

A Global Perspective of Migration and Occupational Health

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Background *Global migration has dramatically increased over the past decade and is at an all-time high, approaching 200 million persons per year. Demographics and economic interdependence suggest that immigration will continue for the near future at record high levels.*

Methods *A review of the few studies that have investigated occupational injury and illness rates among immigrant populations.*

Results *Existing data indicate that higher rates of fatal and non-fatal injuries are common compared to native populations. This increase is in part due to immigrants working in higher risk occupations (e.g., agriculture, construction), but occupational morbidity and mortality is higher among immigrants than native-born workers within occupational categories.*

Conclusions *Research is needed to identify the causes of increased risk among immigrants and to provide direction to effective public health interventions. Research methods must be adapted to different epidemiologic characteristics of immigrant populations, including lack of standard sampling frames, different language and culture from the dominant culture, and precarious work status.* Am. J. Ind. Med. 2010.

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INTRODUCTION

Global migration, including immigration to the United States, is at an all-time high, and the percentage of immigrants without legal status is also the highest on record. This situation has led to a vocal debate on the political, economic, and ethical issues related to immigration. Unfortunately, this debate has completely missed the public health issues arising from increasing immigration, and more specifically, the health disparities of immigrant

populations, including those health outcomes related to work.

While migration is often cast in a negative light because of the social and political debate, the economics of immigration can benefit both the countries of origin and the receiving countries. Unfortunately, many of the hidden costs of immigration affect the immigrants themselves. Health costs include obvious fatal and non-fatal injuries as well as less obvious chronic diseases and negative impacts on mental health. One of the hidden costs is the occupational health burden of immigrants who work in low-skilled, hazardous jobs, often without adequate protection. This paper summarizes what is known about the occupational injuries and illnesses of global migrants, with particular attention to the disparities in these outcomes from non-migrant workers.

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THE MAGNITUDE OF GLOBAL MIGRATION

Global migration is approaching 200 million persons per year. It rose 23% from 1990 to 2005, increasing from

155 to 191 million [GCIM, 2005]. There are an estimated 200 million people living outside their country of birth, a doubling over the past 50 years. More importantly, the demographics of migration indicate that increases are inevitable. This is based on the reality that the aging population in developed countries requires immigrants to perform the work in those countries, particularly in low-skilled jobs. The report to the United Nations on migration notes that there are currently 142 new entrants into the labor force for every 100 people ready to retire in developed countries, but in 10 years, there will be only 87 entrants for every 100 people leaving the workforce. Only immigrants can make up this difference. Further, the driving force for migration from the sending countries is that those countries have 342 candidates for every 100 jobs that become available [GCIM, 2005].

The economics of migration also drive the migration cycle. For the developed countries, migrants perform low-skilled jobs that would otherwise go unfilled. Migration also provides a labor source to perform higher paying jobs (international brain drain). Most analyses suggest that immigration is a net economic benefit to the receiving countries, but little attention is paid to the countries of origin where the migration pressures are even greater. It is estimated by the World Bank that global migrants send \$300 billion annually in remittances. There are 60 countries receiving \$1+ billion a year, and in 38 countries remittances account for over 10% of the GDP [World Bank, 2006]. Thus, migration provides a substantial source of global “foreign aid.” It is for this reason that migrant workers are hailed as national heroes in some sending countries [DeParle, 2007].

Immigration statistics in the United States translate into equally impressive numbers. There is a net in-migration of 1.25 million immigrants (documented and undocumented) into the US each year. The country’s immigrant population (documented and undocumented) reached a record 37.9 million in 2007, accounting for 1 in 8 or 12.5% of U.S. residents. This percentage has been increasing since 1970 when it was at a low of 4.7%. However, immigrants historically represented over 10% of the US population until World War II, and the total was close to 15% around the turn of the 20th century [U.S. Census Bureau, 2001]. Thus, while the total number of foreign-born residents in the U.S. is at an all-time high, the percentage is lower than historical levels. One change associated with the recent increase in immigration to the U.S. is the dramatic increase in the percentage of undocumented immigrants, now estimated at 26% of the foreign-born population but up to one-half the foreign-born residents in several states [Bean et al., 1988].

