Trends in the Disproportionate Burden of Work-Related Traumatic Injuries Sustained by Latinos

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Objective: Disproportionate occupational injury rates for Latinos are well documented, but there is limited information about whether disparity is increasing over time. This study describes trends in the burden of work-related traumatic injuries sustained by Latinos in Washington State. **Methods:** Washington State Trauma Registry data from 1998 to 2008 were used to model annual change in the odds that a work-related traumatic injury was sustained by a Latino, controlling for demographics, injury-related factors, and Latino representation in the underlying labor force. **Results:** We found a 5% mean annual increase in the odds that a comparable work-related traumatic injury was sustained by a Latino ($P = 0.007$). Falls in industrial/mine/quarry locations were the strongest contributor to increasing disparity. **Conclusions:** Latinos bear an increasingly disproportionate burden of occupational injuries and are less likely to have health insurance coverage aside from workers' compensation.

Many studies have reported a disproportionate rate of occupational injuries for Latinos, which may be due to both higher prevalence of Latinos in more risky industries and occupations[1,2] and higher rates of injuries for Latinos even within specific industries and occupations.[3,4] A number of studies based on hospital discharge data or trauma registry reports have found higher rates of work-related injuries among Latinos in several states, including Illinois,[5] Massachusetts,[6] New Jersey,[7] and Washington,[8] as well as for the United States as a whole,[1,4,9] but there is limited information available about whether the disparity in injury rates is also increasing over time. Generally speaking, studies have found decreasing or flat trends in occupational injury rates over recent years regardless of ethnicity,[5,7,9] but there is some evidence suggesting that the relative burden of occupational injuries is increasing for Latinos and foreign-born workers.[8,10,11]

Focusing in on Washington State, the Safety and Health Assessment and Research for Prevention program of the Washington State Department of Labor and Industries (L&I) has reported that the percentage of nonfatal occupational injuries with days away from work sustained by Latino workers increased from 7% to 15% from 1997 through 2004.[12] The Safety and Health Assessment and Research for Prevention program also reported that the percentage of occupational fatalities sustained by Latino workers has increased even more steeply for Washington State than for the United States as a whole, with the agriculture, foresting, and fishing sector responsible for the most occupational fatalities among Latinos, followed by the construction sector in second place.[13] Nevertheless, these findings were not adjusted for Latino representation in the labor force, either generally or by sector, and it is unclear whether these increases were attributable solely or partially to demographic and employment trends.

In a recent study[8] based on Washington State Trauma Registry (WTR) data, we noted that Latino workers were 2.6 times more likely than non-Latino workers to have a work-related traumatic injury reported to the WTR between 1998 and 2008 (accounting for Latino representation in the employed population). Upward trends in work-related traumatic injury rates observed from 2003 through 2008 were steepest for Latinos.[8] Trauma registries are well positioned to capture severe work-related traumatic injuries and may avoid some recognized reporting filters afflicting other data sources (eg, workers' compensation claims data, health care–based databases/surveys that rely on the payer data fields to identify work-related claims, or employer-based injury records/surveys),[14] specifically whether a workers' compensation claim was filed or accepted for a particular injury or whether an employer recognized and reported a particular injury as work related. The WTR, along with at least 20 other state trauma registries, includes an indicator of work relatedness (distinct from payer) that makes it possible to directly identify work-related trauma.[15,16] Nevertheless, there were several important limitations to findings of this study, particularly changes to WTR inclusion criteria, which restricted the time window during which trends could be estimated and significant amounts of missing ethnicity data, which would have caused underestimation of injury rates for Latino workers and may also have affected trends in rates over time.

The aim of this study was to further investigate and describe trends in the disproportionate burden of traumatic occupational injuries sustained by Latinos in Washington State. We addressed the following research question with regard to traumatic injuries reported to the WTR: Controlling for representation of Latinos in the relevant underlying labor force, is there evidence of an increasing trend from 1998 to 2008 in the odds that a comparable work-related traumatic injury was sustained by a Latino rather than by a non-Latino? This approach allowed us to examine relative trends by ethnicity while avoiding the challenges posed by injury-rate calculations based on these data.

