

Traumatic Occupational Injuries in Hispanic and Foreign Born Workers

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Background *Hispanic and foreign-born workers suffer high rates of occupational fatality. Reasons for this are not well understood. Our aim was to gather information about the details related to severe, non-fatal occupational injuries in this vulnerable population.*

Methods *Eight years of data were obtained from an urban trauma center. In addition, medical consultations of individuals admitted for an occupational injury during an 8-month period are reported.*

Results *Hispanics were more highly represented than expected; their number of injuries steadily rose. Hispanics were more likely to be injured by machinery and hand tools. Workers reported hazardous working conditions, lack of workers compensation, short time in current employment, and not working in their usual job.*

Conclusion *Trauma systems can provide a glimpse of risk factors for severe injuries in vulnerable workers. We recommend greater use of this data source, follow backs, long-term follow up of individuals, and improvement of surveillance of vulnerable working populations.* Am. J. Ind. Med. 53:344–351, 2010. © 2009 Wiley-Liss, Inc.

KEY WORDS: *Hispanic workers; occupational injury; trauma systems; foreign born workers; injury surveillance*

INTRODUCTION

Data are emerging that show large numbers and high rates of occupational fatality among Hispanic and foreign-born workers over the last two decades, despite downward trends for the US workforce, overall [Loh and Richardson, 2004; Richardson, 2004, 2005; Cierpich et al., 2008]. Between 2003 and 2006, the work related death rate for foreign born Hispanics was 5.9 per 100,000 compared to a rate of 3.5 for US born Hispanics [Cierpich et al., 2008]. In

2006, the fatality rate was 5.0 per 100,000 Hispanic workers, 4.0 for all US workers, 4.0 for non-Hispanic white workers, and 3.7 for non-Hispanic black workers. The percent of Hispanic decedents that were foreign born went from 52% in 1992 to 67% between 2003 and 2006. This has been attributed to work in hazardous economic sectors and in low-skill occupations, temporary employment situations, poor communication due to inability to speak English, lack of training, low educational attainment, cultural norms and beliefs about vulnerability and prevention, poor access to health care, economic insecurity, fear of deportation, and other socioeconomic factors [Villarejo and Baron, 1999; Bollini and Seim, 2000; Derosé and Baker, 2000; Pransky et al., 2002; Villarejo, 2003; Dong and Platner, 2004; McCauley, 2005]. While over-representation of Hispanics in hazardous work settings has been demonstrated, the relative importance of the other factors is not well characterized in the published literature.

In the 1970s, many states in the US established trauma centers to aggressively treat severe injuries and prevent death and disability [Bazzoli and MacKenzie, 1995]. Trauma

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centers serve all sectors of the public, regardless of immigration status or ability to pay. Investigation of severely injured workers who are admitted to trauma centers may thus improve capture of cases that are undercounted by other occupational surveillance systems [Forst et al., 1999; Azaroff et al., 2002; Husberg et al., 2005; Rosenman et al., 2006; Thomsen et al., 2007]. In addition, trauma data can provide information about the environmental, social, and economic factors surrounding workplace injury—information that is not available from other sources. The aim of this project was to gather information about the background, risk factors, and outcomes of severe, non-fatal occupational injuries in foreign born and Hispanic workers with the goal of determining potential primary, secondary, and tertiary prevention strategies for this vulnerable work force.

METHODS

We conducted a study, with quantitative and qualitative components, of patients who were admitted to a large, urban trauma center after being injured at work. The trauma center (TC) is one of ten centers in a large, metropolitan area, and serves an industrial and densely populated residential section of the city. Each TC in Illinois is part of a system of 67 institutions that receive transports by emergency medical services (EMS). In accordance with State statute, EMS is required to transport any injured individual who is in danger of losing life or limb or who is at risk of long-term disability to the nearest TC. Injured patients may come from outside the designated service area of a given TC if the local TC is full and the EMS has to bypass it, if traffic forces re-direction of the ambulance service, if another hospital deems it necessary to transfer patients for higher acuity care, or if the patients come in themselves. In the study TC, there is an adjacent burn unit, which draws high acuity burns, as well. Level of severity and the need for a patient to be transferred to the TC is made in the emergency department. This study was approved by the Institutional Review Boards at the University of Illinois at Chicago and Stroger Hospital of Cook County.

