

# Reported Work-Related Injuries and Illnesses Among Hispanic Workers: Results From an Emergency Department Surveillance System Follow-Back Survey

Theresa R. Tonozzi, MPH, Suzanne M. Marsh, MPA,\* Audrey A. Reichard, MPH, OTR, and Ruchi Bhandari, PhD

**Background** *Research suggests Hispanic workers underreport injuries/illnesses to their employer.*

**Methods** *The National Electronic Injury Surveillance System—occupational supplement was used to conduct a follow-back study of workers treated in emergency departments (EDs) from June 2012 through December 2013.*

**Results** *An estimated 448,000 (95%CI 230,000–665,000) Hispanic workers treated in EDs for a work-related injury or illness were represented by 362 completed interviews. Of these, an estimated 443,000 (95%CI 228,000–657,000) workers reported the injury or illness to their employer or were self-employed. The majority had not heard of workers' compensation. Only 10% expected workers' compensation to cover their medical payment while 62% expected payment to be covered by their employer.*

**Conclusion** *We characterized our respondent workforce who reported their injury or illness. We determined that NEISS-Work data are not the most appropriate source to capture underreporting of work-related injuries and illnesses to employers among Hispanic workers. Am. J. Ind. Med. 59:621–629, 2016. © 2016 Wiley Periodicals, Inc.*

**KEY WORDS:** *Hispanic workers; work-related injury; foreign-born workers; injury and illness reporting*

## INTRODUCTION

Hispanic workers represent the largest portion of minority workers in the United States (U.S.) (BLS, 2015) and suffer a disproportionately higher share of occupational

morbidity and mortality [Friedman and Forst, 2008; Sears et al., 2012; Byler, 2013; BLS, 2014a; Gany et al., 2014]. Increased risk for adverse work-related health outcomes can be attributed in part to employment in high risk industries, such as agriculture, construction, manufacturing, and transportation, which have higher rates of work-related injuries compared to the overall national injury rate [Schenker, 2010; BLS, 2014b; Steege et al., 2014]. Other factors also known to be associated with Hispanic workers' risk of being injured or becoming ill at work include employment in low-wage jobs, English-language proficiency, residency status in the U.S., and education [Pransky et al., 2002; Baron et al., 2014; Steege et al., 2014].

Identifying Hispanic workers and the factors that place them at higher risk for a work-related injury is a necessary step in addressing occupational safety and health disparities

---

Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Division of Safety Research, Surveillance and Field Investigations Branch, Morgantown, West Virginia

\*Correspondence to: Suzanne M. Marsh, MPA, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Division of Safety Research, Surveillance and Field Investigations Branch, 1095 Willowdale Road, MS 1808, Morgantown, West Virginia 26505. E-mail: smm2@cdc.gov

Accepted 1 May 2016  
DOI 10.1002/ajim.22606. Published online in Wiley Online Library (wileyonlinelibrary.com).

among this workforce. Two data sources commonly used to derive national estimates of nonfatal occupational injuries and illnesses are: (i) the Bureau of Labor Statistics (BLS) annual Survey of Occupational Injuries and Illnesses (SOII); and (ii) the National Institute for Occupational Safety and Health (NIOSH) Occupational Supplement to the National Electronic Injury Surveillance System (NEISS-Work). Both data sources offer the ability to distinguish Hispanic workers among the total population of injured or ill workers. However, neither dataset provides a comprehensive picture of nonfatal occupational injuries and illnesses.

SOII is based on a nationally representative sample of about 250,000 private industry establishments and state and local agencies. Cases for SOII are collected from private industry employers and state and local government agencies based on information captured in their Occupational Safety and Health Administration (OSHA) logs (Wiatrowski, 2014a). Therefore, this surveillance system relies on employers reporting injuries or illnesses that occur in their workplaces. Researchers have suggested that this system likely underestimates workplace injuries and illnesses (Leigh et al., 2004; Rosenman et al., 2006; Joe et al., 2014; Spieler and Wagner, 2014; Wiatrowski, 2014b). Results from industry sectors that commonly employ Hispanic workers could substantially underestimate the true prevalence of injuries and illnesses experienced by this workforce [Orrenius and Zavodny, 2009; Dong et al., 2011; Grzywacz et al., 2012; Leigh et al., 2014]. For instance, the exclusion of farms with fewer than 11 employees, self-employed workers, household workers, and federal government employees (BLS, 2009) could result in underestimating injuries and illnesses. Furthermore, race and ethnicity are provided voluntarily in the SOII (BLS, 2009). Results from the 2013 SOII data indicate that race or ethnicity was unreported in 39% of all cases (BLS, 2014c). This suggests that Hispanic workers could represent a different proportion of occupational injuries and illnesses than the 12% recorded in the SOII for that year.

NEISS-Work is a worker-based reporting system through which estimates are obtained from a national sample of work-related visits to hospital emergency departments (EDs). NEISS-Work does not have exclusions by industry or employment. However, these data are limited to injuries and illnesses treated in an ED where the medical chart provides an indication of work-relatedness [Jackson, 2001]. For example, workers treated in EDs may choose to not disclose their injury or illness as work-related to ED personnel, or ED personnel may not provide information on work relationship in the medical record. Both situations would inhibit identification of work-related injuries and illnesses in NEISS-Work [Jackson, 2001]. Identification of Hispanic workers also depends on whether ethnicity is recorded in the medical record. In the combined race and ethnicity variable in NEISS-Work, the data are missing for about 20% of

workers. An advantage of NEISS-Work is the opportunity to gather detailed information from the workers themselves through targeted follow-back studies.

