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# RACE-RELATED HEALTHCARE DISPARITIES AMONG CALIFORNIA WORKERS: PUBLIC HEALTH CONSIDERATIONS FOR IMMIGRATION REFORM

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**Abstract—Background:** Healthcare disparities are prevalent in medicine and identifying them will provide health-care professionals, administrators, and policy makers needed information to address this public health concern. **Objective:** To evaluate racial and ethnic disparities in the rates of hospital admission and death among California workers.

**Methods:** We performed an analysis of hospital and emergency department (ED) data from the Office of Statewide Health Planning and Development (OSHPD). Data was collected from California licensed acute care hospitals from 2008–2010. Inclusion criteria: patients >15 years of age whose expected source of payment was worker's compensation. Exclusion criteria: patients <15 years; had missing data for age, sex, race, or injury; or were injured by a suicide attempt, poisoning, or complication of medical procedure. Multivariate logistic regression was used to evaluate the relationship of race/ethnicity and admission/death rates. **Results:** There were 393,298 patients discharged from the ED and 23,343 patients admitted from ED had workers compensation as their expected sources of payment and 150,277 met our inclusion criteria. The annual rate of ED treated injuries was 209/100,000 for Caucasians 343/100,000 for Hispanics, 258/100,000 for blacks and 97/100,000 for Asians. Compared to Caucasians, admission odds ratios (OR) were 1.15 (95% CI 1.07–1.25) for Hispanics, 1.08 (95% CI 0.87–1.33) for blacks, and 0.78 (95% CI 0.63–0.97) for Asians. **Conclusion:** We observed race and ethnicity related healthcare disparities among the occupationally injured in California, with Hispanics having the highest odds of admission and annual incidence of ED treated injuries. No difference in mortality rates was observed.

## INTRODUCTION

Work injuries are common and account for up to 30% of total injuries sustained in the United States (US) (1). A growing body of evidence suggests that among these work-related injuries, there exist disparities among different racial groups (2). Studies have demonstrated that Hispanic patients nationally are exposed to greater occupational risks and fall victim to a disproportionate amount of these work injuries (3). Greater interest in the psychosocial factors of race, ethnicity, culture, sex, and insurance status continues to shape studies of occupational injuries. As minority workers, Hispanics may be overrepresented in low-skilled, physically demanding jobs, but further studies show that the causes of the disparity in injuries may be more pervasive than simply increased occupational hazard. Dong and Platner demonstrated that Hispanics had elevated rates of mortality when compared to their non-Hispanic counterparts in the same occupation (3).

Hispanics are among the fastest growing populations of the US workforce. Numerous studies have explored injury trends among this population at both the regional and statewide levels. Anderson et al. utilized emergency department (ED) registration forms to explore trends among Hispanic employees in Washington, DC presenting to a regional ED and found that Hispanic workers had a higher proportion of serious injuries (fractures, head injuries, falls) and missed more days from work than their non-Hispanic counterparts (4). In Illinois, Friedman and Forest utilized the Illinois trauma registry and found that rates of injury among Hispanic workers were more than twofold higher than white workers, and they sustained more machine-related injuries and amputations (5). The current study utilizes data from California's Office of Statewide Health Planning and Development (OSHPD) to look at work-related injuries recorded across California in a 3-year span from January 2008 to December 2010 (6). To our knowledge, there have been no prior studies exploring such injuries in California.