Quantitative Study

We obtained and analyzed data on every occupational injury that presented to the TC from 2000 to 2007. There is a legal mandate to enter surveillance information into a statewide trauma registry, which forces the careful collection of specific data elements on every patient. These data are uploaded to a centralized registry at the end of each month. There is a field for “work-related = Yes/No” in the registry. The research coordinator in the study TC maintains a separate database of the occupational cases

(work related = yes), to which she downloads a small number of fields from the much larger, uploaded trauma registry survey. Patients are asked on admission if the injury is work related. The major inducement to identify work-related injuries is the potential to recover workers compensation funds in a hospital that is grossly under-funded. In discussions with the administrative staff at this particular TC, there was no particular change in ascertainment of work-relatedness during the study period.

A de-identified dataset was provided for this research with the following data elements: date of injury, age, sex, race/ethnicity, ICD9CM External cause of Injury (“E”) codes [WHO, 1977], type of injury, and discharge disposition. Race and ethnicity—Hispanic, White, Black, Asian, Other—are determined by hospital personnel, as is the case with most health care providers of urgent and emergent care. This method is in contrast to other surveillance programs that ask about race and ethnicity separately [CDC, 2000]. There are a number of measures of severity in trauma units, including vital status at admission, and severity scores. However, there was no severity indicator recorded in this dataset, so disposition (hospitalization in the ICU, hospitalization in a non-ICU unit, surgery, discharge home, left against medical advice) after evaluation in the TC was used as a surrogate for severity. MS Excel was used to conduct a descriptive analysis of this dataset.

Qualitative Study

We reviewed medical consultations of patients who were admitted to the TC for severe, occupational injuries during an 8-month period in 2003. Each time an occupational case is admitted to the TC, physicians on the Occupational Medicine service of the hospital are supposed to be called for consultation. Because there is frequent turnover of trauma personnel (residents), a call for consultation is made for only about half of the patients admitted. For this study 37 (42%) of the 87 patients admitted were interviewed. There does not seem to be a systematic reason for placing or not placing a call; the deficiency in referrals has been relatively unchanged for at least a decade.

The occupational medicine consultants gather information on demographics including country of origin, a work and accident history, language proficiency, and the worker’s perception of the circumstances leading to the injury. This is a typical clinical occupational history format, which includes discrete and open-ended questions. Work authorization status is not queried as it is not relevant to clinical care.

During the period, two occupational medicine resident conducted all of the consultations with attending physician oversight. For any patient who spoke a language not fluently

spoken by the interviewer, a hospital interpreter was called. The interviewers asked questions from a pre-printed consultation form. They recorded answers to questions on the form, filling in lengthier segments after leaving the patient's bedside. The data was entered into a MS Excel spreadsheet. For confusion as to the meaning of the written responses, the PI spoke with the residents to clarify the details of the responses according to the information that was queried.

RESULTS

Quantitative Study

There were 1,061 cases identified as being work-related between 2000 and 2007. Occupational cases made up 3.3% of the 31,883 total patient encounters during this period. Table I shows the number of occupational TC admissions by race and ethnicity. The number of cases, overall, doubled from 86 to 174, and showed a steady rise in cases of Hispanics, while the other races/ethnicities moved around a relatively stable baseline. Blacks had a significantly higher number of admissions in 2007, compared to all other years.

The gender was predominantly male in all groups. The median age for Hispanics who presented to this particular TC was to 8–10 years younger than other Whites and Blacks (Table II). Hispanic workers were similar to the other groups in the proportion of falls, but much higher in injuries caused by machinery and hand tools; motor vehicle crashes were much lower for Hispanics than each of the other groups. Of note was the relatively high fraction of injury by assault for Blacks and Asians. There is no job-related information available in the dataset to further describe the factors related to these findings. Hispanics were similar to Whites and

Blacks, in terms of their disposition after intake in the TC, a surrogate for severity.