In 2009, Congress directed NIOSH to assess under-reporting among workers and whether workers reported their work-related injuries and illnesses to their employers. As part of the same directive, Congress also requested NIOSH to study self-employed workers and workers with work-related chronic injuries or illnesses (U.S. House of Representatives, 2009). To accomplish this, NIOSH used NEISS-Work to conduct a follow-back study among workers who sought treatment in an ED for a work-related injury or illness. The study aimed to determine if workers reported their injury or illness to their employer and the reasons that these workers reported or did not report. The results indicate that nearly all of the follow-back study participants reported to their employer. Consequently, this paper describes demographic, employment, and workplace characteristics, and characteristics of work-related incidents for workers who reported their injuries and illnesses to their employer in some way or were self-employed. Because of the growing number of Hispanic workers in the U.S. and the interest in exploring occupational health disparities in this population, the follow-back survey was conducted in both English and Spanish. The results from those who chose to complete the survey in Spanish are reported here. The results from respondents who completed the survey in English are reported by Bhandari et al. (2016).

## METHODS

The following is a condensed description of the methodology used for this NEISS-Work follow-back study. The companion manuscript (Marsh et al., 2016) provides a more detailed description of the follow-back study design.

The NEISS-Work data collection system was used for this follow-back study. NEISS-Work is a routinely collected national surveillance effort conducted collaboratively by NIOSH and the U.S. Consumer Product Safety Commission (CPSC).<sup>1</sup> NEISS-Work provides annual estimates of occupational injuries, illnesses, and exposures using a stratified probability-based sample of approximately 67 U.S. hospital EDs. Cases captured in NEISS-Work data are identified by hospital coders who review all available ED admissions and medical records to identify injury, illness, demographic, and employment information for work-relatedness. These cases are then submitted to CPSC for inclusion in NEISS-Work. In NEISS-Work, a work-related

<sup>1</sup> NIOSH collects the occupational injury data through collaboration with the Consumer Product Safety Commission (CPSC). However, there are no implied or expressed endorsements of the results presented herein by the CPSC.

case is defined as an injury or illness sustained by a civilian, non-institutionalized worker while working for pay, working on a farm, or volunteering [Jackson, 2001].

In addition to the NEISS-Work inclusion criteria, the sample for this follow-back study was further restricted to workers aged 20–64 years who were conversant in English or Spanish. Workers must have been working for a wage or salary, working for a family business, working on a farm, or self-employed at the time of the injury or illness. The age range was chosen to minimize the influence of working students (those <20) and semi-retired (those >64). Workers less than 20 and greater than 64 only accounted for a small proportion (~7%) of workers treated in EDs (CDC, 2016). Volunteers and day laborers were excluded because of the difficulty in characterizing their work situations and the small proportion of these workers made it unlikely that sufficient data could be collected to meet statistical reporting requirements. Additional reasons for excluding day laborers included the fact that they generally could not be pre-identified and would likely not have viable contact information. In addition, this particular group needed special consideration because of their unique reporting requirements, or lack thereof, their highly variable, unpredictable employment arrangements (Gonzalez, 2007), and language and cultural issues. Potential respondents with an ED visit greater than 30 days prior to the sampling date were excluded to minimize recall bias. Each week, CPSC personnel identified cases for the follow-back sample and NIOSH researchers confirmed that cases met the follow-back study criteria. All self-employed and agriculture workers were selected and individuals with an illness were oversampled because these were subgroups of particular interest for this study (Marsh et al., 2016). Twelve hospitals chose not to participate in the follow-back study. Potential respondents for the follow-back study were identified based on ED treatment dates between June 2012 and December 2013.

The design of the follow-back questionnaire was based on an extensive literature review and priority topics identified by an external panel knowledgeable of work-related injury and illness underreporting issues. Furthermore, the questionnaire was reviewed by NIOSH researchers and cognitively tested to assess format, flow, and comprehension (Marsh et al., 2016). The questionnaire began with obtaining verbal informed consent and included multiple choice and open ended questions relating to demographics, employment, and workplace characteristics, the injury or illness that was treated at the ED, reporting of the injury or illness to the employer, medical coverage, payment source for the ED visit, existence of chronic conditions, and return to work information. The final version of the English questionnaire was translated into Spanish by two Spanish speakers with extensive translation experience and then back translated by a NIOSH researcher fluent in Spanish. No further cognitive

testing was done for the translated questionnaire due to resource constraints. Because the questionnaire was simplified in select areas to accommodate language, cultural, and conceptual differences when translated, this introduced potential compatibility issues between the English and Spanish questionnaires. Without further cognitive testing to confirm that the English and Spanish versions were semantically and conceptually equivalent, comparing the results is not recommended [Behling and Law, 2000]. In addition, we recognize that respondents who were unable to speak English well enough to complete our study questionnaire in English have the potential to experience unique barriers to reporting workplace injuries and illnesses. Consequently, the data were analyzed separately, with the Spanish results being presented here and the English results presented in another manuscript (Bhandari et al., 2016). The follow-back study protocol was approved by the NIOSH Institutional Review Board.