California is a state rich in racial diversity and employs more than 6 million Hispanic, 2 million Asian, and one million black employees, and thus has the potential to unveil disparities that may exist according to race. According to the 2010 US Census, California is 37% Hispanic/Latino, 40% white, 13% Asian, and 6% African American/Black (7). Home to 13.7 million Hispanics, California has the largest population of Hispanics by sheer numbers. Hispanics make up 26% of the California Work Force, Whites 60%, Asians 10%, and Blacks 4% of the work force (8). According to the US Bureau of Labor and Statistics, the Hispanic labor force will grow faster than any other ethnicity due to higher-than-average fertility rates and net immigration, and are anticipated to become the largest ethnic group in the state by 2015 (9). Though work-related injuries and fatalities have decreased over the last 5 years, California's Hispanic employee population remains disproportionately represented among these fatalities. A study performed by the Bureau of Labor and Statistics has demonstrated that Hispanics have the highest rates of occupational fatalities among any racial group (10). In our study, we aim to evaluate racial and ethnic disparities among the California work force with regard to hospital admission and death rates.

## STUDY DESIGN AND SETTING

We performed a retrospective analysis of a prospectively collected dataset to evaluate racial and ethnic disparities among work-related injuries in patients presenting to California EDs from 2008–2010. We utilized the ED dataset, comprised of ED visits that did not result in an admission, and the Patient Discharge (PD) dataset, comprised of patients admitted to a hospital (6). Both datasets are collected by the OSHPD, a state agency that aims to analyze California's healthcare structure in terms of outcomes, accessibility, and safety. Both datasets are comprised of individual patient visit encounters submitted each time a patient is treated at a licensed general

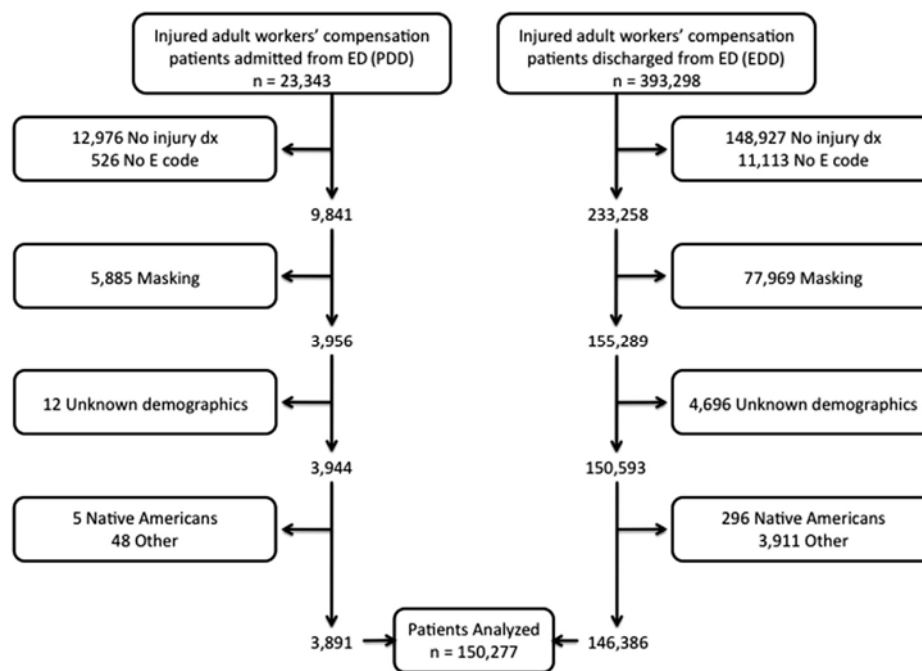


Figure 1. Flow diagram of eligible patients yielding total patients analyzed. ED = Emergency Department; EDD = Emergency Department dataset; PD = patient discharge; PDD = patient discharge dataset; E code = circumstance code; dx = diagnosis.

acute care hospital in California, in compliance with mandated statewide reporting of patient data (6). Both datasets include extensive patient demographic information and diagnosis information. Each patient encounter entry has specified codes for age, sex, race, ethnicity, injury diagnosis (International Classification of Diseases, 9<sup>th</sup> Revision code), circumstance (E) codes, expected source of payment, and other data. E codes provide information regarding the external cause and circumstances of how a patient was injured. For instance, it describes the context of how a patient sustained a fracture (e.g., fall, assault, motor vehicle collision). For the purposes of OSHPD datasets, *race* was defined as a racial background (self reported) and was delineated as white, black, Native American/Eskimo, Asian/Pacific Islander, other, or unknown race, and *ethnicity* was defined as Hispanic, Non-Hispanic, or unknown.

