Work-related injuries among commercial janitors in Washington State, comparisons by gender

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ABSTRACT

Introduction: We analyzed workers' compensation (WC) data to identify characteristics related to workers' compensation claim outcomes among janitorial service workers in Washington State. Method: We analyzed WC data from the Washington State Department of Labor & Industries (L&I) State Fund (SF) from January 1, 2003 through December 31, 2013, for janitorial service workers employed in the National Occupational Research Agenda (NORA) Services Sector. We constructed multivariable models to identify factors associated with higher medical costs and increased time lost from work. Results: There were 2,390 janitorial service compensable claims available for analysis. There were significant differences in injury type and other factors by gender, age, and language preference. Linguistic minority status was associated with longer time loss and higher median medical costs. Women were estimated to account for 35% of janitorial service workers but made up 55% of the compensable claims in this study. Conclusions: Janitorial service workers comprise a large vulnerable occupational group in the U.S. workforce. Identifying differences by injury type and potential inequitable outcomes by gender and language is important to ensuring equal treatment in the workers' compensation process. Practical applications: There were significant differences in injury and individual characteristics between men and women in this study. Women had twice the estimated rate of injury to men, and were more likely to require Spanish language materials. Improving communication for training and knowledge about the workers' compensation system appear to be high priorities in this population of injured janitorial service workers.

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1. Introduction

Janitors work in almost every industry sector, and janitorial work is one of the top 10 largest occupations in the United States. The U.S. Bureau of Labor Statistics (BLS) estimates that there are 2.1 million janitors working in the United States (BLS, 2014b). Janitorial service workers have a high burden of occupational injuries and illnesses (Alamgir & Yu, 2008; BLS, 2014a; Chang, Wu, Liu, & Hsu, 2012; Charles, Loomis, & Demissie, 2009; Lee, Nam, Harrison, & Hong, 2014; Panikkar et al., 2014; Zock, 2005). These injuries are both personally devastating and costly. A recent study estimated $4 billion in medical and productivity costs among Janitors and Cleaners in 2010 (Leigh & Marcin, 2012).

In addition to physical and chemical risk factors, workers in janitorial services face a host of social and economic factors that have been associated with higher risk of work-related injuries and illnesses. Previous studies have identified characteristics among janitors and cleaners that are associated with higher rates of job-related injuries — they are often women (Alamgir & Yu, 2008; Bell & Steele, 2012; Burgel, White, Gillen, & Krause, 2010; Flores & Deal, 2003), over 40 years old (Alamgir & Yu,

2008; Bell & Steele, 2012; Flores & Deal, 2003), the occupation is comprised of a large proportion of immigrants (Burgel et al., 2010; Panikkar et al., 2014), and many have limited English (or dominant language) skills (Bell & Steele, 2012). In addition, janitorial service workers are also low-wage and the occupation is considered low status, which limits their bargaining power to demand safer work (Landsbergis, Grzywacz, & LaMontagne, 2014; Zock, 2005). These characteristics have been linked to higher rates of injury for Latinos compared to non-Latino Whites (Friedman & Forst, 2008; Panikkar et al., 2014).

A study of low wage immigrant workers in Massachusetts (Panikkar et al., 2014) found that those working as cleaners (including those working as janitors) reported significantly lower access to health and safety information and work training, as well as reporting very little knowledge of the workers' compensation (WC) system (compared to a reference population of workers who were cashiers/baggers).

Low occupational class and income can also predict high work injury absence, and janitors, specifically, are among those with the highest rates of work injury absence for both men and women (Piha, Laaksonen, Martikainen, Rahkonen, & Lahelma, 2013). Other factors that may compromise the health of workers include income inequality (Williams & Rosenstock, 2015). The hourly median wages for janitors were $10.86 nationally in 2013 (BLS, 2014b) and $13.42 in WA in 2013 (BLS, 2014b); this is 64% to 80% (respectively) of the median wage for

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all occupations combined (BLS, 2014b). Work by Leigh and Miller, found that in ranking occupations by cost of occupational injuries and diseases, and the causes of death and disability using WC data, "many of the occupations with the highest ranking [including janitors] are poorly paid" (Leigh & Miller, 1997). In a more recent analysis Leigh and colleagues found similar results, with Services to Buildings (including janitors), ranked 33rd out of 513 detailed occupations for highest cost per worker for a work-related injury (Leigh, Waehrer, Miller, & Keenan, 2004).

In a recent editorial, Leigh and De Vogli describe a series of potential mechanisms through which wages (specifically low-wages) can negatively affect occupational health (Leigh & De Vogli, 2016). Among the mechanisms cited were issues such as how low wages may equate to low self-esteem and low job satisfaction, both of which may directly cause worse health, or indirectly cause poor health through poor health behaviors. Another potential mechanism is the issue of relative deprivation, where people with low incomes have choices to make that people with higher incomes do not, such as pay the rent or pay for the hypertension medication, eat well, or eat cheaply. It is unclear which mechanism, or series of mechanisms most strongly link wages to poor health, but enough research exists to make the case for including wage data as an occupational risk factor.

Occupational segregation exists by gender and sex (Messing et al., 2003). It is important to treat these variables appropriately when they are available for research, so that differences in how exposures are expressed may be noted. Differences in anthropometric characteristics can affect how similar exposures affect the sexes differently. Of course similarities between the sexes in anthropometry, bone structure, and muscle mass overlap, but stratifying populations of interest in health studies will provide more detailed information on how specific risk factors affect different populations (Silverstein et al., 2009). Gender is equally important to assess as the sex/gender link can cause differential social and cultural levels of occupational prestige as well as risk factors for injury depending upon which gender dominates an occupation. Previous literature has characterized cleaning occupations as "feminized" or reproductive labor, and may also assign the highest risk tasks to men within these occupations (Duffy, 2007; Locke et al., 2014).

