (95). In a similar study, Tsai & Thompson examined these

associations among a sample of 194 Chinese immigrant food service workers and found that job concerns led to mental health problems, which then increased the risk for work-related injuries (96).

Trafficking and forced labor. Increasing globalization has led to a dramatic increase in international human trafficking or forced labor; the United States is one of the primary destinations for trafficked persons. Estimates of the number of persons trafficked vary widely from 2.5 million to 27 million, and the majority are women and girls; however, human trafficking of men also exists in selected industries (e.g., fishing, mining) around the world (42). Traffickers often confiscate legal documents, demand payment from the worker, and pay very low wages (100). For example, Filipina workers in a Japanese club were forced to sign a blank check which the employers would then fill in with expenses that the women accrued during their time in Japan (77). Victims of trafficking are exposed to multiple forms of abuse and exploitation, including physical and sexual violence. These abuses lead to long-term health effects, including post-traumatic stress disorder, sexually transmitted infections, and other somatic illnesses (71).

ANALYSIS OF RISK FACTORS

Negative health outcomes disproportionately affect immigrant workers across the globe, and there are multiple reasons why immigrant workers carry this increased risk when compared with native-born workers. Overall, immigrant workers are concentrated in industries that expose them to dangerous conditions and increase their risk of occupational injury and fatality (72). In addition, the precarious nature of the jobs makes them susceptible to risk taking and safety violations (41). Precarious employment is associated with higher rates of poverty, wage theft, a lack of overtime, and no health or employment benefits (41). Immigrant workers are more likely to be employed seasonally or temporarily compared with native-born workers who tend to be employed year round. Immigrants tend to work more hours per week but are less likely than native-born workers to receive bonuses (86). Temporary or seasonal workers are not usually represented by unions, which means they have fewer protections than full-time workers do (23) and they are often not eligible for workers' compensation benefits or do not receive benefits for which they are eligible (41).

Language and Cultural Barriers

Immigrants who do not speak the host country's dominant language are at particular risk for occupational injury, although research on this association has been mixed. Without language skills, immigrants are relegated to more dangerous jobs (72). In addition, workers with lower education levels and limited language skills tend to incur more occupational injuries than do those with higher education (72, 80). Although safety trainings are essential to protect worker health, they may not be offered in workers' native language, owing to the wide range of linguistic variation among immigrant workers (28). Safety trainings, posted safety information and warning signs, and legal information do little to protect workers if workers are unable to understand them (90). Trainings may be inadequate for the level of risk involved in the work (69), may not be available in the workers' primary language, and may present complicated information (26, 43, 55). Furthermore, factors such as social position or other cultural issues may impact how workers receive trainings presented by other workers, even if they speak the same language (28).

Access to Health Care

Immigrant workers often lack access to health care owing to their precarious employment, poverty, lack of documentation, or limited knowledge of the health insurance system (4, 76, 86). Insurance coverage for medical expenses is one of the most significant barriers to accessing health care (90). Another barrier is difficulty getting to clinics or medical providers, as workers may live in isolated, rural areas and lack reliable or safe transportation to medical appointments (80). Long working hours, including nights and weekends with no paid time off, make it impossible for workers to access health clinics during standard operating hours (80). In addition, workers report an inability to communicate with medical professionals and a lack of access to interpreters (13).

Female Gender

Females migrating abroad for work may face higher health risks than their male counterparts do, and differences in mental health outcomes, cancer rates, occupational injury, and reproductive health are documented in the literature. Among farmworkers, for example, women make up 43% of the workforce in developing countries and 20% in developed countries, and women have higher rates of esophageal and stomach cancer than men do, potentially related to pesticide exposure (53). In a study of workers in the European Union, researchers report that immigrant women face higher work-related health and safety risks than native workers do (15.9% versus 11.0%) (61). Women often face barriers to reproductive health related to the costs of health care, access to health insurance, or child care. Immigrant women tend to underutilize family planning services, delay prenatal care, and have more unplanned pregnancies than do native-born women (8, 73, 74).

Women who migrate may be at a double disadvantage of discrimination in the workforce because they not only have to navigate their roles as immigrants but also are subject to gender inequality. These workers earn less than do immigrant men and native-born women (65). Females may migrate as partners, following the work of their spouse and then finding employment of their own. This relationship creates an economic dependence on their spouse, and women may suffer intimate partner violence as a result. Additionally, this status as a "partner migrant" may be used as justification by employers for lower wages or fewer rights (61).

Documentation Status

Workers who lack legal authorization to work are arguably most susceptible to negative health outcomes. In a survey of more than 4,000 workers in low-wage jobs in Chicago, Los Angeles, and New York, researchers found that undocumented workers were more than two times as likely to experience wage violations compared with documented workers. Undocumented workers were less likely to make formal complaints to their employers about workplace safety violations because of fears about losing their jobs (7). Undocumented workers who experience dangerous working conditions often have no recourse owing to the threat of deportation by employers if they complain (32). Undocumented workers in many developed countries around the world are excluded from employment laws designed to protect workers, and experience high rates of wage theft, harassment, and exploitation (19). Moreover, recent crackdowns on employers who hire undocumented workers, particularly in the United States, have resulted in less job availability for this group. Workers who experience unfavorable conditions are reluctant to leave because they cannot be certain to find other employment (30). Undocumented workers are often ineligible for various services, including medical insurance coverage or driver's licenses. Workers report that

they do not attempt to access these services because of their documentation status, which may result in increased isolation and vulnerability (30).