METHODS

Study Population and Data Sources

We conducted a retrospective analysis of existing WTR data for the span of 11 years from 1998 through 2008. All traumatic injuries recorded in the WTR from 1998 through 2008 were requested, excluding individuals who were younger than 16 years at the time of injury and injuries occurring outside Washington state. This study was approved by the Washington state institutional review board. For purposes of this study, injury reports with unknown ethnicity were excluded (see further detail in Measures section).

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This study was funded by the National Institute for Occupational Safety and Health (NIOSH), grant 1R03OH009883.

The contents of this study are solely the responsibility of the authors and do not necessarily represent the official views of NIOSH.

Authors JMS, SMB, and BAS declare no commercial interest related to this research. SMB consults for the Arkansas Department of Health regarding trauma system evaluation, and, in the past, provided expert testimony for a legal firm regarding an all-terrain-vehicle injury case (payment went to his institution).

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DOI: 10.1097/JOM.0b013e31825a34ed

Despite previous work supporting the use of hospital discharge records for examining racial/ethnic disparities in occupational injury hospitalizations,[6,7] we had two compelling reasons for using WTR data rather than Washington State's hospital discharge records for this study (known as the Comprehensive Hospital Abstract Reporting System, or CHARS). First, CHARS records do not contain specific information about whether the hospitalization was work related due to a circumstance perhaps unique to Washington State. In Washington, the expected payer code used for workers' compensation claims is also used for crime victim claims because L&I manages both programs.[16] Nevertheless, the WTR contains a work-related data field (distinct from payer) that was found in earlier work to have high sensitivity (87.0%) and specificity (97.2% as a lower bound).[16] Second, the WTR has collected ethnicity information since its inception, whereas CHARS did not begin including ethnicity data until 2007.

The WTR, maintained by the Washington State Department of Health, contains reporting data for traumatic injuries meeting specific inclusion criteria from all state-designated acute trauma facilities (levels I through V). The WTR is described in more detail in an earlier related publication.[8] The Department of Health designates trauma services as part of the comprehensive statewide emergency medical services and trauma care system. Mandatory reporting began in 1995, and trauma coverage gradually increased as the trauma system added new hospitals. The specific WTR inclusion criteria have undergone some refinements over time. For most of the years of this study, reports were mandatory for patients who were discharged with *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM), diagnosis codes of 800–904 or 910–959 (injuries), 994.1 (drowning), 994.7 (asphyxiation), or 994.8 (electrocution), *and* met at least one of the following criteria: trauma resuscitation team activation, dead on arrival or death in the emergency department (ED) or during the hospital stay, interfacility transfer by Emergency Medical Services or ambulance, or inpatient admission of at least 48 hours. In a nationwide survey conducted in 2004 by Mann et al,[17] the WTR trauma manager estimated that the WTR captured about 85% of trauma victims with injuries satisfying registry inclusion criteria. Nevertheless, the WTR does not capture data for the many occupational injuries that do not meet inclusion criteria, particularly minor injuries that did not require hospital-based care.[18] In addition, occupational fatalities can occur in any setting and only those occurring within the Emergency Medical Services and trauma system may be reported to the WTR.[5]

Annual Washington State civilian labor force estimates broken down by sex, age, and ethnicity were provided by the Washington State Office of Financial Management. The Office of Financial Management estimates combine state-level demographically detailed population counts with Bureau of Labor Statistics' data for the civilian noninstitutional labor force, which is composed of individuals aged 16 years or older who were employed (either part time or full time) or actively seeking employment.

Data Analysis

The WTR has conducted periodic validity studies assessing factors such as coding accuracy. The software used by the hospitals to collect and submit data to the registry contains logic checks and error checks that facilitate data quality and completeness. Records were deduplicated and consolidated as reported in an earlier publication (because of transfers of care, many injuries were reported by more than one hospital).[8] When data for the same injury varied by report, we assumed that the most comprehensive trauma care hospital (ie, highest trauma designation level) provided the most reliable report, per the advice of WTR staff. For detailed information about the contents of each WTR field, the reader is referred to the WTR data dictionary.[19] All analyses were performed using Stata/SE 11.2 for Windows (StataCorp LP, College Station, TX).