This study utilizes the National Institute for Occupational Safety and Health (NIOSH), National Occupational Research Agenda (NORA) sector groups to focus the industries where janitorial service workers are employed. The NORA sectors were developed by NIOSH to target industry driven collaborative research. The Services Sector consists of eleven different major North American Industry Classification System (NAICS) industry groups that share similar issues such as the disproportionate incidence of occupational injuries including stress and musculoskeletal disorders. If policy changes are to occur for janitorial service workers, it is important that we address their occupational safety and health concerns within this national research framework (NIOSH, 2016).

Our previous work ranking industries within the Services Sector identified an elevated risk of a compensable injury for workers in the NAICS industry group 5617 — Services to Buildings & Dwellings, which includes janitorial service workers (Anderson, Bonauto, & Adams, 2014). The issues raised by prior literature point to the need for additional research and prevention efforts focused on injuries and illnesses in janitorial service workers. The objective of this study was to explore the nature and characteristics of work-related injuries in janitorial services in Washington State by gender, and to identify factors that may contribute to injury severity (i.e., time loss days), and workers' compensation outcomes among this vulnerable occupational group.

2. Methods

2.1. Data

The Washington State Department of Labor & Industries (L&I) State Fund (SF), is the primary workers' compensation insurer for employers in Washington State and is the source of the data for this study. The WA

WC SF provides coverage for approximately two-thirds of the WA workforce and 99.8% of employer accounts. If not covered by the SF, employers must either meet requirements to self-insure (SI) (typically the largest companies or groups of companies), or be covered by an alternative WC system (e.g. Federal Employees' Compensation Act). Janitorial service workers were identified in the workers' compensation insurance data using Washington State's risk classifications 6602-03 (Janitorial cleaning services, not otherwise classified) and 6602-05 (Janitors, not otherwise classified). The Washington State risk classification system includes a set of approximately 1,908 codes that combine industries and occupations to group work by similar risk of workers' compensation loss for insurance purposes (e.g. a painter and an electrician within the same construction company may have the same NAICS code but will be assigned different risk classes).

The risk classifications for janitorial services used in this study exclude residential janitorial services (risk class 6602-04), as their workplace and tasks can differ substantially from commercial janitorial services (e.g., mops VS electric floor cleaners, 1–2 sets of stairs VS 10 or more). Inclusion criteria were injury dates from January 1, 2003 through December 31, 2013, claims that were coded as compensable, and janitorial service workers who were employed in a NORA Services sector.

Accepted WC claims can be categorized into compensable and non-compensable claims. A claim is considered a 'compensable' claim if it is categorized by the WC system as a 'compensable,' 'kept on salary,' 'total permanent disability,' 'fatal,' or 'loss of earning power' claim. A worker qualifies for time loss compensation if they are unable to work after a 3 calendar day waiting period. Compensated time loss from work must be authorized by a health care provider and some claims may have long periods of time loss payments. Accepted claims that are non-compensable are medical-only claims; a claim may change status (i.e., change from non-compensable to compensable) over time. Analysis was restricted to compensable claims. Time loss days are actual days paid without estimation of future days lost.

Data were extracted from the Washington SF databases on April 29, 2015. Data extracted includes claim identification number, and general demographics (e.g., gender, age, height, weight, language preference for communication), as well as Occupational Injury and Illness Classification System (OIICS) codes for body part, nature of injury, source, secondary source of injury, and injury type. OIICS codes are assigned by the WC system from the information on the initial Report of Industrial Injury or Occupational Disease (RIIOD) form, which is filled out by a worker and their physician to initiate a claim. OIICS codes were used to categorize injury groups in this study, with the exception of musculoskeletal disorders (MSDs).

A combination of codes was used to identify MSDs, including: American National Standards Institute (ANSI) Z16.2 codes, Current Procedural Terminology (CPT) codes, and International Statistical Classification of Diseases and Related Health Problems (ICD-9) diagnosis codes for certain conditions. Non-traumatic onset (cumulative trauma exposure) MSDs were identified by examining a body part for the primary site of disorder (e.g. back, elbow, shoulder) in combination with nature of injury, type, and diagnosis codes; this definition has been previously described (Anderson, Adams, Bonauto, Howard, & Silverstein, 2015).

Additional information extracted from the claim includes initial diagnosis as well as cost for medical aid, non-medical costs, and the number of time loss days covered for the injury. Time loss days in the Washington State workers' compensation (WC) system are calculated using calendar days, and have multiple criteria to determine exact time loss payments.[1]

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[1] In general, calculating time loss takes the average monthly wage, divide by 30 (days) and then multiply this amount by 60% (for a single person with no dependents) up to 75% for a married person with 5 dependent children. There are also minimum and maximum limits so that a person only working one day a week, will be compensated more and someone earning $80,000 a month, will be capped at a certain level; more detail on time loss calculations can be found here: http://www.lni.wa.gov/IPUB/242-104-000.pdf.

Claim costs for closed claims reflect actual paid costs. For claims that are not closed, costs reflect actual totals paid to date plus case reserve estimates for future costs associated with the claim. Approximately 6% of the claims used in this study were not closed at the time of extraction. All costs were Consumer Price Index (CPI) adjusted to 2013 dollars. Medical costs used the CPI for medical care.