The Spanish questionnaire was administered via telephone by trained CPSC interviewers fluent in Spanish using a computer-assisted telephone interviewing system. Responses were not electronically recorded but were only keyed via the Computer Assisted Telephone Interview system. For narrative responses, interviewers often paraphrased answers as the respondents were talking. The interview took approximately 30 min to complete, and no incentives were offered for participation.

The decision to administer a survey in Spanish was based on telephone communication and respondent preference. Prior to submitting potential respondent contact information to the contract telephone interviewers who conducted the surveys, CPSC attempted to identify possible Spanish-speaking respondents based on ethnicity and/or name and assign these to bilingual telephone interviewers. In addition, a letter sent to potential respondents prior to telephone contact included Spanish language that provided workers a Spanish speaking project contact to call if they had questions about the study at which time they could request the survey be administered in Spanish. For most respondents, the decision to administer the Spanish survey was made at the time of initial telephone contact. If the respondent had difficulty with the initial communication in English, the interviewer offered the Spanish version of the survey. Spanish speaking respondents who were not initially contacted by a bilingual interviewer were informed that a Spanish speaking interviewer would call them at a later time.

Prior to analysis, narratives for industry, occupation, and injury/illness information were coded using standardized coding procedures. Industry was classified using the 2002 Bureau of the Census Industry codes (BOC, 2002) and occupation was classified using 2010 Bureau of the Census Occupation codes (BOC, 2010). Injury event was identified from respondent narratives and coded using the BLS Occupational Injury and Illness Classification System

(OIIICS) Version 2.01 Manual (BLS, 2012). Narrative data for a respondent's reasons for reporting an injury or illness to an employer were assigned codes based on a qualitative content analysis which involved two NIOSH researchers defining code categories, assigning narrative responses to the code categories, and adjudicating any non-matching category assignments (Marsh et al., 2016).

Using the American Association for Public Opinion Research methods (AAPOR, 2011) for computing minimum response rates, the combined weighted response rate for the English and Spanish questionnaires was 20%. As respondents were not identified as Spanish speaking until they were reached by phone, a response rate specific to this population could not be calculated. The median days between the date of ED treatment and the interview was 60 (range 32–210). A response propensity analysis identified work employment categories (paid private or government employee and all others/unknown) and age groups (20–30, 31–40, 41–50, and 51–64) to be variables that correlated with interview response rates. Two weight adjustments were performed on the finalized follow-back data based on these variables: (i) a non-response adjustment to account for non-response bias for those hospitals not providing contact information for sampled participants, failure to contact the potential respondent, or refusal of a potential respondent to participate; and (ii) a post-stratification adjustment to account for those cases not eligible for sampling because of the treatment date or because they were selected for a concurrent follow-back study (Marsh et al., 2016). These adjustments resulted in final weights that were assigned to cases with completed questionnaires.

The final weights were used for calculation of national estimates. Proportions were derived using the SAS Proc SurveyFreq procedure (SAS Version 9.3, SAS Institute, Cary, NC) using the adjusted weights. Corresponding variances were estimated using Taylor series linearization for calculation of 95% confidence intervals (CI). Final weighted estimates and proportions were rounded to adhere to NEISS-Work reporting guidelines for confidentiality and reliability. Estimates not meeting reporting guidelines were suppressed, including estimates with a coefficient of variation greater than 30%. Confidence intervals for data that are not shown in the tables are provided within the text.

Of the 2,598 completed interviews, almost 14% ( $n = 362$ ) were completed in Spanish. We refer to the study respondent population who chose to complete the survey in Spanish as Hispanic because nearly all respondents self-identified that they were of Hispanic, Latino, or Spanish origin in the demographic section of the follow-back study interview. We acknowledge that these respondents do not represent all Hispanics, but only those who chose to complete the interview in Spanish. The survey methods did not capture enough respondents who did not report their injuries or illnesses to their employers to produce reliable estimates for

this subpopulation (Marsh et al., 2016). Therefore, the results presented are limited to populations of Hispanic workers whose employers knew of their injury or illness or who were self-employed. Additionally, injuries and illnesses are referred to as injuries throughout the results section because over 90% of the cases in the sample are injuries, and because we cannot report weighted percentages for illnesses separately as these estimates do not adhere to NEISS-Work reporting guidelines. Lastly, the work characteristics section excludes self-employed workers because they generally do not have the same injury reporting requirements. Those who reported as self-employed were asked proxy variables for injury reporting in the questionnaire, but results for this worker group cannot be presented separately due to NEISS-Work reporting guidelines.

## RESULTS

### Demographic and Injury Characteristics

Responses from the follow-back study represented approximately 448,000 (95%CI 230,000–665,000) Hispanic workers with injuries treated in EDs. This analysis focuses on an estimated 443,000 (95%CI 228,000–657,000) of the workers who reported their injury or were self-employed. Most (91%, 95%CI 88–95%) reported their injury to their employer or supervisor directly, less than 5% indicated that their employer or supervisor found out about their injury a different way, and self-employed workers represented less than 5% of the workers in the study population.