The global picture of immigration reflects a dramatic difference between countries of origin (developing) and receiving (developed) countries. The countries or regions receiving the largest numbers of immigrants are low-birth rate countries including the U.S. and Canada, Western

Europe, the Middle East, Australia and Russia. Conversely, the largest numbers of migrants leave countries with high birth rates, including Mexico, China, India, Pakistan, the Philippines, and many other developing countries around the world [United Nations, 2009]. A large and growing percent of population growth in developed countries of the world is a result of migration.

In the U.S., the overwhelming dominant source of immigrants is Mexico with an estimated 12 million residents in the U.S., reflecting a doubling in the previous 10 years. The next largest source is China, which has less than one-fifth the Mexican total of foreign-born residents in the U.S. Traditional patterns of global migration exist, but immigration patterns are increasingly diverse with large increases seen from many Asian countries. A commonality among immigrants in most receiving countries is that they are young, poor, have low educational levels, and lack health insurance. Some countries with active control of immigration and immigrants have a higher percentage of immigrant college graduates and skilled workers. This situation is felt to contribute to an international brain drain of educated people from less-to-more developed countries.

Spain has seen dramatic increases in immigration, as have many other developed countries. The foreign-born population in Spain has increased to almost 5 million in 2007, a 10-fold increase over the past decade [Eurostat, 2004]. The three largest sending countries for Spanish immigration are Morocco, Rumania, and Ecuador, reflecting traditional patterns of immigration that are based on factors such as language, political, and family ties.

The total of remittances sent home by migrants is enormous. It is estimated by the World Bank that migrants from developing countries send home about \$300 billion a year [World Bank, 2006]. This total, sent across borders a few hundred dollars at a time, is more than three times the global total in foreign aid, making immigration a major source of money flowing to developing countries. Most of the remittances are spent on basic necessities such as food and clothing, but some also goes to savings and investment.

IMMIGRATION AND WORK

The largest driver for immigration is work and economic opportunity, and this is reflected in the statistics for immigrant populations. In the U.S., 94.9% of native-born citizens were employed in 2006, compared to 96.9% of foreign-born citizens and 94.8% of foreign-born non-citizens [U.S. Census Bureau, 2009]. However, the distribution of jobs among immigrants is different from that for the native-born. In the 2000 census, professional specialty occupations accounted for 30.9% of the native-born compared to only 24.7% of the foreign-born. Similarly, there were higher proportions of foreign-born workers in service, operator, fabricator, and laborer jobs.

Within specific occupations, the dominance or deficiency of foreign-born workers is readily apparent. For example, 30.2% of agricultural workers in the U.S. in 2004 were Mexican, an increase from just 12.8% 10 years earlier. In some regions of the country, such as California, the percentage of immigrant agricultural workers is closer to 90%. Similarly, 11.0% and 8.6% of construction and transportation workers, respectively, are Hispanic, also reflecting significant increases in the past decade. A similar pattern is seen among housekeeping/maintenance jobs, which are dominated by immigrant women. In 2004, Mexican-born workers filled 12.6% of these jobs, an increase from 5.2% a decade earlier.

Immigration among college-educated individuals has also increased, including migration from one developed country to another. This is seen within European Union countries, as well as elsewhere in the world. For example, one-half of recent immigrants to Canada have a college degree [Smith and Mustard, 2009]. Governments often facilitate the movement of high-skilled immigrants among recent immigrants, as opposed to lower-educated immigrants. The number of college-educated immigrants going to developed, Western countries increased 69% from 1990 to 2000, eclipsing the rate of increase for less-educated immigrants [Ozden and Schiff, 2006].

Over time, disparities between non-foreign born workers and foreign-born workers tend to decrease. Thus, the percentage of foreign-born workers in blue-collar jobs decreases and it increases for white-collar jobs the longer foreign-born individuals have lived in the country. Similarly, poverty rates, which are increased among recent immigrants, decrease with increased time living in the country [U.S. Census Bureau, 2001].