Qualitative Study

Thirty-seven patients were interviewed for the qualitative portion of the study (Table III). Twenty two of them (59.5%) were foreign born—from Mexico (10), other parts of Latin America (3), China (2), Poland (3), Bosnia (1), Ireland (1), and Jordan (1). The remaining 15 were born in the US, and two of those were Hispanic. One hundred percent were male. The average age for Hispanics in this survey was 31.7 ± 10 ; for White Non-Hispanics 41.3 ± 14 ; Blacks 46.5 ± 9 . Only two cases were Asian and had an average age of 39. Ten said they were US citizens and the remainder did not divulge this information. English was the first language in 23 (64%), and 29 (78%) spoke English well enough to be interviewed directly for this study. In 11 (31%), Spanish was the first language, and six individuals (16%) had a different first language.

Injuries

The causes of injury (similar to ICD 9 E codes) for the 37 participants, adapted from the patients' narratives, were as follows: Fall = 11 (30%); Struck by = 7 (19%); Thermal and Electrical Burn = 7 (19%); Chemical Burn = 6 (16%); Caught between = 4 (11%); and two were hit by motorized vehicles on work premises. The mechanism of injury was Blunt (19), Burn (13), and Penetrating (5). The causes and mechanisms of injury in the qualitative sample reflect those ascertained by formal, nosologist E-coding of the occupational TC admissions for the 8-year period. Body parts affected were Upper Extremity (12), Head and Neck (9), Trunk (6) and Lower extremity (7). Diagnoses were Laceration or Penetrating Injury (8), Burn (13), Fracture (5), Contusion (9); the latter includes one concussion.

TABLE I. Number and Trends in Occupational Injury Admissions in an Urban Trauma Center, by Race/Ethnicity, 2000–2007

Year	Race/ethnicity					Year total
	White	Black	Hispanic	Asian	Other	
2000	30	33	17	2	4	86
2001	21	33	31	8	0	93
2002	43	44	36	5	0	128
2003	37	41	43	6	4	131
2004	67	44	43	1	0	155
2005	51	35	52	2	2	143
2006	54	26	62	7	2	151
2007	46	61	66	2	0	174
Total (row %)	349 (32.8%)	317 (29.9%)	350 (33%)	33 (3.1%)		1,061

TABLE II. Characteristics of Workers and Their Injuries by Ethnicity in an Urban Trauma Center, 2000–2007