The current visa structure in the United States results in systematic vulnerabilities for immigrant workers (28). Workers in the United States under H-2 visas enjoy certain occupational protections, including guaranteed pay, workers' compensation, and the legal right to reside in the United States while employed. However, these arrangements may increase their vulnerability if employment conditions are not satisfactory or are dangerous. A worker with an H-2 visa is required to complete his/her work for the sponsoring employer and is not authorized to perform work not specific to the visa. If the worker were to leave the employer, he/she would lose the right to remain in the United States legally. This situation creates incentive for the worker to continue employment, even when presented with working conditions that may endanger his/her own health and safety (55).

Immigrants working legally in Canada are under similar limitations in control, particularly if they are sponsored by a family member. Under that system, immigrants to Canada have the option to sponsor a family member who wishes to immigrate (36). However, this relationship puts the worker in a vulnerable position, tied to the sponsoring family member for financial support. To repay these debts, workers will often remain in dangerous occupations with high injury risk (80).

Similar visa restrictions exist for immigrant workers in other parts of the world. For example, the *kefala* system in several Middle Eastern gulf countries requires all unskilled immigrant workers to have an in-country sponsor for their visa; the sponsor is also responsible for their visa and legal status. This system prevents immigrant workers from changing employers and has been associated with abusive work situations, increased workplace injuries and fatalities, and poor living conditions (99).

Political Climate

Immigrants are always subject to the political climate of the receiving country, which creates uncertainty and irregularity in the treatment of workers. When the receiving country adopts a position of xenophobia, immigrant workers' rights are in jeopardy, and their health suffers (84). A study of immigrant workers in Michigan found worse self-reported health outcomes and higher levels of stress after a raid by immigration officials (56). Increased border patrol activity may also negatively influence workers' health because many workers cross the border to access health care in their country of origin (21). Limiting a worker's ability to return home further increases their social isolation and weakens family ties. In addition, macroeconomic factors emphasizing low prices and global availability of goods perpetuate precarious employment in low-wage jobs and subsequent health risks (28).

The geopolitical context of the host country creates barriers to the testing and treatment of sexually transmitted infections and HIV across the globe (1, 62, 64). Laws and policies have historically limited migration of HIV-positive individuals into various countries, not for purposes of health promotion but to prevent the spread of the virus. Inadvertently, perhaps, these policies often lead to discrimination and exclusion. In an analysis of HIV-related migration restrictions of 193 World Health Organization member states, Chang and colleagues found that 23% had travel restrictions; 62% of those were in Eastern Mediterranean countries. (Of note, both the United States and China recently removed these restrictions.) Nearly half (47%) of the countries with travel restrictions deport foreigners who test positive for HIV (18). It is not surprising, therefore, that migrant workers who lack legal status, employment contracts, or regular access to medical care often do not get tested nor seek care for HIV, other sexually transmitted infections, or pregnancy (20, 51, 101).

RECOMMENDATIONS TO IMPROVE OCCUPATIONAL RISKS FOR IMMIGRANTS

Although immigrant workers are at an increased risk for occupational illnesses and injuries, recent innovations have begun to mitigate some of these risks and reduce the disparities between immigrant and native-born workers. Examples from around the world are used to demonstrate approaches to improving worker health.

Improved Safety Trainings

Despite the increased risks of occupational injury and fatality among immigrant workers, attention to policies and unique partnerships may improve these conditions and the health of workers. Improvement in health and safety trainings is an important first step. Owing to language barriers, variations in literacy levels, and unequal access to formal education, presenting safety information in English or through the use of flyers or worksheets is not adequate in multicultural work settings. Safety trainings should incorporate methods such as pictograms, illustrations, and hands-on exercises that transcend cultural, educational, and linguistic differences (22).

Work-based trainings are only one way to improve the health and safety of workers. Trainings and public health messaging can be expanded beyond the workplace and into the social media arena or through partnerships with local community centers (68). The National Institutes for Occupational Safety and Health created a unique partnership with the Mexican government to improve health and safety trainings for Mexican-origin immigrant workers. Using the 50 consulates across the United States, the agency is able to provide culturally appropriate occupational trainings designed in conjunction with Mexican nationals in a setting where immigrants feel comfortable and secure (29).

The US Department of Labor's Occupational Safety and Health branch recently implemented its Site-Specific Targeting program to target occupations with high injury rates. This program includes a letter to identified agencies to warn about the high injury rates and inspections for compliance with workplace safety and health regulations. Although the results of these interventions are mixed (79), similar approaches using risk-based audits to target resources toward potential occupational safety risks show positive results (11). Federal attention targeting industries known to employ immigrant workers in high-risk jobs may help reduce occupational injuries and fatalities. Innovative strategies designed to improve workplace safety on a national level include the use of social media and government partners (57), which could be expanded to reach the immigrant workforce.

Policy Changes

The ILO has taken the lead in protecting immigrant worker health, and its mission of social justice focuses on creating fair labor practices in host countries to promote worker protection. The ILO calls for policies that recognize the contributions that migrant laborers make to host countries and policies that promote "decent work opportunities" and social protections (46, p. 6). Migrant workers contribute to the economies of both their country of origin and the host country by accepting and shouldering great personal risk (47). Through collaboration between origin and host countries, the ILO seeks to create agreements that promote the safety of workers. Proposed standards include policies to protect against forced labor or trafficking, ensuring that wages are regularly and directly paid to the worker, protecting social security benefits, promoting written

employment contracts, and ensuring a mechanism for workers to register violations of fair practices (47).