In the software used by reporting hospitals, ethnicity was a required element (could not be skipped), but ethnicity could be recorded as "Hispanic origin" (any race), "non-Hispanic origin" (any race), or "unknown." Some reporting hospitals had a practice of almost exclusively selecting "unknown." Missing data were filled in when feasible using ethnicity information contained in related reports for the same injury, prioritized by trauma designation level. There was conflicting information about ethnicity for less than 1% of the injuries, but non-Hispanic origin was never changed to Hispanic origin (or vice versa) based on related reports (defaulting to Latino could be anticonservative, potentially introducing bias toward observing inflated prevalence and severity for Latinos because more transfers would provide more opportunities to have ethnicity converted to Latino). Throughout this article, we use Latino as a synonym for Hispanic origin.

An injury was considered work related if any of the related reports for the same injury indicated that the injury was work related. Information about payer, amputation, traumatic brain injury, burns, and fatalities (either dead on arrival or in hospital) was consolidated in a similar fashion. We categorized the Injury Severity Score (ISS) using the standard scheme of minor (1–8), moderate (9–15), and major (16–75). We classified amputations as the presence of any ICD-9-CM code of 885–887 or 895–897. We followed the Centers for Disease Control and Prevention's[20] case definition for traumatic brain injury: the presence of any ICD-9-CM code of 800.0–801.9, 803.0–804.9, 850.0–854.1, 950.1–950.3, or 959.01. We defined external cause of injury based on ICD-9-CM e-codes to facilitate comparison with previous related work in Illinois (refer to Ref. 21 for categorization scheme).[21] To assign calendar year of injury, we used the ED arrival year for the first report for each distinct injury event (injury dates were either missing, were within a few days of the ED arrival date, or appeared to be data entry errors for the fewer than 1% of cases where injury year and ED arrival year didn't match exactly). Payer was based on the two expected payer fields available in the WTR. In Table 1, we created five mutually exclusive payer categories based on the presence of a particular payer in either expected payer field of any related report for each reported injury. For the logistic regression models, we created one indicator for L&I being listed as an expected payer and a second indicator for other private/government insurance being listed as an expected payer in either field of any related report for each reported injury.

After deduplication and consolidation, most key fields contained few missing data. The work-related field was missing for 2.3% of records and payer was missing for 3.1%. Age, sex, ISS, and external cause were missing for less than 1% of records. Injury place was missing or, more commonly, was "unspecified" for 10.9%. In contrast, the ethnicity field was missing 32.1% of the time overall, and nonmonotonically decreased from a high of 35.9% in 1998 to a low of 27.6% in 2008. This implies that ethnicity-based injury rates would be underestimated, and suggests the potential for upward bias in trends based on ethnicity. Therefore, rather than estimating rates, we assessed trends in the odds that a comparable reported injury was sustained by a Latino versus a non-Latino, adjusted for representation of Latinos in the relevant underlying labor force (stratified by calendar year, age, and sex). Although less informative than rates in terms of absolute burden of injuries, this approach allows us to sidestep challenges inherent to relying on rates in the face of substantial and changing amounts of missing data.

Because of additional concerns about the high proportion of records with ethnicity recorded as "unknown" at some hospitals, we created two samples for use in side-by-side analyses. The primary sample included all reports for which ethnicity was known, a total of 84,587 injuries (7046 work-related injuries). Although this excluded 32.1% of the 125,625 total reported injuries (and 23.3% of the 9185 work-related injuries), it retained the advantage of being a statewide sample with at least some representation by all the 82 reporting

TABLE 1. Characteristics of Work-Related Traumatic Injuries Reported to the WTR, by Ethnicity