Indirect costs to workers and employers and the administrative costs of managing a claim are not included in the claim costs. Information on self-insured (SI) claims is often incomplete regarding risk class, cost data, and time loss, and therefore SI claims were excluded from this analysis.

All descriptive data presented in this study are stratified by gender. Stratifying by gender allows us to describe differences in demographics, physical exposures, and costs that may be associated with differential outcomes (Leigh & Marcin, 2012; Messing et al., 2003; Silverstein et al., 2009).

2.2. Data analysis

Descriptive statistics were calculated to identify skewed data and/or logical cut points to convert continuous data into categorical data or to collapse large groups of ordinal data into smaller groups. All continuous data, except age were highly skewed, so median and first and third quartiles (25th percentile and 75th percentile) are used to describe the continuous data in this study. Body Mass Index (BMI) was calculated using self-reported height and weight using the formula (weight (in pounds) / height (in feet) squared and multiplied by 703). BMI is categorized into four groups: Underweight (BMI < 18.5), Normal (18.5–24.9), Overweight (25–29.9) and Obese (>30) (CDC, 2015).

The number of time-loss days was highly skewed, and overdispersed so negative binomial regression was used to model the relationships between covariates and increasing number of time-loss day claims. Medical costs were also highly skewed; quantile (median) regression was used to describe covariates associated with increased medical costs.

Post-hoc analyses were conducted to describe the larger (uninjured and injured) population of janitors in Washington State and to estimate rates of injury by gender using the Integrated Public Microdata Use Series (IPUMS) from the American Community Survey (ACS) Samples for years 2003 through 2013, from the University of Minnesota (Ruggles, Genadek, Goeken, Grover, & Sobek, 2015). ACS data were restricted to janitorial workers in the NORA Services Sector and those who are 17 years old and older, to match the WC data. The ACS is an ongoing national survey conducted by the U.S. Census Bureau that collects demographic and other individual and household level data, which was previously collected on the "long-form" Census. Data from the ACS were downloaded on July 11, 2016. We extracted sex/gender, marital status, English language speaking ability, hours worked per week, as well as appropriate survey variables (Strata, Cluster and Person weight (perwt)) for those working in Washington State under Standard Occupational Classification (SOC) 37201X. The SOC code 37201X includes the following occupations: Janitors and Cleaners, Except Maids and Housekeeping Cleaners (SOC code 37-2011), Building Cleaning Workers, and All Other (SOC code 37-2019). The Survey command (svy) in Stata 14.1 was used to analyze this data. Replicate weights (which reduce the standard errors of estimates), were not available for study years 2003 and 2004, so replicate weights were not used in this analysis. We adjusted our confidence intervals to the 99th percentile, so that marginally significant differences (at the 95th percentile) were not reported. Detailed descriptions of IPUMS ACS samples can be found here: https://usa.ipums.org/usa/sampdesc.shtml#us2000d.

To calculate rates of injury by gender, we used the proportion of janitors by gender from the ACS samples, for each study year and applied these proportions to the total janitorial service hours reported to the WC system to derive hours worked by gender for our denominator. Actual compensable claims reported were used as the numerator for our rates.

The ACS samples did not have comparable variables from the ACS samples for injuries, dependent children, or BMI, so those could not be compared. For language, the ACS sample has a question regarding how well the person speaks English. Responses to the English proficiency question are: Only speak English, speak English very well, speak English well, speaks English not well, and does not speak English. We dichotomized this variable to speaks English only, very well or well to equal English speaker, and not well and does not speak English to non-English speaker. All statistical analyses for this study were conducted using Stata 14.1.

3. Results

There were 2,390 injured janitorial service workers with compensable claims filed in the State Fund and available for analysis. Table 1 provides descriptive information about this population.

Men and women were divided in this sample of injured workers with slightly more women (1,323 compared to 1,067 men), and had similar job tenure on the job where they were injured (median days on the job = 270 for both men and women; Table 1). Among the compensable claims reviewed, women were more likely to have dependent children in the home than men (p-value < 0.001) and less likely to be married, though not statistically different (Table 1). Additional differences between men and women in this sample include women having a younger median age at time of injury, having higher median medical costs than men ($6,975 compared to $5,696 for men (p-value = 0.02)), women had annual median incomes that were far lower than men (p < 0.001), and the distribution of injury types was significantly different between men and women (Table 1).

Table 2 provides some comparison to Table 1 for the entire janitorial workforce in Washington State, based upon variables from the Integrated Public Microdata Sample (1%) of the American Community Survey (ACS) for years 2003–2013 (Ruggles et al., 2015). Men and women in the ACS sample are slightly older than the injured worker population, women in the ACS sample were more likely to be married (51.6% compared to 47.5%) though not statistically significant, and women in the injured worker sample were more likely to work full-time than the larger ACS sample (59.8% compared with ACS at 38.3%). Median yearly income is higher for both men and women in our injured worker sample compared to the ACS janitors (ACS men $21,500, WC men $26,886; ACS women $ 13,000, WC women $21,732) (Tables 1 and 2), which may be related to the larger proportion of full-time janitors in our WC data. The proportion of English speakers was much higher in the ACS sample of janitors compared to our WC injured workers from 91.2% for men to 83.4% for women. The WC data has approximately 74% English speaking men and 60% English speaking women.