Males comprised 70% of the Hispanic workers (Table I). The median age was 37 years, with the highest proportion (35%) of workers between 30 and 39 years of age. Workers 20–29 and 40–49 made up similar proportions (24% and 23%, respectively). The majority (81%, 95%CI 71–91%) of the workers were foreign born. Nearly 34%<sup>2</sup> (95%CI, 12–55%) were born in Central or South America and 31% (95%CI 17–45%) were born in Mexico. Over half (52%) of the workers had a high school degree, but 35% reported not completing high school. Most (77%) reported an annual income of \$30,000 U.S. dollars or less (Table I). Over half (56%, 95%CI 48–64%) of the workers reported having health insurance at the time of the interview.

Sprains/strains (21%) and lacerations (19%) were the most common types of injuries treated in the ED for these Hispanic workers (Table II). Injuries to the back/neck and hand/finger each accounted for one quarter of all injuries, followed by injuries to a lower extremity (18%). Approximately 43% of the injuries were related to contact with

<sup>2</sup> Data are statistically unreliable with a coefficient of variation of 32%.

**TABLE I.** Demographic Characteristics Among Hispanic Workers Treated in Emergency Departments for a Work-Related Injury or Illness From June 2012 Through December 2013 (NEISS-Work)

Characteristic	Weighted percent <sup>a</sup> (n = 443,000) <sup>b</sup>	95% Confidence interval
Gender		
Male	70	65–76
Female	30	24–35
Age (years)		
20–29	24	19–29
30–39	35	29–41
40–49	23	19–27
50–64	17	12–22
Education level		
Less than high school	35	25–45
High school or equivalent	52	42–63
Some college, college degree, or graduate degree	11	7–15
Annual income (U.S. dollars)		
≤\$15,000	28	22–34
\$15,001–30,000	49	39–59
\$30,001–50,000	14	8–20
Other	9	6–12

NEISS-Work: National Electronic Injury Surveillance System—occupational supplement.

<sup>a</sup>Estimates may not add to 100%.

<sup>b</sup>Estimates include workers who (1) reported their injury or illness to their employer or supervisor directly or (2) indicated that their employer or supervisor found out about their injury or illness a different way or (3) were self-employed.

objects and equipment and 26% of all injury events were overexertion and bodily reaction.

The majority (96%, 95%CI 93–99%) of the workers were treated and released. Over three-quarters (76%, 95%CI 70–83%) of the workers indicated they had returned to work by the time of the interview. Of these, 9% (95%CI 5–13%) felt well enough to return to work the day of the injury, 16% (95%CI 11–22%) felt well enough to return within 1–3 days, 26% (95%CI 18–33%) felt well enough to return within 4–10 days, 31% (95%CI 23–39%) indicated 11 or more days passed before they felt well enough to return, and 18% (95%CI 13–23%) reported still not feeling well at the time they returned. Among the workers who had not returned to work, 14% (95%CI 8–20%) reported they were still recovering. Most other reasons for not yet returning to work were related to job termination by the employer or the worker.

## Work Characteristics

An estimated 424,000 (95%CI 215,000–634,000) Hispanic workers in the follow-back study who reported

**TABLE II.** Injury Characteristics Among Hispanic Workers Treated in Emergency Departments for a Work-Related Injury or Illness From June 2012 Through December 2013 (NEISS-Work)

Characteristic	Weighted percent <sup>a</sup> (n = 443,000) <sup>b</sup>	95% Confidence interval
Injury type		
Sprain/strain	21	15–27
Laceration	19	10–28
Contusions/abrasions	11	8–14
Fracture/crushing/ dislocation	10	4–17
Other	39	26–52
Body part		
Back/neck	25	17–33
Hand/finger	25	17–33
Lower extremity	18	13–23
Arm	14	10–19
Face/eye	10	5–14
Other	8	4–12
Injury event <sup>c</sup>		
Contact with objects and equipment	43	31–55
Overexertion and bodily reaction	26	14–38
Falls/slips/trips	15	13–18
Exposure to harmful substances or environments	9	6–12
Other	7	4–10

NEISS-Work: National Electronic Injury Surveillance System—occupational supplement.

<sup>a</sup>Estimates may not add to 100%.

<sup>b</sup>Estimates include workers who (1) reported their injury or illness to their employer or supervisor directly or (2) indicated that their employer or supervisor found out about their injury or illness a different way or (3) were self-employed.

<sup>c</sup>Variables coded using the Occupational Injury and Illness Classification System (OIICS) Version 2.01 (2012).

their injury were either permanent employees (79%, 95%CI 73–85%) or contingent workers (17%, 95%CI 11–22%). The analysis of work characteristics (Table III) focuses on these two types of workers. Contingent workers are defined as those who were temporary, on-call, or contract.