One method to promote fair labor practices is the Migrant Welfare Fund, operated by the government of the country of origin. A well-developed example of the migrant welfare fund is the Overseas Workers Welfare Administration, operated by a special government agency in the Department of Labor and Employment in the Philippines. Through modest membership fees paid by the migrant or the recruiting agency, the fund protects the rights of workers emigrating from the Philippines by providing predeparture orientation, loans to defray costs of migration, life and personal accident insurance, and immediate repatriation of workers who become ill while abroad (89).

Expanding the role of nongovernmental organizations (NGOs) to improve worker rights is another method used around the world with success. For example, in the Pearl River Delta of China, NGOs offer regular trainings to migrant workers regarding legal status, capacity building, and financial resources (37).

Fair Recruitment Policies

The vulnerability of international migrants begins in the country of origin with predatory recruitment practices. Workers traveling to a foreign country are often required to pay high recruitment fees to the agency or person assisting them in migration. It can be difficult for the migrant to determine whether the recruiting agency is a legitimate organization or one that preys on the vulnerability of the migrant (47). When recruiting fees are exorbitant, the debt of the worker puts him/her at risk for servitude and trafficking for an inability to pay the fee (46). In response to violations of worker rights, the ILO launched the Fair Recruitment Initiative in 2014, which was designed to strengthen laws and policies around international labor recruitment, to promote fair business practices, and to empower workers with channels to combat corruption (2).

Recognizing the boost to their economy from remittances sent by emigrants, the government of Bangladesh created official offices to monitor the recruitment of its citizens. The Bureau of Manpower Employment and Training issues licenses to recruiting agencies and provides immigration clearance after reviewing employment contracts (25). In Latin America, citizens from select countries can take advantage of visa-free employment in a participating country under the Free Movement and Residence Agreement (2). While government regulations cannot protect against all nefarious recruitment practices (25), national attention to the process is a step in the right direction to ensure worker safety.

Finally, social media and investigative reporting can play a role in calling attention to some of the cases of abusive immigrant working conditions and, ultimately, to improvement in workplace conditions. Such was the case with the investigation of nail salon workers in New York (67) and with some of the conditions of female domestic workers in the United Arab Emirates (6). The bad publicity as well as consumer action in these situations have led authorities to make much-needed improvements.

CONCLUSION

Protection of workers' health is the responsibility of the global community as well as of local governments and businesses. Federal governments can and should implement and enforce safety and health policies for all workers regardless of immigration status and can offer immigration reform to reduce the fears of deportation related to personal injury or to reporting health and safety violations (55). Businesses can ensure that they work with authorized recruitment agencies, which

provide legal protection for workers, implement written contracts, provide medical insurance and information on workers' compensation benefits, ensure sanitary living conditions, and follow safety and health regulations (9).

Global migration benefits the countries of origin and the host countries, businesses that employ migrants, and the migrants and their families. Despite the social and economic advantages of migration, immigrant workers are at risk for multiple health disparities related to their occupation, their legal status, immigration policies, and cultural or linguistic barriers. Attention to reducing these disparities can help ensure the success of the global economy and its healthy workforce.

DISCLOSURE STATEMENT

The authors are not aware of any affiliations, memberships, funding, or financial holdings that might be perceived as affecting the objectivity of this review.

LITERATURE CITED

- Álvarez-del Arco D, Monge S, Rivero-Montesdeoca Y, Burns F, Noori T, del Amo J. 2017. Implementing
 and expanding HIV testing in immigrant populations in Europe: comparing guideline's recommendations and expert's opinions. *Enfermedades Infecc. Microbiol. Clin.* 35(1):47–51
- Andrees B, Nasri A, Swiniarski P. 2015. Regulating labour recruitment to prevent buman trafficking and to foster fair migration: models, challenges and opportunities. Work. Pap. 1/2015, Int. Labor Organ., Geneva
- Arcury TA, Grzywacz JG, Isom S, Whalley LE, Vallejos QM, et al. 2009. Seasonal variation in the measurement of urinary pesticide metabolites among Latino farmworkers in eastern North Carolina. Int. J. Occup. Environ. Health 15:339–50
- Arcury TA, Grzywacz JG, Sidebottom J, Wiggins MF. 2013. Overview of immigrant worker occupational health and safety for the agriculture, forestry, and fishing (AgFF) sector in the southeastern United States. Am. 7. Ind. Med. 56(8):911–24
- Arcury TA, Summers P, Carrillo L, Grzywacz JG, Quandt SA, Mills TH 3rd. 2014. Occupational safety beliefs among Latino residential roofing workers. Am. J. Ind. Med. 57(6):718–25
- Begum R. 2014. "I already bought you": abuse and exploitation of female migrant domestic workers in the United Arab Emirates. *Human Rights Watch*, Oct. 22. https://www.hrw.org/report/2014/10/22/ i-already-bought-you/abuse-and-exploitation-female-migrant-domestic-workers-united
- Bernhardt A, Milkman R, Theodore N, Heckathorn DD, Auer M, et al. 2009. Broken Laws, Unprotected Workers: Violations of Employment and Labor Laws in America's Cities. New York: Natl. Employ. Law Proj. http://www.nelp.org/content/uploads/2015/03/BrokenLawsReport2009.pdf
- Betancourt GS, Colarossi L, Perez A. 2013. Factors associated with sexual and reproductive health care
 by Mexican immigrant women in New York City: a mixed method study. J. Immigr. Minor. Health
 15(2):326–33
- BSR (Bus. Soc. Responsib.). 2010. Migrant Worker Management Toolkit: A Global Framework. New York: BSR. https://www.bsr.org/reports/BSR_Migrant_Worker_Management_Toolkit.pdf
- Bur. Labor Stat. 2016. Foreign-born workers: labor force characteristics 2015. News Release, May 19. https://www.bls.gov/news.release/archives/forbrn 05192016.htm
- 11. Burk JA, Hendry JA. 2014. Risk-based auditing. Prof. Saf. 59(6):76
- Byler CG, Robinson WC. 2016. Differences in patterns of mortality between foreign-born and nativeborn workers due to fatal occupational injury in the USA from 2003 to 2010. J. Immigr. Minor. Health https://doi.org/10.1007/s10903-016-0503-2
- Campbell RM, Klei AG, Hodges BD, Fisman D, Kitto S. 2014. A comparison of health access between permanent residents, undocumented immigrants and refugee claimants in Toronto, Canada. J. Immigr. Minor. Health 16(1):165–76
- Can. Cent. Occup. Health Saf. 2016. Hotel housekeeping. Fact Sheet, Nov. 1. http://www.ccohs.ca/oshanswers/occup_workplace/hotel_housekeeping.html