Table 3 provides a breakdown of claim cost, medical cost, and time off work by injury type, stratified by gender. There appears to be a significant difference between gender and injury types in this study. Women were about equal to men in the number of fall from elevation injuries (n = 111 compared to n = 114 for men), yet they were off work much less time (median 39 days compared to men with a median of 109 days) and had much lower median claim costs (Table 2). Women had a higher count of compensable fall from same level claims (n = 253 compared to men = 140), and higher total claim costs, although this appears to be a function of medical costs and interpreter costs, not time loss days paid, even though they were off with a median of 70 days, compared to men at 46 days (Table 3). Women also had a higher count of compensable musculoskeletal disorder claims than men in this sample, 516 compared to 403 respectively, as well as higher counts for vehicle related injuries (n = 75 compared to n = 41 for men); none of the associated WC costs for these injury types (except interpreter costs for musculoskeletal disorders) differed significantly between genders.

Table 1
General characteristics of compensable claims for janitorial workers from 2003 to 2013.

Injured worker characteristics[a]	Men (n = 1,067)	Women (n = 1,323)	p-Value[b]
Median age at time of injury (in years)	41 (30–50)	39 (31–48)	0.09
Married[c] n (%)	529 (49.6)	627 (47.5)	0.31
1 or more dependent children at home	361 (33.8)	605 (45.7)	<0.001
BMI (missing n = 321)[d]			0.08
Normal	276 (29.5)	353 (31.1)	
Underweight	9 (1.0)	22 (1.9)	
Overweight	370 (39.6)	400 (35.2)	
Obese	279 (29.9)	360 (31.7)	
Language preferred for communication			<0.001
English	791 (74.3)	795 (60.1)	
Spanish	217 (20.3)	451 (34.1)	
Other	59 (5.5)	77 (5.8)	
Full time worker (>34 h/week)	742 (77.8%)	703 (59.8%)	<0.001
Injury type n (%)			<0.001
Falls from elevation	114 (10.7)	111 (8.4)	
Falls from same level	140 (13.1)	253 (19.1)	
Musculoskeletal disorders	403 (37.8)	516 (39.0)	
Struck by/against	146 (13.7)	138 (10.4)	
Vehicle related	41 (3.8)	75 (5.7)	
Other[e]	223 (20.9)	230 (17.4)	
Had a prior WC compensable claim in Washington State	471 (44.1%)	483 (36.5%)	<0.001
Median days between injury and first medical visit	1 (0–5)	1 (0–6)	0.12
Median days between injury and first time loss payment	33 (18–77)	37 (21–86)	<0.01
Median annual wage estimates[f]	$26,886 ($20,291–33,781)	$21,732 ($15,877–27,418)	<0.001
Median claim cost total	$7,921 (2,649–37,703)	$10,170 (2,603–38,763)	0.39
Median medical aid paid	$5,696 (1,770–19,842)	6,975 (1,891–22,470)	0.11
Median interpreter cost paid	$1,183 ($362–$5,282)	$3,042 ($901–$8,502)	<0.001
Median non-medical cost paid	$2,202 (402–17,430)	$2,124 (326–13,317)	0.28
Median days off work	39 (7–212)	47 (8–247)	0.09
Median tenure at job in days	270 (30–940)	270 (60–910)	0.35

[a] Values are median and (1st and 3rd quartiles), unless otherwise stated.
[b] p-Values: categorical data Chi-square; continuous data median, Mann–Whitney.
[c] Missing data 1 for men, 4 for women.
[d] Missing data 133 for men, 188 for women.
[e] Other injury type includes: abraded, electrical, exploded, noise, temperature, toxics, violence, and "other" that does not fit into a defined Occupational Injury and Illness Classification System (OIICS) coded injury category.
[f] Calculated from monthly wage. Consumer price adjusted to 2013. Missing data 70 for men, 117 for women.

3.1. Multivariable models

3.1.1. Time loss days

Negative binomial regression models, stratified by gender were run using covariates based on prior literature, and available in the Washington State administrative data. Table 4 presents the results

Table 2
Estimated characteristics of janitorial service workers (SOC Building Cleaning Workers[a]) in Washington State, American Community Survey Sample 2003–2013.

	Men	Women	p-Value
Sample observations	3,034 (65.4%)	1,607 (34.6%)	
Weighted population count	350,000 (65.3%)	180,000 (34.7%)	
Age (median[b] at survey year)	45 (32–56)	44 (32–54)	<0.0001
Individual's income (median Q1–Q3)[c,d]	$21,500 ($10,300–$33,000)	$13,000 ($5,000–$24,000)	<0.0001
Speak English (only, well, or very well)	91.2% (89.1%–93.0%)	83.4% (80.8%–85.7%)	0.002
Married	48.6% (34.1%63.2%)	51.6% (23.0%–79.1%)	0.814
Full-time worker[e,f]	60.6% (53.4%–67.3%)	38.3% (33.5%–43.4%)	<0.0001

[a] Standard Occupational Classification, 2000, 37201X which includes: Janitors and Cleaners, and Building Cleaning Workers, All Other. BLS.
[b] Q1–Q3 refer to quartile 1 (25th percentile) and quartile 3 (75th percentile).
[c] Individual income not CPI adjusted.
[d] Missing 170 men, 117 women.
[e] Full-time worker missing 704 observations (15.0%, 422 men, 282 women).
[f] Full-time worker calculated from "usual number of hours worked per week." 35 + h/week considered full-time.

from our gender stratified negative binomial regression model. We used incidence rate ratios (IRRs) to describe our results. For men, demographic characteristics of age at time of injury and being married were somewhat related to increased rate of time-loss days with a one-year increase in age at the time of injury resulting in a .02 or 2% increase in time loss day rate (95% CI [1.01–1.03]), and being married associated with a 39% increase in rate of time-loss days, compared to those who were not married (Table 2). Injury types (falls from elevation, falls from same level, and musculoskeletal disorders) were significantly related to increased rates of time loss days, with falls from same level increasing the rate of time loss days by 49% and falls from elevation increasing the rate by 89%, compared to "Other" injury types. The body part injured was also highly related to increased rates of time loss for men, with all but the neck, trunk, and upper extremities being significantly related to increased rate of time loss compared to "Other" body parts (Table 4). Shoulder injuries had a triple the rate of time loss days for men (Table 4).