	Overall ($N = 7,046$)		Non-Latino ($n = 5,821$)	Latino ($n = 1,225$)	
Characteristic	**No.**	**%**	**%**	**%**	***P***
Sex					0.03
Male	6,299	89.4	89.0	91.2	
Female	747	10.6	11.0	8.8	
Age, yr					<0.0005
16–24	1,063	15.1	13.1	24.5	
25–34	1,572	22.3	19.9	33.9	
35–44	1,694	24.0	24.3	22.9	
45–54	1,549	22.0	24.3	11.2	
55–64	855	12.1	13.6	5.3	
≥65	313	4.4	4.9	2.3	
Payer					<0.0005
L&I only	4,601	65.3	62.5	78.6	
L&I and other private/government insurance	521	7.4	7.8	5.5	
Other private/government insurance only	1,376	19.5	22.0	7.8	
None (self-pay, charity)	304	4.3	4.2	5.0	
No payer information (missing)	244	3.5	3.5	3.2	
Injury Severity Score					0.009
Minor (1–8)	2,956	42.1	41.5	45.0	
Moderate (9–15)	2,532	36.1	36.0	36.4	
Major (16–75)	1,529	21.8	22.5	18.7	
Amputation (any type)	543	7.7	7.4	9.1	0.05
Upper or lower extremity amputation	97	1.4	1.1	2.9	<0.0005
Traumatic brain injury	1,549	22.0	22.8	18.2	<0.0005
Burn	697	9.9	10.0	9.6	NS
Fatality (death on arrival or in-hospital)	209	3.0	3.3	1.6	0.002
External cause of injury					<0.0005
Falls	2,557	36.3	36.6	34.8	
Machinery	1,019	14.5	13.2	20.4	
Motor vehicle traffic	642	9.1	9.8	5.8	
Cutting/piercing objects	340	4.8	4.5	6.5	
Struck by object	858	12.2	12.7	9.7	
Caught between objects	314	4.5	4.3	5.3	
Electrocution	135	1.9	2.2	0.5	
Corrosive material/steam	265	3.8	3.3	5.8	
Homicide/assault	99	1.4	1.6	0.7	
Overexertion/movement-related	35	0.5	0.5	0.7	
Fire/flames	163	2.3	2.5	1.5	
Explosive materials	50	0.7	0.7	0.7	
Animal bites	42	0.6	0.6	0.7	
Other/unspecified	527	7.5	7.6	7.1	
Place of injury					<0.0005
Home	414	5.9	6.6	2.4	
Farm	404	5.7	3.8	15.2	
Mine/quarry	18	0.3	0.3	0.0	
Industrial	4,080	57.9	57.5	59.7	
Sports/recreation	110	1.6	1.7	0.8	
Street/highway	659	9.4	10.1	5.6	
Public building	208	3.0	3.1	2.0	
Residential institution	64	0.9	1.1	0.1	
Other specified	621	8.8	9.2	6.9	
Missing/unspecified	468	6.6	6.5	7.4	

L&I, Labor and Industries; NS, not significant; WTR, Washington State Trauma Registry.

hospitals. The second sample included only injuries that were treated by one of the five hospitals at which ethnicity was recorded as unknown for less than 5% of reports in every calendar year. Ethnicity was unknown for only 0.52% of this sample (0.47% of work-related injuries), and there was no apparent trend over time in missing data. We treated this as a confirmatory sample, to assess whether large amounts of missing data or trends in missing data may have substantially biased these findings. This sample contained 46,330 injuries (4634 work-related injuries). WTR data did not provide adequate residential data or other information that would allow for imputation of ethnicity.

We report descriptive summaries for all work-related injury reports from 1998 through 2008 for which ethnicity was available. We also report unadjusted trends in the Latino share of the injury burden by year for both work-related and non–work-related injuries. Logistic regression models with robust variance estimates were used to estimate mean annual percent change in the odds that a comparable work-related injury was sustained by a Latino rather than a non-Latino. We also tested log-linear models (Poisson and log binomial) but settled on logistic regression models because of better model fit and performance.[22] All models included: injury year (1998 through 2008, continuous), sex, age category (categorized as shown in Table 1), ISS (continuous), L&I as an expected payer, other private/government insurance as an expected payer, and the proportional representation of Latinos in the relevant underlying Washington labor force according to Office of Financial Management estimates (continuous). Proportional representation was constructed using the proportion of Latinos in each distinct stratum defined by calendar year, sex, and age categories (16–19, 20–24, 25–34, 35–44, 45–54, 55–64, 65–69, 70–74, and ≥75 years) and added as a covariate to the regression models to adjust for the effect of changing Latino representation in various demographic sectors of the labor force over time on the odds that a particular injury would be sustained by a Latino (it was a significant predictor in both the work-related and the non–work-related injury models).