OCCUPATIONAL HEALTH OF IMMIGRANTS

Few studies have critically evaluated the occupational health risks of immigrant populations. A recent review found only 48 articles in English or Spanish on immigrant occupational health between 1990 and 2005 [Ahonen et al., 2007]. Despite the paucity of research, published studies and various reports indicate a consistent pattern of higher occupational morbidity and mortality among immigrant workers. Few studies have examined the association of legal status and injury or death among immigrant populations.

Occupational Fatalities

The U.S. Census of Fatal Occupational Injuries has documented an overall 25% decrease in occupational fatalities over the past 15 years [U.S. Dept. of Labor, 2006]. However, during this time period, the number of fatal occupational injuries among Hispanic workers has nearly doubled, and the rate of fatal occupational injuries in this population has increased. Even more striking is that the

increase in fatalities among Hispanics has been entirely accounted for by foreign-born workers.

The disproportionate share of occupational fatalities among immigrants in large measure derives from the distribution of occupations among immigrants. For example, in the U.S., the three occupational groups with the highest rates of occupational fatalities (transportation, construction, and agriculture) are the three groups with the highest proportion of immigrant workers [U.S. Dept. of Labor, 2006]. Only 8% of recorded occupational fatalities occur among women.

Consideration of occupational fatalities within specific occupations has also shown similar findings. A study of occupational fatalities of Hispanic construction workers in the U.S. from 1992 to 2000 found that Hispanics constituted 15% of construction workers in 2000 but suffered 23.5% of fatal construction injuries [Dong and Platner, 2004]. Overall, the risk of an occupational fatality among Hispanic construction workers was 1.84 (95% CI: 1.60–2.10) times the risk among non-Hispanics. Another study of occupational fatalities in New Mexico from 1998 to 2002 analyzed two different datasets and found that non-U.S. citizenship was an independent risk factor [Mulloy et al., 2007].

Analysis of occupational fatalities in the retail trade industry from 1992 to 1996 found that workers had an overall lower risk of occupational fatalities but a markedly increased risk of violent deaths compared with workers in other industries. The increased risk was independently associated with being a foreign-born worker [Peek-Asa et al., 1999].

Analysis of the U.S. National Traumatic Occupational Fatality surveillance system (NTOF) showed an increase in occupational fatalities among Hispanics in the 1990s. At the same time, the rate was decreasing among non-Hispanics and Blacks [Richardson et al., 2004]. This study also confirmed marked regional differences in occupational fatality rates, with higher rates of occupational fatalities for all race/ethnic groups observed in Southern States. Among Hispanics and Blacks, the occupational fatality rates in Southern States were approximately double the rate in other states. No data existed on immigration status in this study.

Fatalities among agricultural occupations rank among the highest for U.S. workers [Hard et al., 2002], and Hispanic immigrants dominate the agricultural workforce, particularly in the states of California, Texas, and Florida. Thus, the finding of increased occupational fatalities among agricultural workers is consistent with an increased rate of occupational fatalities among immigrant workers, although no data exist on immigrant-specific fatalities in agriculture.

Global data on immigration and occupational injury are limited but tend to confirm the findings from U.S. studies. An Australian study of occupational fatalities found increased rates among foreign-born workers within 5 years of immigration [Corvalan et al., 1994]. The highest observed

rates were among immigrants from non-English speaking countries. Interestingly, all groups showed a decrease in occupational fatalities to predicted rates after 20 years of residence in Australia.

Many investigators have speculated on the causes of increased occupational fatalities among immigrant workers, but there are little or no data investigating specific risk factors. Common explanations include the assignment of more hazardous tasks to immigrant workers, failure of employers to invest in safety training and equipment, greater risk-taking by immigrant workers, and failure to complain about unsafe conditions by workers who may have precarious job status.