For women, the negative binomial regression model provided in Table 4 shows far fewer significantly related WC variables to be associated with increased rates for time loss days. For women, age was marginally related to increased rates for time loss days, with the same IRR and confidence interval as for men (IRR 1.02 95% CI [1.01–1.03]). The most significant relationships were language, with Spanish language preferring injured women having a 58% higher rate of time loss days, and those who preferred a language other than English or Spanish had a 50% increase rate for time loss days (Table 4). Effects were found for injury types, with struck by and vehicle related injuries for women being about one half lower rate for time loss days compared to having an 'Other' injury. No body parts were associated with increased or decreased rates for time loss days for women.

Table 3

Median cost, medical, interpreter, and time loss for injuries by gender and injury group. Janitorial service workers 2003–2013.[a]

Injury type	Men	Women	p-Value[b]
Falls from elevation	(n = 114)	(n = 111)	
Total claim cost paid	$15,241 ($2,903–$65,147)	$6,753 ($1,713–$34,228)	0.01
Medical aid paid	$8,343 ($2,673–$36,695)	$5,172 ($1,513–$17,877)	0.02
Interpreter cost	$4,191 ($649–$13,603)	$3,873 ($1,209–$8,559)	0.85
Non-medical cost paid	$7,052 ($549–$28,662)	$1,562 ($195–$12,470)	0.01
Time loss days	109 (14–261)	39 (5–218)	0.07
Falls from same level	(n = 140)	(n = 253)	
Total claim cost paid	$9,749 ($2,325–$40,682)	$13,694 ($3,857–$52,722)	0.05
Medical aid paid	$5,922 ($1,563–$18,792)	$8,734 ($2,667–$27,801)	0.02
Interpreter cost	$1,526 ($610–$5,459)	$3,735 ($1,343–$12,406)	0.02
Non-medical cost paid	$2,593 ($394–$20,335	$3,045 ($395–$19,480)	0.90
Time loss days	46 (6–257)	70 (10–335)	0.26
Musculoskeletal disorders	(n = 403)	(n = 516)	
Total claim cost paid	$9,602 ($2,607–$49,353)	$10,121 ($2,972–$40,386)	0.99
Medical aid paid	$6,414 ($1,708–$21,413)	$6,561 ($1,886–$20,563)	0.69
Interpreter cost	$1,127 ($373–$5,920)	$2,361 ($888–$7,943)	0.02
Non-medical cost paid	$2,905 ($446–$22,057)	$2,277 ($403–$16,855)	0.24
Time loss days	47 (9–322)	52 (10–261)	0.53
Struck by/against	(n = 146)	(n = 138)	
Total claim cost paid	$5,318 ($2,077–$22,010)	$5,307 ($1,288–$13,663)	0.16
Medical aid paid	$3,272 ($1,263–$14,396)	$3,430 ($1,999–$9,417)	0.29
Interpreter cost	$1,244 ($344–$2,510)	$1,358 ($775–$4,452)	0.13
Non-medical cost paid	$1,436 ($266–$9,910)	$978 ($193–$4,064)	0.14
Time loss days	19 (5–104)	22 (5–88)	0.96
Vehicle related	(n = 41)	(n = 75)	
Total claim cost paid	$6,098 ($3,605–$26,675)	$9,036 ($2,603–$26,215)	0.56
Medical aid paid	$4,611 ($2,146–$9,414)	$6,719 ($2,231–$17,616)	0.37
Interpreter cost	$2,843 ($801–$11,151)	$3,159 ($932–$6,779)	0.91
Non-medical cost paid	$1,618 ($464–$8,741)	$1,673 ($280–$7,576)	0.64
Time loss days	31 (9–109)	36 (7–164)	0.61
Other[c]	(n = 223)	(n = 230)	
Total claim cost paid	$7,008 ($3,076–$21,741)	$10,677 ($2,649–$53,142)	0.07
Medical aid paid	$5,008 ($1,782–$12,451)	$6,883 ($2,197–$26,333)	0.06
Interpreter cost	$722 ($326–$3,047)	$3,607 ($872–$9,836)	<0.001
Non-medical cost paid	$1,787 ($365–$9,457)	$2,279 ($462–$18,187)	0.09
Time loss days	30 (7–97)	45 (7–267)	0.03

[a] Median (1st–3rd quartiles).

[b] Mann–Whitney (rank sum) for medians between genders.

[c] Other injury type includes: abraded, electrical, exploded, noise, temperature, toxics, violence, and "other" that does not fit into a defined Occupational Injury and Illness Classification System (OIICS) injury code.