Approximately, 86% (95%CI 80–92%) of the permanent and contingent workers were employed by a private company. Common industries included services (36%), construction (22%), and manufacturing (14%). Similarly, 32% had a service occupation, 22% had a construction and extraction occupation, and 15% had a production occupation. Over three-fourths of these Hispanic workers (76%, 95%CI 71–82%) worked for an employer who employed more than 11 workers and 92% (95%CI 89–94%) worked over 34 hrs

**TABLE III.** Work Characteristics Among Hispanic Workers Treated in Emergency Departments for a Work-Related Injury or Illness From June 2012 Through December 2013 (NEISS-Work)

Characteristic	Weighted percent <sup>a</sup> (n = 424,000) <sup>b</sup>	95% Confidence Interval
Industry		
Services	36	29–43
Construction	22	13–31
Manufacturing	14	7–21
Trade	10	5–15
Health and social services	8	3–12
Other	10	5–15
Occupation		
Service	32	22–43
Construction and extraction	22	14–30
Production	15	10–21
Transportation and material moving	13	8–17
Other	18	13–22
Length of time with employer		
Less than 7 months	16	11–20
7–11 months	10	4–16
1 year	13	7–18
2–5 years	31	28–35
6–10 years	17	12–23
11–20 years	8	5–12
21 or more years <sup>c</sup>	–	–
Payment source		
Employer directly	62	57–67
Workers' compensation	10	7–13
Other/do not know	28	21–35

NEISS-Work: National Electronic Injury Surveillance System—occupational supplement.

<sup>a</sup>Estimates may not add to 100%.

<sup>b</sup>Estimates include workers who (1) reported their injury or illness to their employer or supervisor directly or (2) indicated that their employer or supervisor found out about their injury or illness a different way. Data excludes the small portion of self-employed workers.

<sup>c</sup>Estimate did not meet minimum reporting requirements.

per week. Over half (56%) of the workers had worked for their current employer for greater than 2 years. However, 16% worked for their current employer for less than 7 months at the time of the interview.

The majority (98%, 95%CI 95–100%) of these Hispanic workers were given instructions regarding whom to tell if they were injured at work. Based on the qualitative analysis of the responses from this group of workers, the primary reason for reporting their injury was due to the worker experiencing pain, discomfort, and/or bleeding. Many workers also reported their injury because the incident was witnessed or heard by another person at work or the injury needed medical attention. A few respondents reported their

injury because they were following employer policies or procedures. Nearly all of the Hispanic workers indicated they told the ER staff that their injury happened at work (98%, 95%CI 96–100%). Less than half (44%, 95%CI 35–53%) reported that they had heard of workers' compensation. The expected source of payment for the ED visit was mostly the workers' employer (62%) (Table III). Only 10% reported workers' compensation as the expected payer.

Workplace characteristics of employment security and labor union membership were applicable to non-contingent workers only. Almost all (94%, 95%CI 90–98%) of the permanent employees reported feeling very secure in their employment situation. While the proportion of Hispanic workers who were labor union members does not meet reporting requirements, a few indicated that they belonged to a labor union and all of these reported that the union encouraged them to report their injury.

## DISCUSSION

Workers who chose to complete the follow-back survey in Spanish were mainly foreign born, had a high school education or less, made less than \$30,000 U.S. dollars per year, and were employed in service and construction related industries. These demographic characteristics of the study sample are similar to those of the larger Hispanic workforce in the U.S. (DOL, 2012). Moreover, these characteristics have previously been shown to put a worker at increased risk for a work-related injury and illness [Pransky et al., 2002; Brunette, 2004; Orrenius and Zavodny, 2009; Shannon et al., 2009; Forst et al., 2010; Stanbury and Rosenman, 2014; Steege et al., 2014].

The workers included in our analyses had informed their employer that an injury or illness occurred at work. Most of the workers indicated they were provided instructions as to whom to report to if they were injured or became sick at work, but only a few of the study respondents indicated they were following policies, procedures, and instructions when reporting the incident to their employer. Workers were much more likely to report that they informed their employer because of pain, discomfort, and/or bleeding or the need for medical attention, indicating they may have reported because they needed to stop work. We could not assess if the workers' employers were required to report the injury or illness on an OSHA log, and whether employers in the SOII sample subsequently reported the injury or illness for inclusion in SOII, or if the employers followed OSHA recordkeeping regulations.

Based on the employer size of the permanent and contingent workers, our study population may not represent the overall Hispanic workforce. Similar to the 22% of our study respondents who worked in the construction industry, almost 25% of all Hispanic workers are employed in the construction industry (DOL, 2012) and nearly half of those

(46%) are in construction firms employing 1–10 workers. However, over 75% of the workers in our study worked for an employer who employed more than 11 workers. Consequently, we may have missed some high risk workers employed in small establishments resulting in our study respondents not accurately reflecting the broader Hispanic workforce. Dong et al. (2011) found that small construction establishments with mostly Hispanic workers were significantly less likely to report nonfatal injuries to their employer compared to establishments with White, non-Hispanic workers, estimating that only 8–16% of the injuries among Hispanic workers were reported in such establishments. In addition to differences in the distribution of employer size, the high percentages of permanent employees and workers who felt secure in their job from our study suggest that our respondent population was not entirely representative of the Hispanic worker population.