The WTR unfortunately does not contain information about occupation or industry, making it difficult to determine the work settings most contributory to observed trends. Nevertheless, we used place of injury and external cause of injury to control for and target particular settings to the extent feasible. We report results for an overall model controlling for place of injury and external cause of injury. We ran logistic regression models stratified by place of injury (industrial/mine/quarry, farm, all other), and then ran models stratified by external cause for the industrial/mine/quarry location (the only location of the three that exhibits a significantly increasing burden on Latinos).

RESULTS

Characteristics of work-related traumatic injuries reported to the WTR (1998 through 2008) were summarized by ethnicity and are presented in Table 1. Mean age for Latinos was 34.2 years, compared with 41.8 years for non-Latinos ($P < 0.00005$). More than 90% of work-related injuries had at least one expected payer listed (other than self-pay or charity care). Expected payer distribution varied significantly by ethnicity ($P < 0.0005$). A higher proportion of Latinos had L&I listed as an expected payer (84.1% compared with 70.3% for non-Latinos) and a lower proportion of Latinos had other private/government insurance listed (13.3% compared with 29.8% for non-Latinos). Most of those with no private/government insurance other than L&I listed did have L&I listed as an expected payer, regardless of ethnicity (94.0% of Latinos and 93.7% of non-Latinos; difference not statistically significant). Mean ISS was 9.7 for Latinos compared with 10.9 for non-Latinos ($P < 0.00005$). There was no significant difference by ethnicity in mean ISS among just those having any private/government insurance other than L&I listed as an expected payer (11.7 for both Latinos and non-Latinos). Latinos had lower percentages of traumatic brain injury and observed fatalities, but a higher percentage of amputations (both for all amputations and when restricted to the more severe upper or lower extremity amputations). There was no significant difference for burns.

The distribution of external cause of injury varied significantly by ethnicity ($P < 0.0005$), with proportionally more Latinos injured by machinery and fewer injured in motor vehicle traffic events compared with non-Latinos. Of all reported work-related injuries caused by machinery, 25% were sustained by Latinos. The distribution of place of injury also varied significantly by ethnicity ($P < 0.0005$). Proportionally more Latinos were injured on nonresidential areas of a farm (15.2%) compared with non-Latinos (3.8%). Of all reported work-related injuries occurring on nonresidential areas of a farm, 46% were sustained by Latinos.

The ethnicity distribution and numbers of work-related and non–work-related injuries by calendar year are presented in Table 2. Across all 11 years, 17.4% of work-related injuries were sustained by Latinos, compared with 6.8% of non–work-related injuries

TABLE 2. Latino Representation by Year

Calendar Year	Washington Labor Force % Latino	All WTR Injuries ($N = 85,322$)		Non–Work-Related Injuries ($n = 77,541$)		Work-Related Injuries ($n = 7,046$)	
		No.	% Latino	No.	% Latino	No.	% Latino
1998	6.5	5,064	8.0	4,332	7.3	508	13.8
1999	6.4	5,491	7.9	4,869	7.1	581	14.3
2000	6.3	6,596	7.4	5,889	6.4	623	16.4
2001	6.5	7,258	7.0	6,541	6.3	605	16.4
2002	6.7	7,324	7.3	6,619	6.5	628	15.0
2003	6.8	7,615	7.2	6,981	6.4	604	14.9
2004	7.1	8,163	7.5	7,503	6.7	626	16.5
2005	7.2	8,636	7.7	7,961	6.9	637	17.7
2006	7.5	9,636	7.9	8,859	6.9	740	18.4
2007	7.7	9,494	8.7	8,691	7.4	780	22.7
2008	7.9	10,045	7.9	9,296	6.8	714	22.1
All-year mean	7.0		7.7		6.8		17.4

WTR, Washington State Trauma Registry.