	Race/ethnicity ^a			
	White (N = 349)	Black (N = 317)	Hispanic (N = 350)	Asian (N = 33)
Gender, N (%)				
Male	332 (95%)	265 (83.6%)	330 (94%)	29 (87.9%)
Age, N (cumulative %)				
<18	0	2 (0.6)	2 (0.5)	0
18–24	31 (8.9)	21 (7.3)	63 (18.6)	3 (9.1)
25–34	93 (39.5)	58 (25.5)	135 (57.1)	8 (33.3)
35–44	96 (63.0)	99 (56.8)	76 (78.9)	10 (63.6)
45–54	86 (87.7)	95 (86.8)	56 (94.9)	8 (87.9)
55–64	40 (99.1)	29 (95.9)	15 (99.1)	4 (100)
≥65	3 (100)	12 (100)	3 (100)	0
Average age ± SD	40.28 ± 11.4	41.9 ± 12.0	34.6 ± 11.2	39.7 ± 11.3
Median age	40	42	32	38
External cause, N (column %)				
Fall (E880–888)	128 (36.7%)	97 (30.6%)	130 (37.1%)	10 (30.3%)
Motor vehicle crash (E810–829)	43 (12.3%)	46 (14.5%)	12 (3.4%)	6 (18.2%)
Machinery/tools/caught between (E918, 919, 920)	48 (13.8%)	38 (12.0%)	70 (20.0%)	1 (3.0%)
Struck by (E916, 917)	39 (11.2%)	39 (12.3%)	34 (9.7%)	3 (9.1%)
Burn (E890–899, 924, 925)	57 (16.3%)	34 (10.7%)	59 (16.9%)	6 (18.2%)
Assault (E960–969, 985, 922)	16 (4.6%)	41 (12.9%)	17 (4.9%)	4 (12.1%)
Other	18 (5.2%)	22 (6.9%)	28 (8.0%)	3 (9.1%)
Type of injury, N (column %)				
Blunt	245 (70.2%)	240 (75.9%)	245 (70.0%)	18 (54.5%)
Penetrating	44 (12.6%)	40 (12.6%)	47 (13.4%)	6 (18.2%)
Burn (remainder unknown)	59 (16.9%)	37 (11.7%)	70 (20.0%)	7 (21.2%)
Triaged from trauma unit				
Death	11 (3.2%)	8 (2.5%)	1 (0.3%)	0
Admitted to surgery ^b	25 (7.2%)	22 (6.9%)	28 (8.0%)	3 (9.1%)
Admitted to ICU ^b	32 (9.2%)	24 (7.6%)	22 (6.3%)	1 (3.0%)
Admitted to burn unit ^b	27 (7.7%)	22 (6.9%)	37 (10.6%)	3 (9.2%)
Admitted to observ/ward ^b	86 (9.2%)	92 (29.0%)	101 (28.9%)	7 (21.2%)
Discharged home	161 (46.1%)	140 (44.2%)	159 (45.4%)	17 (51.5%)
Left against medical advice ^b	6 (1.7%)	8 (2.5%)	2 (0.6%)	0
Other/not determined	1	1	0	2

^aThere were 12 cases in the “other” category for race/ethnicity.

^bLonger term vital status is unknown.

Underlying Causes

Hazardous working conditions noted by the interviewees were physical environment hazards (e.g., slip-trip hazards), heat, broken or malfunctioning equipment, and chemical agents. When interviewees were asked in an open ended format, “why do you think this injury occurred,” 20 (54%) reported unsafe working conditions, including (a) not understanding or being trained about the hazards, (b) problems with personal protective equipment (not

provided or defective), (c) no machine guard, (d) slippery or uneven walking surfaces, or (e) being overworked. Six (16%) reported that they, themselves, were careless, two cited alcohol involvement, two were hit by other motor vehicles, two “lost balance” and three did not respond to this question. Two injuries occurred among individuals who were volunteering in construction projects in their communities, and were not formally employed at the place they were injured. When asked if others were injured at the same task, half did not know and only one said yes.

TABLE III. Occupations of Traumatically Injured Workers Interviewed in a Hospital Trauma Unit, Overall, by Ethnicity, and by Birthplace, 2003

Occupation	All participants (N = 37)	Foreign born (N = 22)	Hispanic (N = 18)
Construction (n = 22, 59%)			
Laborer	10 (27%)	7/22 = 32%	3/18
Special trades			
Mason	2 (5.4%)	1 (4.5%)	2
Painter	1 (2.7%)	1 (4.5%)	
Roofer	1 (2.7%)	0	1
Plumber	1 (2.7%)	1 (4.5%)	
Electrician	2 (5.4%)	0	
Ironworker	1 (2.7%)	1 (4.5%)	1
Carpenter	2 (5.4%)	2 (9%)	1
Operating engineer	2 (5.4%)	0	1
Service (n = 11; 30%)			
Auto/truck mechanic	3 (8.1%)	1 (4.5%)	2
Dishwasher	1 (2.7%)	1 (4.5%)	1
Teaching assistant	1 (2.7%)	1 (4.5%)	
Grocery store worker	1 (2.7%)	1 (4.5%)	1
Handyman	1 (2.7%)	0	
Driver (delivery, tow truck)	4 (10.8%)	3 (14%)	3
Manufacturing (n = 4; 11%)			
Steelworker	3 (8.1%)	1 (4.5%)	1
Plant manager	1 (2.7%)	1 (4.5%)	1