- Cartwright MS, Walker FO, Newman JC, Schulz MR, Arcury TA, et al. 2014. One-year incidence of carpal tunnel syndrome in Latino poultry processing workers and other Latino manual workers. Am. J. Ind. Med. 57(3):362–69
- CDC (Cent. Dis. Control Prev.). 2008. Heat-related deaths among crop workers—United States, 1992– 2006. MMWR 57(24):649–53
- Ceballos DM, Whittaker SG, Lee EG, Roberts J, Streicher R, et al. 2016. Occupational exposures to new dry cleaning solvents: high-flashpoint hydrocarbons and butylal. 7. Occup. Environ. Hyg. 13:759–69
- Chang F, Prytherch H, Nesbitt RC, Wilder-Smith A. 2013. HIV-related travel restrictions: trends and country characteristics. Glob. Health Action. 6(1):20472
- Clibborn S. 2015. Why undocumented immigrant workers should have workplace rights. Econ. Labour Relat. Rev. 26(3):465–73
- Davis A, Terlikbayeva A, Terloyeva D, Primbetova S, El-Bassel N. 2017. What prevents central Asian migrant workers from accessing HIV testing? Implications for increasing HIV testing uptake in Kazakhstan. AIDS Bebav. 21:2372–80
- De Jesus M, Xiao C. 2013. Cross-border health care utilization among the Hispanic population in the United States: implications for closing the health care access gap. Ethn. Health 18(3):297–314
- De Jesus-Rivas M, Conlon HA, Burns C. 2016. The impact of language and culture diversity in occupational safety. Workplace Health Saf. 64(1):24–27
- Dong X, Platner JW. 2004. Occupational fatalities of Hispanic construction workers from 1992 to 2000.
 Am. J. Ind. Med. 45(1):45–54
- Dong XS, Largay JA, Choi SD, Wang X, Cain CT, Romano N. 2017. Fatal falls and PFAS use in the construction industry: findings from the NIOSH FACE reports. Accid. Anal. Prev. 102:136–43
- Fee LK, Rahman MM. 2006. International labour recruitment: channelling Bangladeshi labour to East and South-East Asia. ASIA Pac. Popul. 7. 21(1):85–107
- Fernández-Esquer ME, Fernández-Espada N, Atkinson JA, Montano CF. 2015. The influence of demographics and working conditions on self-reported injuries among Latino day laborers. *Int. J. Occup. Environ. Health* 21(1):5–13
- Figueiredo M da C, Suleman F, Botelho M do C. 2016. Workplace abuse and harassment: the vulnerability of informal and migrant domestic workers in Portugal. Soc. Policy Soc. 17:65–85
- 28. Flynn MA. 2014. Safety and the diverse workforce. Prof. Saf. 59(6):52-57
- Flynn MA, Check P, Eggerth DE, Tonda J. 2013. Improving occupational safety and health among Mexican immigrant workers: a binational collaboration. *Public Health Rep.* 128(Suppl. 3):33–38
- Flynn MA, Eggerth DE, Jacobson CJ Jr. 2015. Undocumented status as a social determinant of occupational safety and health: the workers' perspective. Am. J. Ind. Med. 58(11):1127–37
- 31. Fung K-A. 2014. Gel, acrylic, or shellac: the impact of Southeast and East Asian immigrant nail salon workers on the health care system. *U. Md. L. J. Race Relig. Gend. Cl.* 14:124–43
- Fussell E. 2011. The deportation threat dynamic and victimization of Latino migrants: wage theft and robbery. Sociol. Q. 52(4):593–615
- 33. Garcia GM, De Castro B. 2016. Working conditions, occupational injuries, and health among Filipino fish processing workers in Dutch Harbor, Alaska. *Workplace Health Saf.* 65:227
- García-García CR, Parrón T, Requena M, Alarcón R, Tsatsakis AM, Hernández AF. 2016. Occupational
 pesticide exposure and adverse health effects at the clinical, hematological and biochemical level. *Life*Sci. 145:274–83
- Gomes J, Lloyd OL, Revitt DM. 1999. The influence of personal protection, environmental hygiene
 and exposure to pesticides on the health of immigrant farm workers in a desert country. *Int. Arch. Occup. Environ. Health* 72(1):40–45
- Gov. Can. 2017. Immigration and citizenship. Updated Aug. 17, Gov. Can., Ottawa. http://www.cic.gc.ca/english/index.asp
- Gransow B, Zhu J. 2016. Labour rights and beyond—how migrant worker NGOs negotiate urban spaces in the Pearl River Delta. *Popul. Space Place* 22(2):185–98
- Grzywacz JG, Arcury TA, Marín A, Carrillo L, Coates ML, et al. 2007. The organization of work: implications for injury and illness among immigrant Latino poultry-processing workers. Arch. Environ. Occup. Health 62(1):19–26