The majority of the workers in our study were not familiar with workers' compensation, and only 10% expected workers' compensation to cover their medical payment. While our study did not examine the lack of workers' compensation usage among injured Hispanic workers in more detail, our results were similar to the findings of Pransky et al. (2002) who found that Hispanic immigrant workers who were injured on the job had reported their injury to their employer, but most had not received any workers' compensation. Dong et al. (2007) also reported that Hispanic workers in the construction industry had a lower proportion of medical costs paid by workers' compensation (23%) compared to their White, non-Hispanic peers (50%). Based on our study, payment for medical care fell on the employers. Further exploring the shift of medical costs from workers' compensation to employers directly and possibly to the workers themselves may provide more insight into the true burden of a work-related injury that these workers face (Dong et al., 2007; Gany et al., 2014; Lipscomb et al., 2015). Targeted, innovative efforts to inform this group of workplace safety, injury reporting, and compensation of medical costs for work-related injuries could help address the health disparities among the Hispanic workforce in the U.S. that is currently being reported by researchers.

## Strengths and Limitations

Our results should be viewed in light of various limitations and strengths. Beginning with the limitations, our sample was restricted to injuries and illnesses treated in EDs. Therefore, the surveyed population may not be equally representative of those with injuries and illnesses that do not require medical treatment or those that were treated in other medical facilities such as clinics. This could have contributed to the small proportion of illnesses

reported in this study. Previous research has found that migrant and seasonal workers in New York did not use the EDs for non-trauma events, further impacting the number of reported illnesses [Bowers et al., 2009]. Others have noted the difficulty in capturing work-related illnesses [Azaroff et al., 2002; Ruser, 2010] and this may be especially difficult through ED-based surveillance, which better captures acute health ailments [Jackson, 2001]. In addition, our sample was primarily based on workers who reported that their injury was work-related to ED personnel. Consequently, if a worker did not indicate to ED staff that their injury was work-related or if the ED staff failed to document the work-relatedness in the ED record, the worker would not be part of the NEISS-Work sample.

The participation rate for this study was low. Several issues may have contributed to the low response rate including obstacles in contacting and identifying eligible respondents (Marsh et al., 2016). It is unknown whether those who participated had different reporting behaviors or employment characteristics from the eligible participants who could not be contacted, opted out from participating, or stopped mid-survey. There were also issues with collection of the narrative section of the questionnaire. Cases where exact information was not entered during the interview restricted in-depth analysis, and therefore, provided limited insight into reasons why a respondent reported an injury or illness to their employer.

Finally, another possible limitation is the accuracy of the Spanish questionnaire. While the English questionnaire was cognitively tested (Marsh et al., 2016), the Spanish questionnaire did not undergo pilot testing after translation. Therefore, insight into the understandability of the survey is limited. For example, the low number of workers who indicated that they had heard of workers' compensation may be attributed to how the respondents interpreted the terms workers' compensation and payment from the employer. To address this limitation, we chose to report the results among those who completed the survey in English and Spanish separately.

Despite the limitations, our study does have certain strengths. First, the NEISS-Work methodology uses a stratified probability sample of U.S. hospitals and the sample design allows for a nationally representative sample of occupational injury and illness cases treated in EDs. Second, using this study design we reached populations not captured in SOII (e.g., self-employed and farm workers). Finally, gathering injury and illness information from the worker directly may have addressed employer recordkeeping issues reported by others [Azaroff et al., 2002; Wuellner and Bonauto, 2014].

## CONCLUSION

We aimed to describe reporting behaviors among Hispanic workers who sought treatment in EDs for work

related injuries or illnesses. Because the results of the survey indicated that almost all of the respondents reported their injury or illness to their employer, we were not able to examine the reasons for workers not reporting. We conclude that NEISS-Work data are not the most appropriate data source for investigation of underreporting issues. Continued research efforts are needed to understand work experiences among Hispanics in the U.S., including the training they receive on workplace injury and illness reporting and compensation for work-related injury and illness medical costs. This information will improve the current understanding of workplace reporting among Hispanic workers and identify existing training gaps, and can be used by employers and the occupational safety and health community to advance worker safety and health.

## AUTHORS' CONTRIBUTIONS

Theresa Tonozzi was involved in conducting data analysis, interpreting results, writing the manuscript, and addressing editorial changes. Suzanne Marsh was involved in all aspects of the study including designing study and analysis, interpreting results, writing the manuscript, and addressing editorial changes. Audrey Reichard was also involved in all aspects of the study including designing study and analysis, interpreting results, editing the manuscript, and addressing editorial changes. Ruchi Bhandari was involved in reviewing and editing the manuscript. All authors gave final approval of the final version and agree to be accountable for all aspects of the published work.

## ACKNOWLEDGMENTS

All authors are federal government employees and preparation of this manuscript was completely funded by the U.S. Government. We recognize Larry Jackson, a former NIOSH employee, for his efforts in conceptualizing, developing, and providing oversight for this project. We thank Dominique Heinke and Claire Dye, former NIOSH fellows, for their efforts in survey development and in obtaining necessary clearances. We thank Herman Burney, Mary Cowhig, Jean Mah, Tom Schroeder, and other members of the CPSC Division of Hazard and Injury Data Systems for their management of routine NEISS-Work and the related follow-back studies, as well as the coders at each NEISS-Work hospital for their diligent medical record abstraction and the telephone interviewers for their collection of the follow-back study data. We thank Emily Geisen, Georgina McAvinchey, Kristina Peterson, and Rosanna Quiroz of RTI International for their pre-interview evaluation, testing of the follow-back questionnaires, translation of the Congressional questionnaire into Spanish, and conducting the Spanish interviews. Thank you to our NIOSH

colleagues Ana Barbero, for her help with the back translation of Spanish questionnaire, and Rosa Rodriguez, for her help with coordinating study respondents. We thank Susan Derk, T. M. Jackson, and Michele Jones for their efforts in collecting, coding, editing, and analyzing NEISS-Work data and the follow-back study data. Finally, we thank Pam Broene, Ying Chen, David Marker, Klaus Teuter, and Sabrina Zhang of Westat for their work to re-weight the follow-back data. Opinions expressed here do not reflect the opinions of any of these organizations.

