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Using Behavioral Risk Factor Surveillance System Data as an Occupational Health Profile

Washington State Janitors, 2011 to 2017

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Objective: Janitorial workers have a high burden of occupational injury and illness, but little information exists on their overall health. **Methods:** Data from the Washington State Behavioral Risk Factor Surveillance System (BRFSS) were analyzed to characterize the working population of Janitors in Washington State from 2011 to 2017 ($n = 490$) as compared with all other workers ($n = 38{,}885$). **Results:** Compared with other workers, Janitors were significantly more diverse, had lower socioeconomic status, and reported poorer general health and higher rates of arthritis and depression. Janitors were less likely to have adequate sleep, health insurance, and access to technology. Janitors reported higher rates of smoking and marijuana use. **Conclusions:** Multiple risk factors compound the vulnerability of Janitors. BRFSS data can be used to characterize the health of occupational groups. Identifying overall health needs can better inform policy and help formulate strategies to improve workers' health.

Keywords: arthritis, behavioral, Behavioral Risk Factor Surveillance System, chronic conditions, depression, injury, janitors, occupational coding, occupational health, occupational injury, risk factor, safety, surveillance, vulnerable workers, work-related injury

Janitors are a growing employment group, and are low-wage, low status workers with a high burden of occupational injury.[1,2] Janitors are the 12th largest occupation in Washington, with an annual mean wage around $32,000.[3] Janitorial work has high physical demands and chemical exposures, and workers face high rates of occupational injuries and illnesses including musculoskeletal disorders, respiratory diseases, and traumatic injuries.[1,4–11]

Janitors, along with other occupational groups at high-risk of work-related injury and illness, may have multiple factors, in addition to on-the-job hazards, that affect their work and health. These factors, such as age, sex, racial/ethnic diversity, and having a "preferred language other than English" of large percentages of Janitors[1,4,9,12–14] may combine to form what has been described as "overlapping vulnerabilities"[15] by the National Institute for Occupational Safety and Health (NIOSH). NIOSH promotes "Total Worker Health"[16] research and policies, recognizing that many factors exist which may compound existing occupational risks, or make it difficult for workers to access care, advocate for safe work, and heal and return to work. Workers with pre-existing health conditions are also at greater risk of experiencing longer periods of time loss following an occupational injury or not returning to work at all.[17] Workers may benefit from comprehensive health and safety efforts that are based on holistic information about their life experiences and not solely on counts and rates of work-related injuries.

The Behavioral Risk Factor Surveillance System (BRFSS) is a survey that provides data on a wide range of health and risk behaviors. These data can be analyzed by industry and occupation ("I/O") in states that add I/O questions to their BRFSS survey. Using this information allows researchers to supplement their understanding of specific groups by exploring data that is not from work injury-based reporting sources (such as workers' compensation [WC] or hospital discharge records).

In Washington State, BRFSS data are regularly used to analyze work-related injuries and other health conditions by I/O,[18–25] though many of these studies group workers into broad industry or occupational categories for analysis rather than profiling one occupational group. Several studies have identified the wider category of "Services" or "Cleaning and Building Services" (which would include Janitors) as being at increased risk for obesity,[24] work-related injury,[18] influenza-like illness,[23] and current depression and frequent mental distress.[21] Analyses of WA WC claims data have identified Janitors as a population in need of injury prevention efforts.[1,2] Recent legislation has also focused on Janitors' needs for a safe working environment and on establishing training requirements.[26,27] However, there is little research on the overall health status of Janitors.

This study analyzes 7 years of WA BRFSS data for Janitors to better characterize the occupation, describe worker health status, and identify possible avenues for injury prevention efforts, interventions, and overall worker health promotion.