- Hall M, Greenman E. 2015. The occupational cost of being illegal in the United States: legal status, job hazards, and compensating differentials. Soc. Forces. 49(2):406–42
- Hansen E, Donohoe M. 2003. Health issues of migrant and seasonal farmworkers. J. Health Care Poor Underserved 14(2):153–64
- 41. Hege A, Vallejos QM, Apostolopoulos Y, Lemke MK. 2015. Health disparities of Latino immigrant workers in the United States. *Int. J. Migr. Health Soc. Care* 11(4):282–98
- Hodge DR. 2014. Assisting victims of human trafficking: strategies to facilitate identification, exit from trafficking, and the restoration of wellness. Soc. Work. 59:111–18
- Hsieh Y-C, Apostolopoulos Y, Sönmez S. 2016. Work conditions and health and well-being of Latina hotel housekeepers. *J. Immigr. Minor. Health* 18(3):568–81
- Hsieh Y-C (Jerrie), Apostolopoulos Y, Sönmez S. 2013. The world at work: hotel cleaners. Occup. Environ. Med. 70(5):360–64
- Hsieh Y-CJ, Sönmez S, Apostolopoulos Y, Lemke MK. 2017. Perceived workplace mistreatment: case of Latina hotel housekeepers. Work 56(1):55–65
- ILO (Int. Labour Off.). 2014. Fair Migration: Setting an ILO Agenda. Rep. Dir.-Gen. ILO Conf. Geneva: ILO. http://www.ilo.org/wcmsp5/groups/public/-ed_norm/-relconf/documents/meetingdocument/wcms_242879.pdf
- ILO (Int. Labour Off.), Ctry. Off. Bangladesh. 2014. Promoting Cooperation for Safe Migration and Decent Work. Dhaka: ILO. http://www.ilo.org/wcmsp5/groups/public/—ed_protect/—protrav/ —migrant/documents/publication/wcms_248857.pdf
- 48. ILO (Int. Labour Off.), Labour Migr. Branch, Int. Labour Off., Dep. Stat. 2015. *ILO Global Estimates on Migrant Workers: Results and Methodology. Special Focus on Migrant Domestic Workers.* Geneva: ILO. http://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/documents/publication/wcms_436343.pdf
- Jackson LL, Rosenberg HR. 2010. Preventing heat-related illness among agricultural workers. J. Agromed. 15(3):200–15
- Jo W-K, Kim S-H. 2001. Worker exposure to aromatic volatile organic compounds in dry cleaning stores. AIHA7 62(4):466–71
- Kurth E, Jaeger FN, Zemp E, Tschudin S, Bischoff A. 2010. Reproductive health care for asylum-seeking women—a challenge for health professionals. BMC Public Health 10:659
- Landsbergis PA, Grzywacz JG, LaMontagne AD. 2014. Work organization, job insecurity, and occupational health disparities. Am. J. Ind. Med. 57(5):495–515
- Lee WJ, Son M, Chun BC, Park ES, Lee HK, et al. 2008. Cancer mortality and farming in South Korea: an ecologic study. Cancer Causes Control 19(5):505–13
- Liebman AK, Juarez-Carrillo PM, Reyes IAC, Keifer MC. 2016. Immigrant dairy workers' perceptions
 of health and safety on the farm in America's Heartland. Am. J. Ind. Med. 59(3):227–35
- Liebman AK, Wiggins MF, Fraser C, Levin J, Sidebottom J, Arcury TA. 2013. Occupational health policy and immigrant workers in the agriculture, forestry, and fishing sector. Am. 7. Ind. Med. 56(8):975–84
- Lopez WD, Kruger DJ, Delva J, Llanes M, Ledón C, et al. 2016. Health implications of an immigration raid: findings from a Latino community in the Midwestern United States. J. Immigr. Minor. Health 19:702–8
- Macario E, Hannon SW, Baker R, Branche CM, Trahan C. 2015. Preventing falls in residential construction: effectiveness of engaging partners for a national social marketing campaign. Am. J. Ind. Med. 58(8):809–23
- Marín AJ, Grzywacz JG, Arcury TA, Carrillo L, Coates ML, Quandt SA. 2009. Evidence of organizational injustice in poultry processing plants: possible effects on occupational health and safety among Latino workers in North Carolina. Am. J. Ind. Med. 52(1):37–48
- Marsh SM, Fosbroke DE. 2015. Trends of occupational fatalities involving machines, United States, 1992–2010. Am. J. Ind. Med. 58(11):1160–73
- McKernan LT, Ruder AM, Petersen MR, Hein MJ, Forrester CL, et al. 2008. Biological exposure assessment to tetrachloroethylene for workers in the dry cleaning industry. *Environ. Health* 7(1):12