Non-Fatal Occupational Injuries

Non-fatal occupational injuries and illnesses are also higher among immigrant workers, but the findings are less consistent than for fatal injuries. Some studies have begun to explore occupational injuries among specific occupations, but data on immigration status and associated factors (e.g., language, documentation) remains very uncommon.

Hispanics comprise 10.2% of the U.S. workforce but account for 17.1% of occupational injuries and illnesses [NIOSH, 2004]. National data from the Bureau of Labor Statistics also shows that Hispanic workers had greater days away from work due to occupational injury or illness than all other race/ethnic groups [NIOSH, 2004]. Again, consideration of the industries with the highest rates of non-fatal occupational injuries reflects the greater proportion of immigrants exposed to these higher risks; the four U.S. industries with the highest occupational injury rates are construction, agriculture, manufacturing, and transportation, and all of these have a large and increasing proportion of immigrant workers in the U.S. [U.S. Census Bureau, 2001].

A prospective study of employed youth in the U.S. aged 14- to 21-year old found no difference in occupational illness or injury rates by ethnicity but did observe increased days of work missed by injured Hispanic men but not women [Strong and Zimmerman, 2005].

A review of European studies of occupational injuries based on data from the 1980s found that rates of occupational accidents were higher for immigrants than for natives in the Netherlands, Germany, Switzerland, and France [Bollini and Siem, 1995]. There are few European studies of occupational health outcomes during the past decade, when immigration has dramatically increased. One recent report analyzed occupational injuries in Spain in 2003 and 2004 [Benavides et al., 2008]. They found contradictory results for risk of fatal and non-fatal occupational injuries among immigrants, largely reflecting problems with immigrant status definition and missing data. A recent study from the Netherlands found increased injury mortality among ethnic minorities compared to the native Dutch population, although the

investigators did not separately analyze occupational injury fatalities [Stirbu et al., 2006].

A few recent studies have begun to focus on specific occupations dominated by immigrant workers, such as day laborers, cleaners, construction, and agricultural workers. In many of these studies immigration status is not directly ascertained, so it is not possible to analyze results in this manner. Nevertheless, recent immigrants dominate some of these occupational categories, and research has begun to explore occupational health risks of this population.

Non-Fatal Injuries in Specific Occupations

“Day labor” is a very visible work vehicle for immigrants, particularly those who are undocumented. Employment is through short-term, informal work agreements with employers, and includes a wide range of jobs, including construction, yard work, and maintenance. Day labor represents one form of precarious work for the large immigrant labor pool performing contingent work, a practice that has increased with downsizing and outsourcing of work. Day laborers in the U.S. are predominantly young, male, Hispanic, undocumented immigrants [Valenzuela, 2000; Buchanan, 2004]. An ethnographic study of 38-day laborers in San Francisco found that most were homeless, living in shelters or in overcrowded single rooms [Walter et al., 2002].

Data on injury or illness rates among day laborers are very sparse, but consistent findings indicate increased rates of occupational injuries, lack of health insurance, and limited worker’s compensation. Job segregation by sex exists with men dominating construction and day labor jobs while women are more commonly found performing cleaning and garment work. A population-based study of 427 immigrant Latino workers (not just day laborers) in a Washington, DC suburb found an annual occupational injury rate of 12.2/100 full-time equivalent employee (FTE), which is 70% above expected rates for U.S. workers [Pransky et al., 2002]. The severity of the injuries was apparent with median lost time from work being 13 days, and 29% of the study population having to change jobs because of the injury. Over one-half the subjects reported not having worker’s compensation and only 20% had medical insurance.

A survey of day laborers at two worker centers and an unregulated street location in Seattle, Washington, found immigrant workers were 1.5–2.0 times more likely than non-immigrant workers to report hazardous work conditions, controlling for type of work [Seixas et al., 2008]. The estimated injury rate was 31/100 FTE, but as with most studies of this type, it is difficult to interpret this finding because the actual population denominator is unknown.