OSHPD masks demographic data for visits with unique combinations of certain demographic information to prevent identification of individuals (6). The frequency of masking is known for each dataset as a whole, but not for any set of visits selected from those data. In the PD dataset, 70% of Native Americans, 39% of Asians and Blacks, and 22% of Whites were masked. In the ED data-set, 48% of Native Americans, 36% of Asians, 19% of Blacks, and 12% of Caucasians were masked.

## SELECTION OF PARTICIPANTS

This study analyzed adult patients who presented to EDs in California from 2008–2010 seeking medical care for work-related injury. Inclusion criteria included patients above age 15 years whose expected source of payment was workers' compensation. Patients were excluded if the dataset records lacked information on their age, sex, race and ethnicity, injury code, E code, and masking. Race/ethnicities other than those primarily studied were also excluded. Because one of the main independent variables was race and ethnicity, patients lacking either were excluded, as we would be unable to evaluate the association of race or ethnicity with our outcome variables. Injuries from medical and surgical complications, poisonings, and suicides were excluded because they were not considered work-related injuries, though they were coded as injuries in the OSHPD datasets. This study was approved by the University's Institutional Review Board.

## METHODS AND MEASUREMENT

There were 23,343 adult patients in the PD dataset that presented through an ED who were eventually admitted for their work-related injuries. We excluded 12,976 patients without an injury diagnosis code, and 526 with an injury diagnosis code but no E code. Another 5,885 were excluded for masking, and 12 patients were excluded for unknown demographics. Because American Indians were so heavily masked, the remaining 5 un-masked Native Americans were removed, as they too would not be representative of the greater sample that was masked. Forty-eight patients who comprised the racial 'other' categories were excluded; 3,891 patients remained in the PD dataset to be analyzed. Patients included in this set were mutually exclusive of the patients in the ED dataset (Figure 1).

There were 393,298 patients in the ED dataset, all of which, by virtue of the dataset, were discharged. We excluded 148,927 patients without an injury diagnosis code, and 11,113 with an injury diagnosis code but no E code. Another 77,969 were excluded for masking, and 4,696 were excluded for missing demographic data. Lastly, 296 unmasked Native Americans and 3,911 patients belonging to the racial group classified as 'other' were excluded, in the same manner as exclusions removed from the PD dataset. There were 146,386 remaining in the ED group. Combining these patients with the PD dataset yielded 150,277 patients available for analysis (Figure 1).

## OUTCOMES

We sought to evaluate healthcare disparities according to race and ethnicity. Our primary outcome was hospital admission according to race and ethnicity. Our secondary outcome was differences in death according to race and ethnicity. Disparities in our study refer to differences in admission and death rates amongst people of different race and ethnic backgrounds. We evaluated the outcomes of hospital admission as a proxy for injury severity. Our independent variables were race, ethnicity, gender, age, injury type, and circumstance. Our dependent variables were hospital admission and death. The aggregate of the PD and ED datasets was the basis of our analysis. This aggregate amounted to 150,277 patients presenting to California EDs with work-related injuries from 2008–2010. These patient records were analyzed using Stata software (version 12; StataCorp, College Station, TX), and ED and PD records were assessed according to the coded race, ethnicity, age, gender, and injury type.