- Mousaid S, De Moortel D, Malmusi D, Vanroelen C. 2016. New perspectives on occupational health and safety in immigrant populations: studying the intersection between immigrant background and gender. Ethn. Health 21(3):251–67
- Muñoz FA, Servin AE, Garfein RS, Ojeda VD, Rangel Gómez G, Zúñiga ML. 2015. Deportation history among HIV-positive Latinos in two US–Mexico border communities. J. Immigr. Minor. Health 17(1):104–11
- 63. Murphy J, Samples J, Morales M, Shadbeh N. 2015. "They talk like that, but we keep working": sexual harassment and sexual assault experiences among Mexican indigenous farmworker women in Oregon. 7. Immigr. Minor. Health 17(6):1834–39
- 64. Murray JK, DiStefano AS, Yang JS, Wood MM. 2016. Displacement and HIV: factors influencing antiretroviral therapy use by ethnic Shan migrants in Northern Thailand. J. Assoc. Nurses AIDS Care 27(5):709-21
- Nicodemo C, Ramos R. 2012. Wage differentials between native and immigrant women in Spain: accounting for differences in support. Int. 7. Manpow. 33(1):118–36
- NIOSH (Natl. Inst. Occup. Saf. Health). 2017. Pesticide illness & injury surveillance. Updated Feb. 7, Cent. Dis. Control Prev. (CDC), Atlanta. https://www.cdc.gov/niosh/topics/pesticides/default.html
- Nir SM. 2015. The price of nice nails. New York Times, May 7. https://www.nytimes.com/2015/ 05/10/nyregion/at-nail-salons-in-nyc-manicurists-are-underpaid-and-unprotected.html
- 68. O'Connor T, Flynn M, Weinstock D, Zanoni J. 2014. Occupational safety and health education and training for underserved populations. *New Solut*. 24(1):83–106
- O'Connor T, Loomis D, Runyan C, Abboud dal Santo J, Schulman M. 2005. Adequacy of health and safety training among young Latino construction workers. J. Occup. Environ. Med. 47(3):272–77
- Okechukwu CA, Souza K, Davis KD, de Castro AB. 2014. Discrimination, harassment, abuse and bullying
 in the workplace: contribution of workplace injustice to occupational health disparities. Am. J. Ind. Med.
 57(5):573–86
- 71. Oram S, Abas M, Bick D, Boyle A, French R, et al. 2016. Human trafficking and health: a survey of male and female survivors in England. *Am. 7. Public Health* 106(6):1073–78
- 72. Orrenius PM, Zavodny M. 2009. Do immigrants work in riskier jobs? Demography 46(3):535-51
- 73. Ostrach B. 2013. "Yo no sabía..."—immigrant women's use of national health systems for reproductive and abortion care. *J. Immigr. Minor. Health* 15(2):262–72
- Otero-Garcia L, Goicolea I, Gea-Sánchez M, Sanz-Barbero B. 2013. Access to and use of sexual and reproductive health services provided by midwives among rural immigrant women in Spain: midwives' perspectives. Glob. Health Action 6(1):22645
- Panikkar B, Brugge D, Gute DM, Hyatt RR. 2015. "They see us as machines:" the experience of recent immigrant women in the low wage informal labor sector. PLOS ONE 10(11):e0142686
- Panikkar B, Woodin MA, Brugge D, Hyatt R, Gute DM, Community Partn. Somerville Community Immigr. Work. Proj. 2014. Characterizing the low wage immigrant workforce: a comparative analysis of the health disparities among selected occupations in Somerville, Massachusetts. Am. J. Ind. Med. 57(5):516–26
- Parreñas RS. 2011. Illicit Flirtations: Labor, Migration, and Sex Trafficking in Tokyo. Stanford, CA: Stanford Univ. Press
- Perumalla Venkata R, Rahman MF, Mahboob M, Indu Kumari S, Chinde S, et al. 2017. Assessment of genotoxicity in female agricultural workers exposed to pesticides. *Biomarkers* 22:446–54
- 79. Peto B, Hoesly L, Cave G, Kretch D, Dieterle E. 2016. Evaluation of the Occupational Safety and Health Administration's Site-Specific Targeting Program Final Report. Washington, DC: Dep. Lab., Chief Eval. Off. https://www.dol.gov/asp/evaluation/completed-studies/SST_Evaluation_Final_Report.pdf
- 80. Preibisch K, Otero G. 2014. Does citizenship status matter in Canadian agriculture? Workplace health and safety for migrant and immigrant laborers. *Rural Sociol.* 79(2):174–99
- 81. Quandt SA, Arcury-Quandt AE, Lawlor EJ, Carrillo L, Marín AJ, et al. 2013. 3-D jobs and health disparities: the health implications of Latino chicken catchers' working conditions. *Am. J. Ind. Med.* 56(2):206–15
- Quandt SA, Grzywacz JG, Marín A, Carrillo L, Coates ML, et al. 2006. Illnesses and injuries reported by Latino poultry workers in western North Carolina. Am. 7. Ind. Med. 49(5):343–51