The U.S. agricultural workforce is dominated by Hispanic immigrants who are predominantly male, poor,

and undocumented [Villarejo and Baron, 1999]. In some locations, such as California, over 85% of hired farmworkers are immigrant Hispanics. Agriculture has been recognized for years to have increased fatal and non-fatal injury rates plus a wide range of occupational illnesses, including disorders of multiple organ systems [Kirkhorn and Schenker, 2002]. A population-based study of farmworkers in California found increased rates of occupational injuries and high prevalences of chronic pain among men and women [Villarejo and McCurdy, 2008]. A prospective study of injury among farmworkers found an injury incidence of 9.3/100 FTE per year [McCurdy et al., 2003].

Female immigrants dominate cleaning occupations, both in commercial and residential settings. Recent research has documented very high prevalence rates of severe neck and back pain among hotel cleaners associated with physical workload, work intensification, and ergonomic stresses [Krause et al., 2005]. Barriers to worker's compensation were apparent in this population [Scherzer et al., 2005]. A series of studies from Europe have documented increased respiratory disease among household cleaners. Analysis of the European Community Respiratory Health Study found increased respiratory symptoms and asthma independently associated with the use of cleaning products [Zock et al., 2007]. The immigration status of subjects was not analyzed, but it is likely that the population includes a large and increasing proportion of immigrants, as it does in the U.S.

Garment work is an occupation that has been dominated by immigrant women for the past century. Studies of garment workers have consistently found increased rates of chronic pain compared to control populations [Punnett et al., 1985; Andersen and Gaardboe, 1993]. Garment industry work is well known for its repetitive nature, awkward, and sustained postures. The work is precarious among immigrants, and worker's compensation claims are infrequent [Burgel et al., 2004]. A recent prospective intervention study found that improving seating ergonomics could reduce pain scores among garment workers [Rempel et al., 2007].

FACTORS ASSOCIATED WITH INCREASED INJURIES AMONG IMMIGRANT WORKERS

Several factors are commonly cited as being associated with increased occupational injury risk among immigrant workers, although hard data are generally sparse and sometimes contradictory. As with fatal injuries, immigrants are disproportionately represented in jobs with increased non-fatal injury rates. A common observation is that the precarious job status of immigrant workers, commonly manifest as undocumented immigration status or lack of a job contract, is associated with increased occupational injury rates. For example, the ethnographic study of San Francisco day laborers found that the men worried, if they complained about safety hazards they would be replaced

[Walter et al., 2002]. The economic need to work and a sense of "machismo" may also reduce complaints about unsafe work conditions. Other factors cited as contributing to increased occupational injury risk are a lack of safety training, inadequate safety equipment, economic pressure to continue working, and language/cultural differences. The lack of formal work contracts may result in increased likelihood that abusive labor practices will result. For example, labor contractors have been found to avoid compliance with regulatory and immigration issues, and immigrant day laborers have been recruited to work with hazardous materials such as asbestos without adequate training or protection [Stephenson, 1995].

An interesting study of occupational fatalities in Australia found that recent immigrants from non-English speaking countries had the highest rates of occupational fatalities, but after 20 years residence, fatalities fell to the rate among native-born workers [Corvalan et al., 1994]. However, the recent study of Pransky et al. [2002] in the U.S. did not find that workplace injuries were associated with speaking English, job tenure, number of jobs in the past year, or having received safety training. A study of workers in Salvador, Brazil, found no increase in non-fatal work injury rates associated with the absence of a job contract compared to workers who had the labor legislation protections of the formal job sector [Santana and Loomis, 2004]. Arcury et al. [1999] found that agricultural workers in the U.S. with an H-2A work visa had more frequently received pesticide safety training, but the effectiveness of the training in reducing illness is unknown.

A common correlate of precarious work status among immigrant workers is psychological distress. Thus, unemployment or irregular employment among immigrants may result in a greater degree of chronic health problems or lower perception of one's health [Elkeles and Seifert, 1996]. A Brazilian study found that informal work among women (no labor contract) was positively associated with an almost twofold increase in the number of psychological symptoms, adjusted for other risk factors [Santana et al., 1997]. This study did not specifically address immigrant workers, but other research has documented the predominance of immigrants in informal work arrangements. The serious emotional toll of precarious work has been noted in a study of San Francisco day laborers, including the impact of being isolated from family and community support, of inadequate living situations, and the economic effects of injuries [Walter et al., 2002].