3.1.2. Medical costs

Table 5 presents a multivariate model stratified by gender for medical costs incurred from work-related injuries. Individual characteristics were not associated with increased medical costs, with the exception of preferred language for communication. For both men and women, requesting Spanish materials and interpreters increased the associated median medical costs (after excluding interpreter services from the claim medical total) by over three (men) to over five (women) thousand dollars (Table 5). For men, having a fall from elevation, increased median medical costs compared to having an 'Other' type of injury by about $4,500 dollars (Table 4). Both men and women had increased median medical costs for each day that it took to receive a time loss payment and about $2,000–$2,500 dollars in increased median medical costs if they previously had a time-loss claim with the Washington State workers' compensation system (Table 5).

3.1.3. Post hoc analyses

The Washington State workers' compensation data does not differentiate hours worked in each risk classification by gender, making it difficult to calculate gender stratified injury rates within our data. The estimated rates of injury by gender were calculated using hours reported to the WC agency and ACS estimated proportion of workers by gender, and are presented in Table 6. The estimated rate ratios for women varied from 1.8 (99% CI 1.3–2.7) (lowest) in 2003, 2005, and 2011 to 3.2 (99% CI 2.2–4.6) (highest) in 2004 (Table 6). Women had higher estimated injury rates in all study years.

4. Discussion

This study presents counts, rates, and direct workers' compensation costs for janitorial service workers who filed compensable claims in Washington State. In addition to the overall picture of janitorial service worker injuries presented in this study, there are some significant differences by gender worth noting. Injured women were more likely to have at least one dependent child in the home, were much more likely to request communication in Spanish, and had significantly different injury types and costs than men (Table 1). Women also had a higher proportion (and rates) of compensable injuries in this study, as well as having higher (though not statistically) median medical cost, and higher time loss days compared to men.

In the multivariable models, the factors associated with higher time loss days included age, being married (for men), as well as injury type (for both genders). For the multivariable model examining medical costs significant factors include Spanish language preference for communication, specific injury types, days from injury to first time-loss payment, and whether or not the injured worker had prior WC experience. Although this study looked at a single occupational group (janitorial services), there are most likely sex/gender segregation related to tasks or exposures on the job that we are not able to see in our data, but that might explain the differences in injury types by gender (Hooftman, van der Beek, Bongers, & van Mechelen, 2005; Messing et al., 2003; Silverstein et al., 2009). There are also very likely some issues related to language preferences that are creating costlier claims with longer return to work times, and although we excluded the costs

Table 4

Negative binomial incidence rate ratio regression model for factors associated with time loss days. Stratified by gender. Janitorial service workers, Washington State. 2003–2013.

	Men (n = 1,063)				Women (n = 1,318)			
	IRR[a]	[95% CI][b]		p-Value	IRR[a]	[95% CI][b]		p-Value
Age at time of injury	1.02	1.01	1.03	<0.001	1.02	1.01	1.03	0.05
Married	1.39	1.09	1.78	0.01	1.28	1.06	1.54	0.08
Language preference								
English	–							
Other	1.13	0.70	1.83	0.61	1.50	1.00	2.26	0.05
Spanish	1.02	0.78	1.34	0.89	1.58	1.28	1.94	<0.001
Injury type								
Other[c]	–							
Falls from elevation	1.89	1.00	1.26	<0.001	0.87	0.58	1.31	0.50
Falls from same level	1.49	0.85	1.02	0.04	0.96	0.70	1.33	0.82
MSDs	1.64	1.01	1.19	<0.001	1.04	0.77	1.42	0.79
Struck by/against	1.19	0.71	0.81	0.38	0.57	0.39	0.83	0.00
Vehicle related	0.95	0.72	0.53	0.88	0.55	0.35	0.88	0.01
Body group								
Other	–							
Back	2.20	1.18	4.10	0.01	1.44	0.58	3.56	0.43
Head	2.43	1.30	4.52	0.01	1.92	0.79	4.70	0.15
Lower extremity	1.85	0.99	3.49	0.06	1.63	0.65	4.10	0.30
Neck	1.61	0.61	4.25	0.33	1.36	0.48	3.88	0.56
Shoulder	3.13	1.54	6.36	0.00	1.98	0.77	5.11	0.16
Trunk	1.65	0.81	3.39	0.17	0.47	0.18	1.28	0.14
Upper extremity	1.42	0.75	2.68	0.28	1.17	0.47	2.92	0.73

[a] IRR = incidence rate ratio.

[b] 95% CI = 95th percent confidence interval.

[c] Other injury type includes: abraded, electrical, exploded, noise, temperature, toxics, violence, and "other" injuries that do not fit into a defined Occupational Injury and Illness Classification System (OIICS) injury code.

associated with interpreter services from the model, language was still an important covariate related to both higher days of time loss (women) and medical care cost (both men and women).

In addition, the injured janitorial service workers were quite different in general characteristics compared to the larger janitorial population in Washington State. First off, women make up an estimated 32.4% of the janitorial worker population in Washington State, yet they accounted for 55.4% of the compensable claims in our study. In addition, for both genders, injured workers were younger, less likely to be married, less likely to be a fluent English speaker, made more per year, and were more likely to work as a janitor full-time. Making more in annual wages is most likely a function of the hours worked, although it is important to note that female full-time workers made significantly less than male full-time janitors (median yearly wage: $21,418 ($15,877–$27,418), compared to men: $26,886 ($20,291–$33,781),

p-value < 0.001, Table 1). Our study found a higher proportion of women, being younger and less likely to speak English to be risk factors for increased rates of time loss days and higher medical costs, which are similar to those found in previous studies (Alamgir & Yu, 2008; Bell & Steele, 2012; Burgel et al., 2010), although the exact mechanisms for these results have not been well studied.