- 83. Quandt SA, Kucera KL, Haynes C, Klein BG, Langley R, et al. 2013. Occupational health outcomes for workers in the agriculture, forestry and fishing sector: implications for immigrant workers in the southeastern US. Am. J. Ind. Med. 56(8):940–59
- Quesada J, Hart LK, Bourgois P. 2011. Structural vulnerability and health: Latino migrant laborers in the United States. Med. Anthropol. 30(4):339–62
- 85. Reid A, Peters S, Felipe N, Lenguerrand E, Harding S. 2016. The impact of migration on deaths and hospital admissions from work-related injuries in Australia. *Aust. N. Z. 7. Public Health* 40(1):49–54
- Reid A, Schenker MB. 2016. Hired farmworkers in the US: demographics, work organisation, and services: hired farmworkers in the US. Am. J. Ind. Med. 59(8):644–55
- 87. Rodriguez G, Trejo G, Schiemann E, Quandt SA, Daniel SS, et al. 2016. Latina workers in North Carolina: work organization, domestic responsibilities, health, and family life. *J. Immigr. Minor. Health* 18(3):687–96
- Ronda Pérez E, Benavides FG, Levecque K, Love JG, Felt E, Van Rossem R. 2012. Differences in working conditions and employment arrangements among migrant and non-migrant workers in Europe. *Ethn. Health* 17(6):563–77
- Ruiz NG, Rannveig DA. 2008. Protecting temporary workers: migrant welfare funds from developing countries. Migr. Dev. Brief, Oct. 24, Dev. Prospect. Group., World Bank, Washington, DC. https://openknowledge.worldbank.org/bitstream/handle/10986/11010/462810BRI0Box334084B01PUBLIC10MD1Brief7.pdf?sequence=1&isAllowed=y
- Simon J, Kiss N, Łaszewska A, Mayer S. 2015. Public Health Aspects of Migrant Health: A Review of the Evidence on Health Status for Labour Migrants in the European Region. Copenhagen: World Health Organ. Reg. Off. Eur. http://www.euro.who.int/_data/assets/pdf_file/0003/289245/WHO-HEN-Report-A5-1-Labour-rev1.pdf?ua=1
- Sousa E, Agudelo-Suárez A, Benavides FG, Schenker M, García AM, et al. 2010. Immigration, work and health in Spain: the influence of legal status and employment contract on reported health indicators. *Int.* 7. Public Health 55(5):443–51
- 92. Takala J, Hämäläinen P, Saarela KL, Yun LY, Manickam K, et al. 2014. Global estimates of the burden of injury and illness at work in 2012. *J. Occup. Environ. Hyg.* 11(5):326–37
- Toossi M. 2016. A look at the future of the U.S. labor force to 2060. Sept., US Dep. Labor, Washington, DC. https://www.bls.gov/spotlight/2016/a-look-at-the-future-of-the-us-labor-force-to-2060/home. htm
- 94. Tribble AG, Summers P, Chen H, Quandt SA, Arcury TA. 2016. Musculoskeletal pain, depression, and stress among Latino manual laborers in North Carolina. *Arch. Environ. Occup. Health* 71(6):309–16
- Tsai JH-C, Thompson EA. 2013. Impact of social discrimination, job concerns, and social support on Filipino immigrant worker mental health and substance use. Am. 7. Ind. Med. 56(9):1082–94
- Tsai JH-C, Thompson EA. 2015. Effects of social determinants on Chinese immigrant food service workers' work performance and injuries: mental health as a mediator. J. Occup. Environ. Med. 57(7):806– 13
- Underhill E, Rimmer M. 2015. Itinerant foreign harvest workers in Australia: the impact of precarious employment on occupational safety and health. *Policy Pract. Health Saf.* 13(2):25–46
- 98. UNFPA (UN Popul. Fund). 2017. Migration. UNFPA, New York. http://www.unfpa.org/migration
- Varia N. 2008. "As If I Am Not Human": Abuses against Asian domestic workers in Saudi Arabia. Human Rights Watch, July 1. https://www.hrw.org/report/2008/07/07/if-i-am-not-human/abuses-against-asian-domestic-workers-saudi-arabia
- 100. Weitzer R. 2015. Human trafficking and contemporary slavery. Annu. Rev. Sociol. 41:223-42
- 101. Wolff H, Epiney M, Lourenco AP, Costanza MC, Delieutraz-Marchand J, et al. 2008. Undocumented migrants lack access to pregnancy care and prevention. BMC Public Health 8:93



Volume 39, 2018

Contents

Symposium

Commentary: Increasing the Connectivity Between Implementation Science and Public Health: Advancing Methodology, Evidence Integration, and Sustainability David A. Chambers	. 1
Selecting and Improving Quasi-Experimental Designs in Effectiveness and Implementation Research Margaret A. Handley, Courtney R. Lyles, Charles McCulloch, and Adithya Cattamanchi.	. 5
Building Capacity for Evidence-Based Public Health: Reconciling the Pulls of Practice and the Push of Research Ross C. Brownson, Jonathan E. Fielding, and Lawrence W. Green	27
The Sustainability of Evidence-Based Interventions and Practices in Public Health and Health Care Rachel C. Shelton, Brittany Rhoades Cooper, and Shannon Wiltsey Stirman	.55
Epidemiology and Biostatistics	
Selecting and Improving Quasi-Experimental Designs in Effectiveness and Implementation Research Margaret A. Handley, Courtney R. Lyles, Charles McCulloch, and Adithya Cattamanchi	. 5
Agent-Based Modeling in Public Health: Current Applications and Future Directions Melissa Tracy, Magdalena Cerdá, and Katherine M. Keyes	.77
Big Data in Public Health: Terminology, Machine Learning, and Privacy Stephen J. Mooney and Vikas Pejaver	.95
Environmental Determinants of Breast Cancer Robert A. Hiatt and Julia Green Brody	13