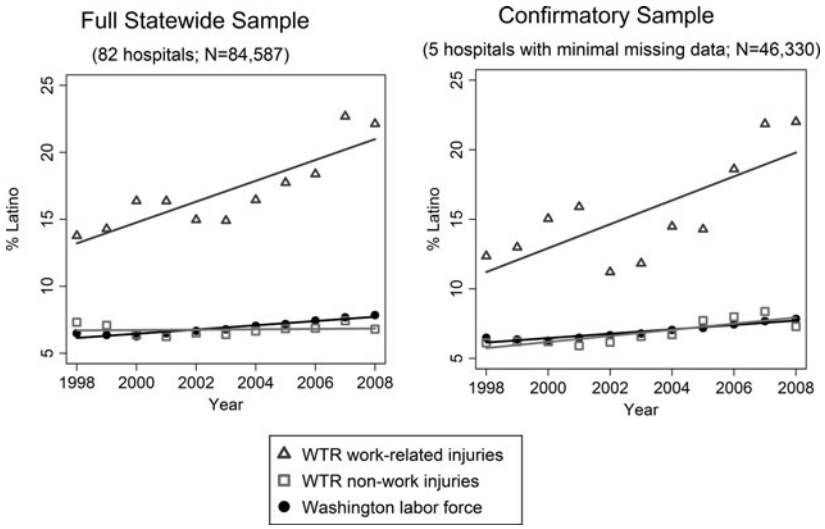

FIGURE 1. Trends in the Latino share of the traumatic injury burden. WTR, Washington State Trauma Registry.

($P < 0.0005$). To illustrate the striking contrasts in trends, Fig. 1 displays the information in Table 2 graphically for each of the two samples. The trend lines represent the unadjusted percent of injuries that are sustained by Latinos (vs non-Latinos) and are independent of trends in injury rates. It is evident from this figure that both the magnitude of the injury burden on Latinos (relative to non-Latinos) and trends in Latino representation differ substantially between work-related and non–work-related injuries. It seems that Latinos both carry a higher share of the injury burden and have a steeper increasing trend in the injury burden they carry for work-related injuries, relative to both non–work-related injuries and underlying Latino representation in the labor force.

We quantified these differences using logistic regression to model mean annual percent change in the odds that a comparable injury was sustained by a Latino rather than a non-Latino, controlling for demographics, payer, and injury-related factors as well as Latino representation in the relevant underlying labor force. The results of these models are presented in Table 3. The results for the full sample and the confirmatory sample were substantially similar for all models, with the full sample generally providing more conservative results. There was an estimated mean annual increase of 4.2% in the odds that an injury was sustained by a Latino rather than a non-Latino ($P = 0.007$) and 5.1% when place and external cause of injury were included in the model ($P = 0.001$). When the model was stratified by place of injury, only the industrial/mine/quarry category exhibited a significantly increasing trend (8.3%; $P < 0.0005$). Focusing on this category and stratifying further by external cause, only falls exhibited a significantly increasing trend (12.7%; $P = 0.005$).

DISCUSSION

We found not only a disparity in the burden of work-related traumatic injuries sustained by Latinos relative to non-Latinos but also that the disparity has increased over time. We found a 5% mean annual increase in the odds that a comparable work-related traumatic injury was sustained by a Latino ($P = 0.007$), after controlling for Latino representation in the labor force. In contrast, although not the focus of this study, the unadjusted magnitude and trend in non–work-related injuries seemed to more closely follow population trends. Although several studies have reported a disproportionate rate of occupational injuries for Latinos, trends over time in the relative rates of occupational injuries among Latinos compared with other workers have not been well studied. This study provides evidence that Latinos in Washington State bear an increasingly disproportionate burden of severe work-related traumatic injuries, accounting for a rising share of such injuries over time even after accounting for demographic trends in the labor force.