METHODS

The BRFSS is an annual, Centers for Disease Control (CDC) funded, state-based, random digit-dialed, telephone survey of the noninstitutionalized adult (more than or equal to 18 years) US civilian population conducted in all 50 states, the District of Columbia, and three US territories.[28] The BRFSS is comprised of a CDC "Core" set of questions, which states may supplement by selecting additional CDC "optional" modules, or developing and including their own modules ("state-added questions" [SAQ]). BRFSS core questions include age, sex, race/ethnicity, smoking status, alcohol use, and questions on general health and health conditions.[28] Optional and SAQ modules vary by year,[28] and WA has added an I/O module annually since 1995. Results based on questions that are not asked in every year of the time period (2011 to 2017) are noted. The Washington State Institutional Review Board considers the BRFSS an exempt project.

In WA, the BRFSS has included landlines and cell phones in their sampling frame since 2011, and the proportion of respondents by cell phone in WA has increased annually. The survey weighting

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methodology changed in 2011, therefore we limited this study to include only data from years after that change. For additional information on the BRFSS weighting procedures, data, and documentation, please refer to the Annual Survey Data webpage.[29] For this analysis, Washington State BRFSS data from 2011 to 2017 were extracted and combined ($n = 94{,}989$). The annual WA BRFSS response rates ranged from 31% to 44% during these years, which was low but not out of line with the response rates of the other states conducting the BRFSS. Response rates for BRFSS are calculated using standards set by the American Association of Public Opinion Research (AAPOR), Response Rate Formula #4.[30] The response rate is the number of respondents who completed the survey as a proportion of all eligible and likely-eligible people. For example, the median BRFSS response rate for all states, territories, and Washington, DC, in 2017 was 45.1% and ranged from 30.6% to 64.1%; for detailed information on response rates, see the BRFSS Summary Data Quality Reports for the years 2011 to 2017.[31–37]

I/O questions were asked only to respondents who indicate that they are employed for wages, self-employed, or out of work for less than 1 year. To determine industry and occupation, respondents were asked ''What kind of work do you do?'' for occupation (with probes for job title); and for industry, ''What kind of business or industry do you work in?'' Verbatim responses were coded with census occupational codes by trained coders and computerized coding procedures.[38] Workers were subsequently classified into two groups for comparison using the 2000 Standard Occupational Classification (SOC) codes and the Census 2000 (2011 BRFSS) and 2002 (2012 through 2017 BRFSS) Industrial Classification (Census codes). ''Janitors'' included those respondents who were employed (for wages, self-employed, or out of work for less than 1 year) whose occupation responses were coded with ''4220'' (2002 Census code) and ''422'' (2000 Census code). ''All other workers'' were those who met the employment criteria but had any other occupation code. Non-working adults ($n = 55{,}614$) were excluded from this analysis.

Having 490 working Janitors out of 39,375 total working respondents is in line with the full-time equivalent (FTE) numbers for ''Janitorial Services'' (North American Industrial Classification System [NAICS] code 56120) in WA, which consistently comprised less than 1% of employment in WA (based on hours reported to WA WC by employers from 2006 to 2016).

To compare the two occupational groups (''Janitors'' and ''All other workers''), the distribution of demographic characteristics, general health status indicators, access to care, select chronic health conditions, injuries, and risk behaviors were analyzed. Body mass index (BMI) ($BMI = [kg/m^2]$) was calculated from self-reported height and weight, and CDC standard weight status categories for BMI were used. ''Serious Mental Illness'' was measured using the Kessler Psychological Distress Scale (K6) (score more than 13). The question on health care coverage includes health insurance, prepaid plans such as HMOs, and government plans such as Medicare or Indian Health Services.

Statistical analysis was performed using SAS 9.4 (SAS Institute Inc., Cary, NC). Descriptive statistics means, and proportions are presented for comparison, with their respective Taylor series 95% confidence intervals. Missing values are not assumed to be completely at random (SAS NOMCAR option). All estimates were weighted (BRFSS weights are developed using a raking procedure that accounts for survey design and population demographics, but not employment status or I/O). Statistical significance was determined through Rao-Scott chi-square tests for categorical variables. All estimates were examined for instability by reviewing the coefficient of variation (CV); estimates with a CV greater than 25% were flagged, and those with a CV above 50% were suppressed.