Methodologic Issues in Studying Immigration and Occupational Health

There has been very little research on occupational health among immigrant workers [Ahonen et al., 2007], but the reasons for this deficiency are multiple and complex. A

dramatic increase in immigration has occurred in the past decade, a period when interest and funding for occupational health research has generally been decreasing. Immigration has also become a politically charged issue, likely causing some funding agencies to avoid involvement for fear of a political backlash. Despite the magnitude of recent global migration, few developed countries have implemented a well-regulated immigration policy. Immigrants are generally lacking in political power, thus they lack influence to increase funding and research in health issues affecting them. Despite all these constraints, existing data indicates that immigrants are at increased risk of occupational illness and injury, and research is needed to implement appropriate policies to decrease the associated morbidity and mortality. Public health issues affecting immigrants include many non-occupational health issues, such as housing, nutrition, health-related behaviors, and medical care delivery, but these topics are beyond the scope of this manuscript [Bethel and Schenker, 2005; Kasirye et al., 2005; Arcury and Quandt, 2007].

Another barrier to studying occupational health among immigrants is the need to develop new epidemiologic tools and methods. Whereas classic occupational epidemiologic studies have most commonly used workplace sampling frames to identify study populations, this approach is difficult or impossible for immigrant populations. Researchers are often unable to develop a valid sampling frame because of the large proportion of informal work arrangements, use of labor intermediaries, short-term job placements, and absence of standard identification data (e.g., Social Security number). In addition, many standard population-based survey approaches (e.g., telephone contact) are not feasible and can result in significant under-coverage of the target immigrant population. Even population-based surveys focusing on relevant populations (e.g., Hispanic Health and Nutrition Examination Survey, HHANES) will exclude large segments of the population by their urban-focus, language, or residential stability requirements. Finally, immigration status is often not recorded on surveillance surveys or may be incorrectly reported by immigrants.

Community acceptance is a critically important social requirement that is particularly felt to be lacking by undocumented immigrants fearing arrest and deportation. Using community-based participatory research approaches is one means to increase acceptance and success of research efforts [Arcury et al., 2001]. Successful research projects typically field multidisciplinary teams that include members familiar with the immigrant community under study. Despite the limitations and difficulties of using standard epidemiologic study designs, successful research is possible among immigrant populations. The first requirement is simply to obtain information on immigrant status and related factors in health surveillance and research studies [Schenker, 2005].

Only by asking questions about immigration status will data be obtained that can be used to understand the causes of increased morbidity and mortality among immigrant populations and to design appropriate interventions.

Population-based survey sampling approaches have successfully been used to study immigrant subjects [Pransky et al., 2002; Villarejo and McCurdy, 2008]. This process often requires door-to-door enumeration of residents because census or other public data may not include immigrants living in crowded conditions, in “back dwellings” behind the standard housing units or in other “non-standard” structures, such as sheds, garages, trailers, and motor vehicles. Non-standard dwellings represented 30% of the residences of the population-based study of California farmworkers [Villarejo et al., 2000].

Language and culture are two additional barriers to successful research on immigrant populations. Frequently, subjects not fluent in the dominant language are excluded from research studies, thus differentially excluding recent immigrant subjects. Even bilingual studies may exclude subjects fluent in different dialects or languages. For example, there is an increasing number of indigenous farmworkers in California from Mexico. Many in this population speak only indigenous languages, such as Mixtec, Zapotec, and Triqui. No epidemiologic research to date has studied occupational health in this growing population, although anthropologic approaches have been used in indigenous populations [Holmes, 2006].