## DISCLOSURE (AUTHORS)

There are no known conflicts of interest associated with this publication that could have influenced its outcome.

## DISCLOSURE BY AJIM EDITOR OF RECORDS

Steven Markowitz declares that he has no competing or conflicts of interest in the review and publication decision regarding this article.

## DISCLAIMER

The findings and conclusions of this report are those of the authors and do not necessarily represent the official views of the National Institute for Occupational Safety and Health.

## REFERENCES

- American Association for Public Opinion Research (AAPOR). 2011. Standard definitions: Final dispositions of case codes and outcome rates for surveys. 7th edition: AAPOR.
- Azaroff LS, Levenstein C, Wegman DH. 2002. Occupational injury and illness surveillance: Conceptual filters explain underreporting. *Am J Public Health* 92:1421–1429.
- Baron SL, Beard S, Davids KD, Delp L, Forst L, Kidd-Taylor A, Liebman AK, Linnan L, Punnett L, Welch LS. 2014. Promoting integrated approaches to reducing health inequalities among low-income workers: Applying a social ecological framework. *Am J Ind Med* 57(5):539–556.
- Behling O, Law KS. 2000. Translating questionnaires and other research instruments: Problems and solutions. London: Sage Publications, Inc.
- Bhandari R, Marsh SM, Reichard AA, Tonozzi TR. 2016. Characterizing emergency department patients who reported work-related injuries and illnesses. *Am J Ind Med* 59(8):611–621.
- Bowers MA, Earle-Richardson GB, May JJ, Jenkins PL. 2009. Occupational injury and treatment patterns of migrant and seasonal farmworkers. *J Agro Med* 14(2):172–178.
- Bureau of Census (BOC). 2002. Alphabetical index of industries. Washington, DC: U.S. Department of Commerce.
- Bureau of Census (BOC). 2010. Alphabetical index of occupations. Washington, DC: U.S. Department of Commerce.