RESULTS

There were 39,375 respondents who were employed (for wages, self-employed, or out of work for less than 1 year) in Washington State from 2011 to 2017, and of these, 490 were Janitors. Janitors were compared with all other workers on demographics (Table 1), health (Table 2), and other activities and behaviors (Table 3). The majority of Janitors (70%) were men; there were significantly fewer female Janitors than other occupations (Table 1). Janitors had fewer non-Hispanic Whites than all other occupations (Table 1). A significant proportion of Janitors had not graduated from high school (21%), and significantly lower educational attainment than other occupations (Table 1). Janitors also had lower household income, and differences in marital status when compared with all other workers (Table 1). Nearly 20% of Janitors did not have healthcare coverage, which was significantly higher than other occupations. Janitors also had more workers reporting poor overall health status, higher mean days with physical health ''not good,'' more workers reporting inadequate sleep, and more with diagnosed arthritis than all other workers (Table 2). Close to a quarter of Janitors (24%) reported being diagnosed with a depressive disorder, which was significantly higher than other workers (Table 2). Janitors also had significant differences in technology access compared with all other workers, with a greater percentage of Janitors not having used the internet in the past 30 days and not having a cellphone for personal use (Table 3). Janitors reported higher activity levels at work than all other workers, but a significantly higher percentage without physical activity or exercise outside of work (Table 3). Significantly more Janitors were current cigarette smokers, and had recently used marijuana (Table 3) than all other workers.

DISCUSSION

To our knowledge, this is the first study to use BRFSS data to characterize Janitors' health and behaviors extensively. Janitors are a population with a diminished overall health status and multiple vulnerabilities, and results confirm and indicate that they could benefit from increased efforts to improve their overall health as well as their occupational health and safety.

Demographic Characteristics

Janitors differ in demographic characteristics in several ways from the population of all other workers, and this has implications for occupational health and safety prevention and intervention efforts. These workers are particularly vulnerable to hazardous work, as they have low socioeconomic status (SES) (as indicated by household income and educational attainment) compared with all other workers, and are a population of higher diversity (less non-Hispanic whites), which may present access and communication barriers in negotiating work and health concerns. Janitors may be limited in their economic mobility and ability to leave hazardous work, and in their ability to advocate for their workplace rights, including safer work conditions. If injured on the job, their options may be further limited, as they have been primarily engaged in highly physically active work to which they may not be able to easily return.

More Janitors have not recently used the internet and do not have a cellphone for personal use than other Washington workers, which may also be related to SES. These differences in access to personal cell phones and the internet have important implications regarding Janitors' ability to obtain information, whether on general health care, worker rights (and workers' compensation), injury prevention materials or education and outreach materials. Strategies to reach these groups need to be offered through multiple avenues, and not solely through the internet, such as in-person training, or through community groups. Training and prevention materials should also be customized to be culturally and linguistically appropriate for a more diverse workforce, not just translated,[39] and account for varying levels of literacy and educational attainment.

TABLE 1. Demographic Characteristics of Janitors Compared With All Other Workers, Washington State Behavioral Risk Factor Surveillance System Data, 2011 to 2017