**Table 1. Baseline Characteristics of Study Patients**

	Admitted (n = 3,891)	Discharged (n = 146,386)
Race		
Hispanic	1,519 (2%)	55,035 (98%)
White	2,151 (3%)	78,220 (97%)
Black	118 (2%)	7,118 (98%)
Asian	103 (2%)	6,013 (98%)
Gender		
Male	2,896 (3%)	88,230 (97%)
Female	995 (2%)	58,156 (98%)
Age, years		
15–19	54 (1%)	6,574 (99%)
20–24	259 (1%)	22,633 (99%)
25–29	338 (1%)	22,549 (99%)
30–34	353 (2%)	17,794 (98%)
35–39	331 (2%)	16,067 (98%)
40–44	389 (2%)	15,190 (98%)
45–49	490 (3%)	14,858 (97%)
50–54	517 (4%)	13,290 (96%)
55–59	458 (5%)	9,245 (95%)
60–64	375 (7%)	5,126 (93%)
65–69	142 (8%)	1,734 (92%)
70–74	76 (9%)	754 (91%)
75–79	42 (11%)	324 (89%)
80–84	42 (21%)	161 (79%)
≥85	25 (22%)	87 (78%)

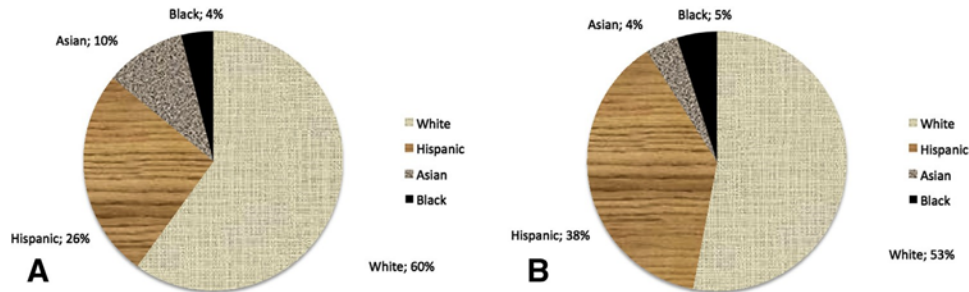


Figure 2. (A) California workers by race/ethnicity from 2008–2010. (B) Work-related injuries presenting to California Emergency Departments by race/ethnicity from 2008–2010.

## ANALYSIS/STATISTICS

The OSHPD SAS datasets were converted to Stata format using Stat/Transfer (version 11; Circle Systems, Seattle, WA) and analyzed in Stata (version 12; StataCorp). Rates were calculated using the number of employed persons, obtained from the Bureau of Labor Statistics (11–13). The odds ratio (OR) for admission was assessed using multiple logistic regression that included age, gender, and race/ethnicity categories, diagnostic groups, and injury circumstance groups. Due to the small number of deaths, and with the goal of not overfitting our statistical model, the multiple logistic regression analysis for death included only age, gender, and the four race/ethnicity categories.

## RESULTS

There were 416,641 patients that presented to California EDs for work-related injuries, as collected by OSHPD datasets over a 3-year time span (2008–2010). After exclusions, 150,277 injured workers in California met our inclusion criteria and were analyzed.

There were 146,386 patients (97.4%) discharged and 3,891 (2.6%) admitted to the hospital (Table 1). Of these injured workers, 80,371 (53%) were white, 56,554 (38%) Hispanic, 7,236 (5%) black, and 6,116 (4%) Asian (Figure 2). According to the Bureau of Labor and Statistics, from 2008–2010, California was home to 5.5 million Latino, 12.8 million white, 2.1 million Asian, and 0.9 million black employees in California (11–13). Comparing the work-injured patients from the current study to baseline state employment data from the Bureau of Labor and Statistics, the annual incidence of ED- treated injuries was 209/100,000 for Whites (95% confidence interval [CI] 208–211/100,000), 343/100,000 for Hispanics (95% CI 340–346/100,000), 258/100,000 for Blacks (95% CI 253–264/100,000), and 97/100,000 for Asians (95% CI 95–100/100,000).