Jobs

Around one half of those interviewed worked in the Construction sector, with Transportation and Utilities, Service, and Manufacturing, approximately equally repre-

sented (Table III). Job titles included skilled laborers (building trades = 16), general laborer (9), driver (4), mechanic (4), and other. Job tasks at the time of injury included building, repair, renovation, roofing, laying concrete, cleaning, masonry, carpentry, painting, plastering, lubricating, and electrical work. Eleven of the participants were operating machinery when they were injured.

Employment Circumstances

While 91% said they worked in the same occupation for more than 1 year, the median length of time with the current employer was 1 year; five of the respondents worked for less than 1 month. Seventy-eight percent worked full time at the time of injury and nine (24.3%) were not performing their usual job.

Ten of the 37 workers (27%) reported membership in a union-four of the 10 were foreign born, but all were US citizens. Sixteen (43%) reported working for companies with less than ten employees, while only four (11%) worked for companies with >100; this question was not answered by 13 of the 37 participants. Of the 37 interviewed, only 13 answered that they were covered by workers compensation; 15 said they were not covered, seven did not know, and two did not answer the question.

A case summary of an individual worker who was interviewed in this project is shown in Figure 1 to illustrate the factors related to severe, traumatic occupational injury.

DISCUSSION

According to the US Bureau of Labor Statistics (BLS), the number and rate of nonfatal workplace injuries has

One interviewee was a 24 year old man who was born in Mexico. He presented to the Trauma Center with a meat grinder encasing his hand. When asked by the medical interpreter whether the injury was work-related, he answered that it was not. The interpreter challenged this response and the worker admitted that the injury did occur at work. This gentleman had been in the US for less than one year and had worked for this employer for under a month. The injury occurred at 4:30 PM on a weekday, when he was pushing meat through a grinder that had no guard. He worked full time in a grocery store where he stocked shelves and prepared meat. The store employs less than 10 people, the workforce is not unionized, and this man did not know if he was covered by workers compensation. He did not speak or write English, only Spanish. His injury led to a complete amputation of the hand and he did not return to that job. Four years later, he was still unemployed. He reported receiving no compensation, no prosthesis, no job retraining, and had no independent source of income. Five years after the injury, the same medical interpreter encountered him in the emergency department of another hospital where he was being evaluated for clinical depression and suicidal ideation.

FIGURE 1. Case summary of a traumatically injured, foreign born, Hispanic worker, 2003.

trended downward over the past three decades [NIOSH, 2005a]. In this trauma center, and in other datasets that are based on encounters with the health care system, the number of occupational injuries, overall, has remained steady, with no observable decrease [Friedman and Forst, 2008]. Workplace fatalities among Hispanic workers have gone up from 1996 to 2005, with the rise in numbers due to injuries occurring in workers who are foreign born [Richardson, 2005]. Our prior work in Illinois also has shown a rise in severe workplace injuries among Hispanics that is 2.5 times higher than whites and African Americans [Friedman and Forst, 2008].

Trauma centers can serve as an excellent source of surveillance data on occupational injuries [Forst et al., 1999; Husberg et al., 2005; Friedman and Forst, 2007]. They are valuable because they are more likely to capture data on foreign born workers; this group is likely to be underreported in employer based systems, or even systems that rely on active involvement of the workers themselves, like workers compensation systems and the OSHA Integrated Management Information System [Thomsen et al., 2007; Rosenman et al., 2006]. Workers that are severely injured are unlikely to refuse trauma care despite immigration status, work authorization, or inability to pay, and trauma centers do not refuse care to such patients. Our prior work with the Illinois Trauma Registry shows a high quality database; reporting is required to obtain certification as a trauma center, assuring complete reporting of cases [Friedman and Forst, 2007; IDPH, 2008].