Because of the lack of information about industry or occupation in the WTR, the data available to us do not reveal whether the increased burden on Latinos is due mainly to distributional changes in employment patterns or also due to differential risk for Latinos even within specific work settings. Nevertheless, when using place of injury and external cause of injury, it seemed that falls in industrial/mine/quarry locations were the strongest contributor to the increasing disparity over time. These findings are consistent with (but not probative of) previous evidence that the primary fatal event for Latin American–born US workers was falls to a lower level,[10] that more than a third of fatally injured Mexican-born US workers were employed in the construction industry[10] and that Latino representation in the construction industry has risen rapidly since 1990 (as of 2005, Latino representation in the construction industry was 27%, second only to agriculture at 35%),[23] and with evidence that Latino construction workers face significantly higher occupational risks than non-Latino workers, even within specific occupations.[4]

A higher proportion of Latinos had L&I listed as an expected payer for work-related injuries (84.1% compared with 70.3% for non-Latinos). A study[5] of ethnic disparities in traumatic occupational injuries in Illinois also reported that Latinos were more likely to have workers' compensation listed as a payer. This observation seems counterintuitive given higher barriers to claim filing among more vulnerable populations that might be expected to more heavily impact Latino workers.[24,25] Nevertheless, lower insurance rates for Latinos may provide a key. We observed that a lower proportion of Latinos had any private/government insurance other than L&I listed as an expected payer (13.3% compared with 29.8% for non-Latinos). We cannot be sure that those with no private/government insurance listed actually had no such insurance, because L&I may have been assumed to be the only necessary payer (effectively displacing the availability of other insurance information), but this observation does comport with population-based survey data. According to the 2008 Washington State Population Survey, Hispanic residents are almost two times more likely to be uninsured; about 10% of Washington's nonelderly population is Hispanic, but 18% of the uninsured are Hispanic.[26] It is possible that Latinos more often had workers' compensation listed as an expected payer simply because of their disproportionate lack of other insurance coverage. Among the large subset of injured workers with no private/government insurance other than L&I listed, we found that almost all (94%) had L&I listed as an expected payer, and there was no significant difference by

TABLE 3. Burden of Work-Related Injuries Sustained by Latinos Relative to Non-Latinos

	Mean Annual Trend in the Odds That a Work-Related Injury Was Sustained by a Latino (Rather Than a Non-Latino)					
	Full Sample ($N = 7,017$)			Confirmatory Sample ($n = 4,624$)		
Model*	No.	Mean Annual % Change	*P*	No.	Mean Annual % Change	*P*
All places and external causes of injury	6,775	4.2% ↑	0.007	4,434	4.8% ↑	0.02
All places and external causes of injury, controlling for place and external cause	6,775	5.1% ↑	0.001	4,434	5.8% ↑	0.003
Stratified by place of injury						
Industrial/mine/quarry	3,941	8.3% ↑	<0.0005	2,930	8.1% ↑	0.001
Farm	392	6.3% ↓	NS	178	10.7% ↓	NS
All other or unspecified	2,442	1.2% ↑	NS	1,326	4.9% ↑	NS
Industrial/mine/quarry only, stratified by external cause						
Falls	1,389	12.7% ↑	0.005	966	18.5% ↑	0.004
Machinery	774	4.8% ↑	NS	581	6.0% ↑	NS
Objects: struck/cut/caught	1,051	7.0% ↑	NS	771	4.2% ↑	NS
Fire/electricity/explosive/corrosive/steam	426	6.9% ↑	NS	404	6.2% ↑	NS
All other or unspecified†	301	10.1% ↑	NS	208	7.7% ↑	NS

NS, not significant.

*All logistic regression models included: year (continuous), % Latino in relevant Washington labor force stratum, sex, age category, Injury Severity Score (continuous), Labor and Industries as an expected payer, and other private/government insurance as an expected payer.

†Expanded to include motor vehicle traffic because of smaller numbers within industrial/mine/quarry place of injury.

ethnicity. Traumatic injuries reported to the WTR are relatively severe and costly, and injury severity has been identified as the strongest predictor of filing a workers' compensation claim.[27] In Washington State, the health care provider diagnosing and treating a work-related injury is required to file the initial report of accident that serves to initiate a workers' compensation claim and allows for health care cost reimbursement. It can be surmised that hospitals would be motivated to recoup their costs for treating severe work-related injuries and would perhaps be particularly motivated to ensure a workers' compensation claim were filed if no other payer were available. These observations raise questions about the impact of being otherwise insured on the likelihood of having a workers' compensation claim filed and the extent of potential cost shifting. Nevertheless, an unknown number of the work-related injuries reported to the WTR, with an unknown ethnicity distribution, would not be reported to or covered by L&I. For example, federal workers' compensation coverage would be captured in the other private/government insurance payer category. There are a number of jobs that are exempt or excluded from mandatory coverage by Washington State workers' compensation (eg, the self-employed, corporate officers, certain domestic/household workers, racing jockeys), but optional coverage is available.