When compared to Whites, the admission odds ratio (OR) for hospital admission was 1.15 (95% CI 1.07–1.25) for Hispanics, OR 1.08 (95% CI 0.87–1.33) for Blacks, and OR 0.78 (95% CI 0.63–0.97) for Asians, when controlling for other variables, including gender, age, circumstance, and injury. Being male was associated with nearly twice the OR for admission compared to females: OR 1.96 (95% CI 1.80–2.14) (Table 2). There was no difference in terms of mortality across ethnicity and race (Table 3).

**Table 2. Likelihood of Hospital Admission According to Race/Ethnicity and Gender**

	Odds Ratio	95% Confidence Interval
Race/ethnicity		
White	1	Referent
Hispanic	1.15	1.07–1.25
Black	1.08	0.87–1.33
Asian	0.78	0.63–0.97
Gender		
Male	1.96	1.80–2.14

**Table 3. Mortality by Race/Ethnicity**

	Total Injured (n = 150,277)	Deaths (n = 50)	% Mortality
White	80,371	30	0.04%
Hispanic	56,554	16	0.03%
Black	7,236	2	0.03%
Asian	6,116	2	0.03%

Of the 150,277 injured patients in this study, the most common injuries sustained were open wounds (45,039; 30%), sprains (39,887; 26.5%), contusions (21,972; 14.6%), and fractures (13,053; 8.7%) (Table 4). Injuries that were most associated with hospital admission were fractures, OR 11.10 (95% CI 9.72–12.66); intracranial injuries, OR 10.96 (95% CI 9.24–12.99); burns, OR 10.65 (95% CI 7.20–15.76); and crush injury, OR 6.16 (95% CI 4.99–7.61) when compared to the referent value of 1 attributed to an open wound.

The most common circumstances for injury during the study period were cuts/piercings (30,603; 20.4%), falls (30,256; 20.1%), overexertion (23,098; 15.4%), and being struck by an object (21,926; 14.6%) (Table 5). Circumstances that were most associated with hospital admission were injuries involving drowning/submersion, OR 40 (95% CI 3.74–385.60); unintentional gunshot wound, OR 23.37 (95% CI 10.18–53.68); motor vehicle collisions, OR 7.68 (95% CI 6.05–9.76); and machinery-related, OR 6.98 (95% CI 5.70–8.54); when compared to the reference value of 1 attributed to cuts/piercing.

## DISCUSSION

Our study is the first, to our knowledge, that utilizes ED data at the statewide level to evaluate work-related injuries in California. Our findings show that racial and ethnic disparities do exist with regard to likelihood of admission for work-related injuries. Hispanics had a greater likelihood of being admitted for work-related injuries when compared to Whites, OR 1.15 (95% CI 1.07–1.25). Asians suffering a work-related injury had a decreased likelihood of admission, OR 0.78 (95% CI 0.63–0.97), when compared to Whites. We also found that males had twice the likelihood of admission, which corroborates findings of McGreevy et al., who reported that



Hispanic males in New Jersey had higher rates of hospital admission from work-related falls, motor vehicle accidents, machinery-related accidents, and blunt trauma (14).

Our secondary outcome was death, and we found no significant difference in death rates according to race and ethnicity. A recent study by the Bureau of Labor and Statistics found that Hispanics in California comprised the greatest number of work-related fatalities in the state in 2010 (10). Our study likely underestimates deaths, as only patients presenting to the ED were included in this study, and did not include patients that may have been killed at the work place or expired en route. With so few deaths in our data set, we may not have had the power to detect a difference in death rates of 0.01% between groups.

Utilizing employment data from the Bureau of Labor and Statistics, this study also found that there were more Hispanics presenting to the ED per 100,000 workers than other ethnicities (11–13). Though Hispanics made up only 26% of the California workforce, they made up 38% of the work-related injuries in our participants, thus comprising a disproportionate amount of work-related injuries, when compared to the California employee demographics. Berdahl and Zodet note that Hispanics were overrepresented in physically demanding, low-skilled jobs in construction, domestic labor, and cleaning occupations that place these employees at increased injury risk, which may explain this discrepancy (1). In contrast to Berdahl and Zodet's analysis, occupation itself was not evaluated in this study, yet likely strongly influenced the type of injuries sustained by these patients. Furthermore, according to a study by the National Institute for Occupational Safety and Health, poor literacy rates and poor training and supervision compound already dangerous work conditions (15).