Immigrant populations are justifiably suspicious of data collection by unknown professionals from outside the community. Recent raids by immigration officials in the U.S. and elsewhere raise concerns that data provided may be obtained by immigration officials and used for identifying undocumented immigrants. An egregious abuse of this approach was a subterfuge by U.S. immigration officials to have workers come for a safety training, which turned out to be an immigration raid. Given this history, it is critical that researchers establish a rapport and trust with the community so that participation is maintained. It is also important to obtain a Certificate of Confidentiality to protect the privacy of research study subjects [N.I.H., 2008].

For many of the above reasons, surveillance data such as the Behavioral Risk Factor Surveillance (BRFS) system, as well as Census data, are likely to under-represent immigrant populations. In addition, surveillance data may contain insufficient numbers of immigrants to provide useful data for research or health agencies. Statistical methods have been developed to sample low frequency and difficult to reach populations such as immigrants [Andresen et al., 2004]. Possible methods include probability sampling techniques, such as over-sampling areas with a larger number of the subjects of interest, time-space clustering of sampling, and capture–recapture methods [Sudman et al., 1988]. Possible non-probability sampling methods include convenience

sampling, snowball methods, publicly available sampling frames and lists (e.g., local consulates), dual sampling frames, and purchased commercial lists (phone and money transfer companies). Snowball and other referral methods may result in sampling biases that can be reduced by newer methods, such as respondent-driven sampling [Magnani et al., 2005]. Some immigrant populations, such as day laborers, might be sampled by venue-based application of time-space sampling [Muhib et al., 2001]. Obviously, all field methods for recruitment and participation need to be aware of language, culture, legal, and other issues relevant to the population being studied.

It is possible to do long-term follow-up research on immigrant populations, as has been demonstrated by the National Agricultural Worker Survey (NAWS) [Dept. of Labor, 2005] and others [Cooper et al., 2001]. Binational approaches have also been used to study changes in behavior and other health outcomes in immigrant populations [Mines et al., 2001]. Other creative approaches can be used to address different health outcomes. For example, Western Union is the giant of remittance transfers worldwide and might be a source of useful data for epidemiologic research.

CONCLUSIONS

Global migration has doubled in the past 50 years, and nearly 200 million people are currently living outside their countries of origin. Immigration now represents a large and increasing percentage of population growth in developed countries as birth rates continue to decline. Immigrants perform a critical role in the economies of developed countries. Interestingly, immigrants are a source of economic benefits to both their countries of origin and the countries in which they settle and work. It is only the immigrants, themselves, in this global drama who are at increased risk for adverse health effects, including occupational injury and illness.

The United Nations has recognized the unique needs of migrants in the International Convention on the Protection of the Rights of all Migrant Workers and Members of their Families [United Nations, 1990]. This document sets minimum human rights standards for signatory countries including access to health services. Unfortunately, fear and discrimination in host countries can exclude migrants from health services, resulting in more hazardous work conditions, poorer environmental conditions (e.g., housing), and less medical care.

Given the demographic changes and growth in global migration, the economic benefits of migration, and the fundamental human rights involved in health care and disease prevention, it is imperative that public health professionals focus on this issue. It is no longer acceptable to ignore immigration status or to consider it as an epidemiologic confounder. Similarly, the epidemiologic challenges of

studying a population with a different language, culture, residence, and work patterns should not dissuade professionals from doing research on this population but rather should energize the creative abilities of the profession to develop valid research methods.

The nature of work and the workplace is changing. No longer can epidemiologists expect to get work histories for subjects who have spent their working lives at a single company. Work has changed, and occupational epidemiology needs to change. Continuing to use standard epidemiologic research methods developed for stable workforces is akin to looking for one's lost keys under the lamppost because the light is better there.

Immigrant workers are not a homogeneous group, and their diversity and poverty makes research and public health interventions more difficult. Nevertheless, it is evident that they suffer greater occupational illness and injury than do non-immigrants, even within similar occupational categories. This is surely an example of a health inequality that can be addressed. Efforts need to be directed to understanding the nature and causes of these disparities and to developing appropriate public health interventions. Ideally, disease and injury prevention and healthcare access will be equitably implemented for all immigrants as it is for non-immigrant populations.

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