Meta-Analysis of Complex Interventions Emily E. Tanner-Smith and Sean Grant	135
Precision Medicine from a Public Health Perspective Ramya Ramaswami, Ronald Bayer, and Sandro Galea	153
Relative Roles of Race Versus Socioeconomic Position in Studies of Health Inequalities: A Matter of Interpretation Amani M. Nuru-Jeter, Elizabeth K. Michaels, Marilyn D. Thomas, Alexis N. Reeves, Roland J. Thorpe Jr., and Thomas A. LaVeist	169
Social Environment and Behavior	
The Debate About Electronic Cigarettes: Harm Minimization or the Precautionary Principle Lawrence W. Green, Jonathan E. Fielding, and Ross C. Brownson	189
Harm Minimization and Tobacco Control: Reframing Societal Views of Nicotine Use to Rapidly Save Lives David B. Abrams, Allison M. Glasser, Jennifer L. Pearson, Andrea C. Villanti, Lauren K. Collins, and Raymond S. Niaura	193
E-Cigarettes: Use, Effects on Smoking, Risks, and Policy Implications Stanton A. Glantz and David W. Bareham	215
Increasing Disparities in Mortality by Socioeconomic Status *Barry Bosworth**	237
Neighborhood Interventions to Reduce Violence Michelle C. Kondo, Elena Andreyeva, Eugenia C. South, John M. MacDonald, and Charles C. Branas	253
The Relationship Between Education and Health: Reducing Disparities Through a Contextual Approach Anna Zajacova and Elizabeth M. Lawrence	273
Environmental and Occupational Health	
Building Evidence for Health: Green Buildings, Current Science, and Future Challenges J.G. Cedeño-Laurent, A. Williams, P. MacNaughton, X. Cao, E. Eitland, J. Spengler, and J. Allen	291
Environmental Influences on the Epigenome: Exposure-Associated DNA Methylation in Human Populations Elizabeth M. Martin and Pobeca C. Fry.	300

From Crowdsourcing to Extreme Citizen Science: Participatory Research for Environmental Health	225
P.B. English, M.J. Richardson, and C. Garzón-Galvis	335
Migrant Workers and Their Occupational Health and Safety Sally C. Moyce and Marc Schenker	351
Mobile Sensing in Environmental Health and Neighborhood Research *Basile Chaix****	367
Public Health Practice and Policy	
Commentary: Increasing the Connectivity Between Implementation Science and Public Health: Advancing Methodology, Evidence Integration, and Sustainability David A. Chambers	1
Building Capacity for Evidence-Based Public Health: Reconciling the Pulls of Practice and the Push of Research Ross C. Brownson, Jonathan E. Fielding, and Lawrence W. Green	27
The Sustainability of Evidence-Based Interventions and Practices in Public Health and Health Care *Rachel C. Shelton, Brittany Rhoades Cooper, and Shannon Wiltsey Stirman	55
The Debate About Electronic Cigarettes: Harm Minimization or the Precautionary Principle Lawrence W. Green, Jonathan E. Fielding, and Ross C. Brownson	189
Harm Minimization and Tobacco Control: Reframing Societal Views of Nicotine Use to Rapidly Save Lives David B. Abrams, Allison M. Glasser, Jennifer L. Pearson, Andrea C. Villanti, Lauren K. Collins, and Raymond S. Niaura	193
E-Cigarettes: Use, Effects on Smoking, Risks, and Policy Implications Stanton A. Glantz and David W. Bareham	215
Neighborhood Interventions to Reduce Violence Michelle C. Kondo, Elena Andreyeva, Eugenia C. South, John M. MacDonald, and Charles C. Branas	253
Mobile Sensing in Environmental Health and Neighborhood Research Basile Chaix	367
Policy Approaches for Regulating Alcohol Marketing in a Global Context: A Public Health Perspective	
Marissa B. Esser and David H. Jernigan	385

Problems and Prospects: Public Health Regulation of Dietary Supplements
Colin W. Binns, Mi Kyung Lee, and Andy H. Lee
Health Services
Achieving Mental Health and Substance Use Disorder Treatment Parity: A Quarter Century of Policy Making and Research Emma Peterson and Susan Busch
Data Resources for Conducting Health Services and Policy Research Lynn A. Blewett, Kathleen Thiede Call, Joanna Turner, and Robert Hest
Designing Difference in Difference Studies: Best Practices for Public Health Policy Research Coady Wing, Kosali Simon, and Ricardo A. Bello-Gomez
How Much Do We Spend? Creating Historical Estimates of Public Health Expenditures in the United States at the Federal, State, and Local Levels Jonathon P. Leider, Beth Resnick, David Bishai, and F. Douglas Scutchfield
Modeling Health Care Expenditures and Use Partha Deb and Edward C. Norton
Promoting Prevention Under the Affordable Care Act Nadia Chait and Sherry Glied
Treatment and Prevention of Opioid Use Disorder: Challenges and Opportunities Dennis McCarty, Kelsey C. Priest, and P. Todd Korthuis
Indexes
Cumulative Index of Contributing Authors, Volumes 30–39
Cumulative Index of Article Titles, Volumes 30–39
Errata
An online log of corrections to <i>Annual Review of Public Health</i> articles may be found at http://www.annualreviews.org/errata/publicalth