We observed a lower mean ISS for work-related injuries among Latinos (9.7) compared with non-Latinos (10.9; $P < 0.00005$). A study[5] based on Illinois Trauma Registry data also found a lower ISS for work-related injuries among Latinos compared with other racial/ethnic categories. The observation that Latinos have lower-severity injuries on average might be an artifact of differential access to care. Within the subset of injured workers known to have private/government insurance other than L&I, there was no significant difference in mean ISS by ethnicity (11.7 for both Latinos and non-Latinos). Compared with the insured, the uninsured are much less likely to have a usual source of care as an alternative to the ED[28] and are more likely to use EDs for less urgent visits.[29] Regardless of ethnicity, those known to have private/government insurance other than L&I had a significantly higher mean ISS (11.7 for those with insurance, 10.3 for those without; $P < 0.00005$), which is consistent with the hypothesis that those with insurance may be more likely to be treated by a provider outside the trauma system for minor injuries. Nevertheless, this is speculative; testing this hypothesis would require population-based data about a full complement of traumatic injuries regardless of type of treatment facility. As noted previously, the injuries reported to the WTR are relatively severe and may not easily be treated in other settings.

There are several limitations to this study in addition to those already described. The ethnicity information contained in the WTR has not been validated and may rely on staff observation rather than self-report. The most serious challenge was the large number of records with unknown ethnicity, which made reliance on rates problematic. The modeling approach in this study, though unusual, was designed to address this problem to the extent feasible. Results based on the full sample were very similar to those based on the sample that included just those injuries treated at the subset of hospitals with minimal missing data, which lends robustness to these findings.

The WTR also lacks what could be highly useful information about occupation, industry, nativity, language, work status (eg, whether self-employed, full-time, temporary), income, and educational level. A number of occupational injury researchers have called for the addition of occupation, industry, and other work-related information to trauma registries.[8,30,31]

Trauma registries have limitations for surveillance of occupational traumatic injuries due to cross-state and secular variation in inclusion criteria and the completeness of trauma coverage.[8,15,17] Nevertheless, although hospital discharge data are more broadly population based, their use requires reliance on payer to identify work-related injuries, effectively excluding work injuries either not covered by or not reported to workers' compensation. Payer information is particularly problematic in Washington State because the same expected payer code (L&I) is used to indicate both workers' compensation (either state fund or self-insured) and crime victim

compensation claims, and it is not possible to distinguish between the two. In contrast, the use of trauma registry data offers a more direct and complete method of identifying work-related injuries. In addition, race/ethnicity information is not contained in every state's hospital discharge data set. In Washington State, for example, race and ethnicity were not captured in hospital discharge data until very recently (2007), making long-term trend analysis impossible. In contrast, the WTR has included information about race and ethnicity since inception, as have most trauma registries.[15]

CONCLUSIONS

We found that Latinos in Washington State bear an increasingly disproportionate burden of severe work-related traumatic injuries reported to the WTR. Falls in industrial/mine/quarry locations seemed to be the strongest contributor to the increasing disparity over time. The WTR does not contain information about occupation or industry, and this study highlights the potential benefits of including occupation, industry, and other work-related information in clinical databases. There is a need for further research into the impact of health insurance coverage on the likelihood of a workers' compensation claim being filed. On top of their disproportionate injury burden, Latinos are less likely to have health insurance coverage. This reinforces the need for clinicians to facilitate prompt filing of workers' compensation claims to avoid the potential for delayed or inadequate treatment of occupational injuries due to lack of a payer.

ACKNOWLEDGMENTS

The authors thank Kathy Schmitt, Zeynep Shorter, Mary Rotert, and Susan Reynolds at the Washington State Department of Health Trauma Registry for providing the data and for their extensive and generous explanations of many aspects of the trauma care system and the underlying data generating processes. They also thank Bob Baker at the Forecasting Division of the Washington State Office of Financial Management for providing detailed laborforce estimates along with essential background information.

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