We were not able to test specific social issues found in previous work (e.g., communication, power, knowledge of rights, health care services; Kosny et al., 2012; Premji, 2014). A recent report from the National Institute for Occupational Safety and Health (NIOSH) and the American Society for Safety Engineers (ASSE), describes Hispanic immigrants in small construction firms as having "overlapping vulnerabilities" (NIOSH et al., 2015). In other words, Hispanic immigrants have injury risks in addition to the physical hazards inherent to the job, such as working in a small firm, race, class, gender, and ethnicity, which when combined create "overlapping" vulnerabilities that put them at higher risk for injury compared to workers without these characteristics. We are unable to determine race, ethnicity, or immigrant status in our data, but our results regarding language preference, suggest that janitorial service workers suffer overlapping vulnerabilities as well. Our previous work has shown the elevated risk of a compensable injury for janitorial service workers compared to other NORA Services Sector occupational groups (Anderson et al., 2014). The present study adds to this information by specifying some areas for further study, such as risk factors related to falls from same level, and communication quality for injured workers who prefer a language other than English.

While we know that on average, janitorial service workers are low-wage (Leigh & Miller, 1997), and have low occupational prestige scores (Nakao & Treas, 1994), and that both of these factors are linked to higher mortality, and increased risk of injury, the exact mechanisms as to why these are correlated with worse health outcomes are unknown. Detailed task analyses, as well as systematic evaluation of gender-based task level segregation, and additional social and psychosocial factors should be examined to determine the links between low wage/low prestige and higher rates of injury. The results from this study may assist in identifying specific activities in a janitorial job (e.g., heavy lifting, use of shoulders, and working at heights), in order to focus resources on activities that are correlated with the worst outcomes.

There are also some extra-work issues that are suggested by the present data, including marital status, number of children, and language preference, that are worth exploring further to understand the link between social stressors and increased risk of occupational injury.

Finally, the notion of gender differences in janitorial injury rates requires further research. According to the Bureau of Labor Statistics (BLS, 2016), overall, men have higher rates of work-related injuries than

Table 5

Median regression model for factors associated with medical cost for compensable claims. Stratified by gender. Janitorial service workers, Washington State 2003–2013.

	Men (n = 1,015)				Women (n = 1,277)			
	Coeff.	[95% CI][a]		p-Value	Coeff.	[95% CI][a]		p-Value
Age at time of injury	72	−14	157	0.10	40	−35	114	0.297
Married	1,404	−786	3,593	0.21	1,333	−379	3,045	0.127
Language								
English	–							
Other	2,133	−2,372	6,637	0.35	709	−3,016	4,434	0.709
Spanish	3,049	408	5,690	0.02	5,543	3,657	7,428	<0.001
Injury group								
Other[b]								
Falls from elevation	4,981	1,051	8,912	0.01	209	−3,409	3,826	0.91
Falls from same level	1,421	−2,176	5,018	0.44	1,209	−1,582	4,000	0.396
MSDs	858	−1,950	3,666	0.55	35	−2,376	2,446	0.977
Struck by/against	−698	−4,303	2,908	0.70	−1,668	−4,926	1,589	0.315
Vehicle related	2,025	−3,580	7,630	0.48	2,803	−1,434	7,040	0.195
Days from injury to first time loss check	18	11	25	0.00	23	19	27	<0.001
Had a prior compensable claim	2,517	349	4,685	0.02	2,353	568	4,138	0.01

[a] 95% CI = 95th percent confidence interval.

[b] Other injury type includes: abraded, electrical, exploded, noise, temperature, toxics, violence, and "other" that does not fit into a defined Occupational Injury and Illness Classification System (OIICS) injury code.

Table 6
Estimated rates of injury by gender for janitorial service workers in Washington State, 2003–2013.

Variable	Men	Women	p-Value
Total proportion of janitors by gender[a,c]	65.4% (54.6%–74.9%)	34.6% (25.1%–45.4%)	<0.0001
Estimated hours reported for janitorial service workers (risk class 6602-03, 6602-05)	113,566,697	60,201,603	<0.0001
RATES[b]			Rate ratio (99% CI)[c]
Rate of injury per 10,000 FTE	187.9	439.5	2.3 (2.1–2.6)
Rates of injury per year			
2003	249.6	456.6	1.8 (1.3–2.6)
2004	189.5	607.2	3.2 (2.2–4.6)
2005	252.4	466.3	1.8 (1.3–2.6)
2006	195.9	537.8	2.7 (2.0–3.9)
2007	186.2	470.7	2.5 (1.8–3.6)
2008	186.5	403.9	2.2 (1.5–3.1)
2009	185.4	395.1	2.1 (1.5–3.1)
2010	190.5	484.3	2.5 (1.8–3.6)
2011	161.4	292.1	1.8 (1.2–2.7)
2012	131.4	399.0	3.0 (2.0–4.6)
2013	158.6	392.2	2.5 (1.7–3.6)

[a] Standard Occupational Classification, 2000, 37201X which includes: Janitors and Cleaners, and Building Cleaning Workers, All Other. BLS.
[b] Rates use the percent for full-time janitors in NORA sector NAICS male/female from ACS to calculate number of hours by gender reported to WC for the denominator. Numerators are actual compensable claims filed by gender by year.
[c] 99% CI = ninety-ninth percentile confidence interval.

women do and younger (under 45) and older (over 65 years old) workers have higher rates of injury; we are not clear why this is not true for janitorial service workers in Washington State. Is there a pay differential for riskier tasks that is enticing women to more hazardous work? Are women more likely to be single mothers or heads of one-income households that may put additional social and economic stressors on them? Alternatively, do these social and economic stressors make women more prone to adverse health conditions (e.g., chronic fatigue, diabetes, or cardiovascular disease) that have been linked to higher rates of morbidity and mortality? It may also be that men are less likely to report injuries in this occupational group. All of these social factors need to be explored as potential explanations for gender differences in work-related injury risk, so that specific interventions can be tested.