The service area of trauma centers in Illinois is not rigidly defined, so it is impossible to determine the demographic makeup of the background population that is triaged to this particular TC (hence, rates were not calculated). The city in which the TC is located has a population of 2.9 million, of which 26% were Hispanic in 2000 and 28% in 2006 [US Census Bureau, 2006a]; in 2006, 37% were African American, and 31% white. The county figures show an overall population of 5.3 million, a racial makeup of 56% white, 26% African American, and ethnicity figures showing that Hispanics of both races make up 20% of the county population. It should be noted that the US Census Bureau asks race and ethnicity in separate questions and allows respondents to self-identify; TC data-and most health care registry data-does not distinguish race and ethnicity, and the designation is made by hospital staff rather than the patient who is being registered [Friedman et al., 2000; USOMB, 1997]. However, by any assessment, Hispanics are disproportionately highly represented in this TC. While the number of other ethnicities treated here has varied over time, Hispanics show a steady, upward trend. This mirrors the increasing number of Hispanic immigrants in the city over the last decade. Illinois ranks the fifth in the Hispanic population among states in the US [Pew Hispanic, 2007].

In 1980, 80% of the Hispanic population was foreign born; in 1990 it was 64%; in Census 2000, the proportion was 39.1% [US Conference of Catholic Bishops, 2006]. Our observation that foreign born workers, of whom ~60% were Hispanic, demonstrates the importance of separating statistics about foreign born workers from Hispanic workers in regard to workplace morbidity and mortality. It is notable that Hispanics were not the only foreign born workers, and Spanish is not the only first language of this group. Health and safety training should be tailored to the needs of the workers most at risk for traumatic injuries.

There was a higher proportion of Hispanics who were interviewed for the qualitative portion of this study than was seen in the 8-year span of patient encounters in the trauma center; this phenomenon was due to chance. The average ages for each ethnic/racial group and the injuries they suffered were similar for both the quantitative and qualitative segments, and the proportion of injury types is similar in both study components.

As in this study, the Hispanic population in the US is young, relative to whites and African Americans, with median ages of 26, 38, and 30, respectively. Approximately 35% of US Hispanics are under the age of 18, while 23% of whites and African Americans fall into this age group [US Census Bureau, 2006b]. Yet to be determined are the risk attributable to, and the interaction among the following factors: (1) young age, (2) work in entry level, lower skill jobs, (3) immigration/citizenship status, and (4) educational attainment on severe workplace injury for this population.

Our prior analysis of the trauma registry for the entire state showed falls, machinery incidents and motor vehicle crashes to be the three primary causes of occupational injury [Friedman and Forst, 2007]. Burn injuries are more highly represented in this study, most likely because this particular TC has a burn unit, while most other centers do not.

Of note is that half of the Hispanics in this survey and more than half of the foreign born workers were injured while working in construction. As of 2000, 1.4 million Hispanic workers were employed in construction, constituting <16% of the construction workforce; yet they suffered 23.5% of fatal injuries [Dong and Platner, 2004]. In 2007, there were 1,212 construction workers fatally injured; 312 (25.7%) of them were Hispanic [BLS, unpublished]. Between 1992 and 2006, 34% of deaths among Hispanics occurred in the construction sector [Cierpich et al., 2008].

By fatality rate, construction consistently ranks fourth behind agriculture (the largest Hispanic employer in the US), mining, and transportation [USBLS, 2007a]. Although foreign-born workers comprise only 14% of employees in construction, they make up 17% of the fatalities in this sector [Loh and Richardson, 2004]. As expected, agricultural workers and miners were not interviewed in this study, since this TC is in a highly populated, urban center.

The rate of unionization among interviewees (27%) is more than double that of the general US population, which is around 12% [USBLS, 2007b]. Information about union membership was not collected in the TC database (quantitative study). In general, the unionization rate is higher for men than for women (13% vs. 11%), and Hispanics are less likely to be unionized (9.8%) than others. Construction, in general, is more heavily unionized than the other economic sectors (13.9% vs. 12%). The region where the study TC is located is more highly unionized than the US, overall, and construction in this region is particularly heavily unionized. Although unions may be protective in terms of health and safety, unionized patients in this group still reported unsafe working conditions. Small businesses and workplaces employing immigrant workers, well represented here, are known to be less safe.