- Bureau of Labor Statistics (BLS). 2009. Occupational safety and health statistics. In: BLS handbook of methods. Washington, DC: U.S. Bureau of Labor Statistics [Chapter 9]. <http://www.bls.gov/pub/hom/pdf/homch9.pdf>
- Bureau of Labor Statistics (BLS). 2012. Occupational Injury and Illness Classification Manual, Version 2.01. [http://www.bls.gov/iif/oiics\\_manual\\_2010.pdf](http://www.bls.gov/iif/oiics_manual_2010.pdf)
- Bureau of Labor Statistics (BLS). 2014a. Number of fatal work injuries involving Hispanic or Latino workers, 1997–2013. <http://www.bls.gov/iif/oshwc/foi/cfch0012.pdf>
- Bureau of Labor Statistics (BLS). 2014b. Employer-reported workplace injuries and illnesses –2013. <http://www.bls.gov/news.release/pdf/osh.pdf>
- Bureau of Labor Statistics (BLS). 2014c. Nonfatal occupational injuries and illnesses requiring days away from work, 2013.
- Bureau of Labor Statistics (BLS). 2015. Labor force statistics from the Current Population Survey. <http://www.bls.gov/cps/cpsaat18.htm>
- Brunette MJ. 2004. Construction safety research in the United States: Targeting the Hispanic workforce. *Inj Prev* 10(4):244–248.
- Byler CG. 2013. Hispanic/Latino fatal occupational injury rates. *Monthly Labor Review*. <http://www.bls.gov/pub/mlr/2013/02/art2full.pdf>
- Centers for Disease Control and Prevention [CDC]. 2016. Work-related injury statistics query system (Work–RISQS). Washington, DC: U.S. Department of Health and Human Services. Retrieved from <http://www.cdc.gov/wisards/workrisqs>
- Department of Labor (DOL). 2012. The Latino labor force at a glance. [http://www.dol.gov/\\_sec/media/reports/HispanicLaborForce/HispanicLaborForce.pdf](http://www.dol.gov/_sec/media/reports/HispanicLaborForce/HispanicLaborForce.pdf)
- Dong XS, Ringen K, Men Y, Fujimoto A. 2007. Medical costs and sources of payment for work-related injuries among Hispanic construction workers. *J Occup Environ Med* 49(12):1367–1375.
- Dong XS, Fujimoto A, Ringen K, Stafford E, Platner JW, Gittleman JL, Wang X. 2011. Injury underreporting among small establishments in the construction industry. *Am J Ind Med* 54(5):339–349.
- Forst L, Avila S, Anozie S, Rubin R. 2010. Traumatic occupational injuries in Hispanic and foreign born workers. *Am J Ind Med* 53(4):344–351.
- Friedman LS, Forst L. 2008. Ethnic disparities in traumatic occupational injuries. *J Occup Environ Med* 50:350–358.
- Gany F, Novo P, Dobslaw R, Leng J. 2014. Urban occupational health in the Mexican and Latino/Latina immigrant population: A literature review. *J Immigr Minor Health* 16(5):846–855.
- Grzywacz JG, Quandt SA, Marin A, Summers P, Lang W, Mills T, Evia C, Rushing J, Donadio K, Arcury TA. 2012. Occupational injury and work organization among immigrant Latino residential construction workers. *Am J Ind Med* 55(8):698–706.
- Gonzalez A. 2007. Day labor in the golden state. *California Economic Policy*, 3(3): Public Policy Institute of California. Retrieved from: [http://www.ppic.org/content/pubs/cep/EP\\_707AGEP.pdf](http://www.ppic.org/content/pubs/cep/EP_707AGEP.pdf)
- Jackson LL. 2001. Nonfatal occupational injuries and illnesses treated in hospital emergency departments in the United States. *Inj Prev* 7(Suppl):i21–i26.
- Joe L, Roisman R, Beckman S, Jones M, Beckman J, Frederick M, Harrison R. 2014. Using multiple data sets for public health tracking of work-related injuries and illnesses in California. *Am J Ind Med* 57(10):1110–1119.
- Leigh JP, Marcin JP, Miller TR. 2004. An estimate of the U.S. government's undercount of nonfatal occupational injuries. *J Occup Environ Med* 46(1):10–18.
- Leigh JP, Du J, McCurdy SA. 2014. An estimate of the US government undercount of nonfatal occupational injuries and illnesses in agriculture. *Ann Epidemiol* 24:254–259.
- Lipscomb HJ, Schoenfisch AL, Cameron W, Kucera KL, Adams D, Silverstein BA. 2015. Contrasting patterns of care for musculoskeletal disorders and injuries of the upper extremity and knee through workers' compensation and private health care insurance among union carpenters in Washington State, 1989 to 2008. *Am J Ind Med* 58:955–963.
- Marsh SM, Reichard AA, Bhandari R, Tonozzi TR. 2016. Using emergency department surveillance data to assess occupational injury and illness reporting by workers. *Am J Ind Med* 59(8):600–610.
- Orrenius PM, Zavodny M. 2009. Do immigrants work in riskier jobs? *Demography* 46(3):535–551.
- Pransky G, Moshenberg D, Benjamin K, Portillo S, Thackrey JL, Hill-Fotouhi C. 2002. Occupational risks and injuries in non-agricultural immigrant Latino workers. *Am J Ind Med* 42:117–123.
- Rosenman KD, Kalush A, Reilly MJ, Gardiner JC, Reeves M, Luo Z. 2006. How much work-related injury and illness is missed by the current national surveillance system? *J Occup Environ Med* 48(4):357–365.
- Ruser J. 2010. Allegations of undercounting in the BLS survey of occupational injuries and illnesses. In: 2010 JSM Proceedings, Survey research methods. Alexandria, VA: American Statistical Association.
- SAS. 2011. SAS version 9.3. Cary, NC: SAS Institute, Inc.
- Schenker MB. 2010. A global perspective of migration and occupational health. *Am J Ind Med* 53(4):329–337.
- Sears JM, Bowman SM, Silverstein BA. 2012. Trends in the disproportionate burden of work-related traumatic injuries sustained by Latinos. *J Occup Environ Med* 54(10):1239–1245.
- Shannon CA, Rospenda KM, Richman JA, Minich, LM. 2009. Race, racial discrimination, and the risk of work-related illness, injury, or assault: Findings from a national study. *J Occup Environ Med* 51(4):441–448.
- Spieler EA, Wagner GR. 2014. Counting matters: Implications of undercounting in the BLS survey of occupational injuries and illnesses. *Am J Ind Med* 57(10):1077–1084.
- Stanbury M, Rosenman KD. 2014. Occupational health disparities: A state public health-based approach. *Am J Ind Med* 57:596–604.
- Steege AL, Baron SL, Marsh SM, Menendez CC, Myers JR. 2014. Examining occupational health and safety disparities using national data: A cause for continuing concern. *Am J Ind Med* 57(5):527–538.
- U.S. House of Representatives. 2009. Division F – Labor, health, and human services, and education, and related agencies appropriations, 2009. Washington, DC: U.S. Government Printing Office. [http://housedocs.house.gov/rules/omni/jes/divfjes\\_111\\_hromni2009\\_jes.pdf](http://housedocs.house.gov/rules/omni/jes/divfjes_111_hromni2009_jes.pdf)
- Wiatrowski WJ. 2014a. The BLS survey of occupational injuries and illnesses: A primer. *Am J Ind Med* 57:1085–1089.
- Wiatrowski WJ. 2014b. Examining the completeness of occupational injury and illness data: An update on current research. *Monthly Labor Review*, Bureau of Labor Statistics (BLS).
- Wuellner SE, Bonauto DK. 2014. Exploring the relationship between employer recordkeeping and underreporting in the BLS survey of occupational injuries and illnesses. *Am J Ind Med* 10:1133–1143.