**Table 4. Frequency of Injuries by Injury Type**

Injury	Cases, n	% of Total Injuries (x/150,277)	OR for Admission	95% CI
Open wound	45,039	30	Referent	
Sprain/strain	39,887	26.5	0.2	0.16–0.26
Contusion	21,972	14.6	0.2	0.15–0.26
Fracture	13,053	8.7	11.1	9.72–12.66
Superficial injury	6,634	4.4	0.28	0.17–0.45
Burn	4,831	3.2	10.65	7.20–15.76
Foreign body	2,901	1.9	0.3	0–0.36
Intracranial injury	2,532	1.7	10.96	9.24–12.99
Crush injury	2,173	1.4	6.16	4.99–7.61
Dislocation	1,942	1.3	1.73	1.27–2.36

OR = odds ratio; CI = confidence interval.

**Table 5. Frequency of Injuries by Circumstance**

Injury	# Cases	% of Total Injuries (x/150,277)	OR for Admission	95% CI
Cut/piercing	30,603	20.4	1	Referent
Fall	30,256	20.1	4.37	3.60–5.31
Overexertion	23,098	15.4	1.26	0.94–1.68
Struck by object	21,926	14.6	1.48	1.20–1.82
Motor vehicle accident	5,471	3.6	7.68	6.05–9.76
Burn	4,782	3.2	0.5	0.32–0.80
Machinery	4,771	3.2	6.98	5.70–8.54
Natural/environmental	4,594	3.1	2.11	1.53–2.92
Struck by object - assault	2,254	1.5	2.18	1.52–3.13
Other transportation	1,112	0.7	7.85	5.94–10.37

OR = odds ratio; CI = confidence interval.

## Limitations

Although the current study was designed to determine *if* disparities exist, it was not designed to explore *why* disparities exist. The first limitation of this study was its utilization of a retrospective dataset, and although it was collected prospectively, it may have been subject to sampling bias. Known confounding factors were examined, and we controlled for injury type



and other demographic confounders, but this study did not control for injury severity, a known driver of hospital admission. Although the Hispanic patients may have had higher injury severity in our study population, this confounder was not examined, and its contribution toward higher admission rate is unknown.

Specific occupation was not recorded in this dataset. This confounder may drive injury type, admission, and death rates. Given that this data set does not include specific occupation for each patient, we were unable to evaluate the relationships between specific occupations and admission or death rates. We also excluded patients missing either injury or E codes and those with masked data. In a sensitivity analysis, 8,282 patients that were initially excluded for not having an E code (but had injury codes) were included in the analysis and had a negligible effect on the distribution among race and ethnicity for death and hospital admission.

Hawaiians and Native Americans were heavily masked and ultimately excluded, and hence, our study did not evaluate these populations. Additionally, injuries not registered under workers' compensation and injuries not presenting to an ED were not accounted for in this study. Although virtually impossible to obtain, including injury data on uninsured patients who did not present to the hospital would increase the denominator in our calculations, thereby supporting the notion that our findings are an underestimate of the true prevalence of injury and disparity.

## CONCLUSION

We performed a retrospective analysis of a prospectively collected dataset to evaluate racial and ethnic disparities among work-related injuries in patients presenting to California EDs from 2008–2010, and found racial and ethnic disparities among injured Hispanic male workers with regard to hospital admission. We found no differences in work-related mortality according to race and ethnicity. Hispanics were also found to have a disproportionately higher annual incidence of ED-treated injuries when compared to the other groups. Further research is needed to evaluate the complex social, economic, political, and occupational drivers that influence these disparities.

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