The injured worker highlighted in the case presentation (Fig. 1) is exemplary of many of the factors that come into play for immigrant workers: young age, inability to speak English, short time in the US, inexperience in this job task, no machine guarding, work in a small business, and lack of knowledge of entitlements for US workers. Unfortunately, the outcomes after the injury also may be exemplary: complete amputation of the hand, no prosthesis, no job re-training, inability to find other employment, lack of compensation, and severe clinical depression.

Much is known about occupational fatalities because there are many sources of information about mortality in general and in the workplace. Less is known about severe, non-fatal injuries—the near misses that could as easily have ended in fatality. These injuries serve as sentinels that can and should lead to implementation of preventive measures in the workplace. Trauma centers provide a glimpse into severe, non-fatal occupational injuries that is unavailable from other surveillance data sources. Thirty-four states currently have or are developing trauma systems and there is an effort underway to centralize data from the states in the National Trauma Data Bank [NTDB, 2008]. Attention from occupational surveillance stakeholders could make this an excellent source of data for setting national priorities, targeting and evaluating interventions, and detecting emerging issues in injury epidemiology and control that impact Hispanic and foreign born workers.

CONCLUSIONS AND RECOMMENDATIONS FOR A RESEARCH AGENDA

Hispanic workers comprised a higher than expected proportion of severely injured workers that presented to this trauma center between 2000 and 2007. Work in construction appears to be an important risk factor for these injuries. Lack of health and safety measures—inadequate engineering controls, lack of training, inadequate personal protective equipment—were cited by the workers themselves as the

underlying causes of their injuries. Employers that ignore mandated protections, along with employment in small businesses, short time on the job, limited English and English as a second language, and no workers compensation insurance or no knowledge of workers compensation as an entitlement, profiles employment circumstances that are common for foreign born workers.

Additional work based on these results should entail conducting follow backs to the workplaces to determine the factors that led to these injuries, much as fatality investigations are conducted in the NIOSH Fatal Accident and Control Evaluation (FACE) program [Higgins et al., 2001; NIOSH, 2005b]. Mandating notification of OSHA in the event of any severe, traumatic injury—all occupational cases admitted to a trauma center—is a way to force employers to provide safe work environments. The ethical ramifications of this approach—violation of patient confidentiality and exposing some workers to the risk of job loss and deportation—should be weighed against the risk of severe injury and possible death to co-workers and re-injury to the worker himself, if the hazard is not remediated. Should prevention of severe, traumatic injury supersede other considerations?

It would be informative to implement long-term follow up of trauma center worker-patients to find out the consequences of these injuries in terms of workers compensation coverage, return to work issues, rehabilitation, disability, and the economic, social, political, and psychological factors that come into play for injured Hispanic and foreign born workers. This would allow for determining the impact on the health care system and employers, as well as the workers, their families, and society.

Finally, occupational surveillance should be improved to better identify this vulnerable workforce, and to highlight the injury types, the risk factors, and the short and long-term outcomes of potentially devastating injuries. Registries should be made more uniform, to make designation of race and ethnicity as well as definitions of hazardous exposures and injury classification comparable. Linkage of surveillance and enforcement datasets would broaden our understanding of the factors involved in, and the outcomes of, traumatic occupational injury sentinels. For example, data from health care centers can provide extensive information on health outcomes—diagnoses, types of services required (e.g., intensive care and surgery), severity, cost of health care, and discharge disposition. Linked with workers compensation records, it would be possible to determine workplace factors (economic sector, job title, events leading to the injury), as well as long-term outcomes, medical costs, wage replacement costs, and rehabilitation needs. Establishing a data linkage key that could be applied across employer-, worker-, and hospital-based databases would facilitate the possibility of establishing mega-datasets for more effective occupational surveillance.

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