4.1. Limitations

There are a number of limitations to this study. First, workers' compensation claim data may not be representative of the injuries occurring to janitorial service workers. Past research has demonstrated that those reporting an injury to a WC system may have different social, economic, injury, and employment characteristics than those who do not report (Fan, Bonauto, Foley, & Silverstein, 2006; Rosenman et al., 2000). Additional data, such as in-depth interviews and physical and psychosocial exposures both at work and off the job, would greatly add to our ability to identify gender segregation and other potential characteristics that may create differential workers' compensation outcomes for janitorial service workers. Second, we lack meaningful social constructs such as race, ethnicity, and immigrant status, which would help us further characterize this population. Factors such as these would have allowed us to test for additional overlapping vulnerabilities (NIOSH et al., 2015), which could aid in the development of programs and resources to reduce injuries in janitorial services. Third, our outcomes of cost and time loss duration are time dependent (claims from earlier years have longer periods to accrue costs and time loss). Consequently, if the distribution of risk factors for prolonged time loss or increased medical costs varies over the time-period of our study, then bias may have been introduced, particularly in claims from later years. Fourth, our results should be interpreted within the population studied. We restricted our analysis of janitorial services to a group of specific industries in the NORA Services Sector, so our results may not be applicable to janitorial service workers employed in other industries, although post hoc tests revealed no differences in injury type between the 166 non-NORA Services Sector janitorial compensable claims and the janitors described in this

study. Fifth, by restricting our analyses to State Fund (SF) claims in the NORA Services Sector, we did miss some janitorial workers. The SF covers 89% of all janitorial workers in Washington State, but the NORA Services Sector includes only 73% of janitorial service workers. Characteristics between those within the NORA Services Sector and those in other industries may be different in ways that would affect our interpretation of janitorial service workers in Washington State. Sixth, about 6% (n = 104) of the claims that we analyzed were not closed at the time of analysis. This will most likely have an effect on our results, although it is hard to say how. The 104 still open claims were more likely to be men and to be married, and equally likely to have dependents, Spanish or English speaking, and were equally likely to have had a prior WC claim, compared to closed claims. The distribution of injury types was also similar to those with closed claims (data not shown).

Finally, we were not able to generate actual rates of injury by gender or language preference, as these data are not reported in our denominator (hours worked in each risk class by worker for each employer). We did however attempt to construct rates using the Integrated Public Use Microdata 1% samples from the American Community Survey (Ruggles et al., 2015). We estimated the proportion of janitors by gender in the ACS data and used this proportion to divide our denominator data (hours worked by risk class) to estimate yearly injury rates. Our estimates found that women have approximately twice the rate of compensable injuries compared to men in the same industry. Future research should identify alternative methods for calculating injury rates by gender, race, and language in order to more fully capture the burden of injuries on janitorial service workers.

5. Conclusions

Janitorial service workers are a large and growing sector of employment in the United States and are considered vulnerable, low wage workers. This study describes the types of injuries, cost, and lost work time of janitorial service workers who filed a workers' compensation claim in Washington State. While previous research has identified janitors as working in high hazard, low pay, and low status occupations, this is the first study to examine not only injuries, but also to describe differences by gender of worker injured, and direct WC costs for janitorial service workers. This study is also the first, to our knowledge, that investigates factors that may be driving higher cost and higher time loss workers' compensation claims in janitors. The differences by gender deserve further investigation, so that prevention resources can be targeted at social, economic, and physical exposures to reduce injuries, such as on-site childcare, more linguistically diverse training for workers and

multilingual supervisors, or reducing the musculoskeletal load required for the job and thus reduce risk of musculoskeletal disorders for all janitors. The overlapping vulnerabilities thesis from NIOSH also deserves additional study, in more industries and occupations. While our results are suggestive of multiple (or overlapping) vulnerabilities among janitorial workers, more research is needed, to first identify these simultaneous vulnerabilities and then to test for intersectional, additive, or multiplicative effects of these factors on injury risk, trajectory, and outcomes. Our previous work along with others, have identified language discrepancy between workers' compensation systems, their providers, and injured workers, as a potentially critical factor in ensuring equal care for work-related injuries (Bonauto et al., 2010; Kosny et al., 2012; MacEachen, Kosny, Ferrier, & Chambers, 2010). Work to improve the WC experience of workers who prefer communicating in a language other than English should be a high priority.

5.1. Practical implications

Understanding differences in how safety information and training are provided to men and women and to English and non-English speakers is critical to understanding how we can reduce injuries among janitorial service workers. Although women make up approximately one-third of the employed population of janitorial service workers, they suffer twice the rate of time-loss injuries. In this study of injured janitorial service workers, women were younger than men, more likely to have dependent care responsibilities, and had longer median wait times for their first time-loss payment, which most likely increase the stress associated with a time-loss injury and paying bills. Women in this study were also more likely to require communication in Spanish than men. These differences by gender appear to be associated with higher median time loss and higher medical costs for women compared to men. Providing training in linguistically and culturally appropriate ways may go a long way towards reducing the burden of injuries among janitorial service workers.

Disclosure of grant funding

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