Demographics	Years	Janitors $n = 490$	All Other Workers $n = 38{,}885$	*P*-Value
	2011–2017	Percentage or mean (95% confidence interval)	Percentage or mean (95% confidence interval)	
Female (%)		**29.8 (24.8, 34.8)**	**44.2 (43.6, 44.9)**	**<0.0001**
Age (mean)		43.4 (41.7, 45.1)	42.1 (41.9, 42.3)	–
Race/ethnicity (%)				**<0.0001**
White, non-Hispanic		**61.6 (55.7, 67.5)**	**72.3 (71.6, 73.0)**	
Other, non-Hispanic		17.2 (12.2, 22.1)	16.7 (16.1, 17.2)	
Hispanic		**21.2 (16.2, 26.2)**	**11.0 (10.6, 11.5)**	
Education, highest grade completed (%)				**<0.0001**
Did not graduate high school		**20.6 (15.3, 25.9)**	**9.0 (8.5, 9.5)**	
Graduated high school		**38.1 (32.7, 43.6)**	**22.8 (22.2, 23.4)**	
Some college or tech school		35.4 (29.9, 40.8)	34.1 (33.4, 34.7)	
Graduated from college or tech school		**5.8 (3.9, 7.8)**	**34.1 (33.6, 34.7)**	
Annual household income (%)				**<0.0001**
<$15,000 per year		**10.1 (6.2,13.9)**	**4.3 (3.9, 4.6)**	
$15,000 to <$25,000 per year		**22.4 (17.4, 27.4)**	**11.5 (11.0, 12.0)**	
$25,000 to <$35,000 per year		**13.2 (9.5, 17.0)**	**9.1 (8.6, 9.5)**	
$35,000 to <$50,000 per year		**24.6 (19.0, 30.3)**	**13.4 (12.9, 13.9)**	
≥$50,000 per year		**29.7 (24.1, 35.1)**	**61.7 (61.0, 62.4)**	
Marital status (%)				**0.002**
Married		**47.2 (41.4, 52.9)**	**55.8 (55.2, 56.5)**	
Divorced or separated		13.5 (9.7, 17.3)	13.7 (13.2, 14.2)	
Widowed		4.0* (1.7, 6.3)	1.8 (1.6, 1.9)	
Never married		**29.4 (24.0, 34.9)**	**22.8 (22.2, 23.4)**	
Part of unmarried couple		5.9* (3.0, 8.9)	5.9 (5.6, 6.2)	
Have any children less than 18 years in the household (%)		44.6 (38.8, 50.4)	42.5 (41.8, 43.1)	0.46

Unless otherwise indicated, questions asked all years 2011–2017. Bold font indicates significant difference between janitors and all other workers at $P < 0.05$, Rao-Scott chi-square test.

*Estimate is unstable, 25% < coefficient of variation (CV) < 50%.

Health Characteristics and Conditions

Overall, WA Janitors reported worse general health status, and a higher number of days in the past month with ''physical health not good'' than all other workers. Janitors had an array of health conditions where they fare worse in comparison to all other workers, and a higher percentage reported that they were without health coverage, limiting their ability to seek treatment and manage these conditions.

Work-Related Musculoskeletal Disorders

Janitorial work is repetitive and requires bending, twisting, and other motions that can lead to or exacerbate musculoskeletal disorders, such as arthritis. The question used on the BRFSS Core asks if diagnosed with ''some form of arthritis. . .'' which includes a variety of specific diagnoses, including carpal tunnel syndrome (CTS) and we are unable to identify individual disorders (such as CTS) from the responses. The question does not ask about whether the condition was caused or made worse by work, but having arthritis certainly complicates such a physically demanding occupation.

Service occupations (including Janitors) have been associated with arthritis.[40,41] The Census Occupational Code Category ''Building and Grounds Cleaning and Maintenance'' (which includes Janitors) has been identified as having a high rate of Carpal Tunnel Syndrome (CTS) as compared with other occupations (4th highest rate).[42] The North American Industry Classification System (NAICS) industry group ''Administrative and Support and Waste Management and Remediation Services: Services to Buildings and Dwellings'' (which includes Janitors) is ranked among the top 20 industry groups for burden of work-related musculoskeletal disorders (WMSDs) in WA when analyzing WC data.[43] That study found that the leading specific diagnoses in that industry group were Rotator Cuff Syndrome and Carpal Tunnel Syndrome.[43] CTS, specifically, has been found to have substantial and lasting adverse impacts on workers when compared with other types of injuries/illnesses.[44,45] One study also found that workers with lower SES got fewer surgeries to correct CTS and waited longer for these surgeries.[45] Another study looking at workers with WA WC CTS claims found that having chronic comorbidities (eg, obesity and depression) has negative impacts on economic recovery post-work-related injury[17]; the Janitors in the WA BRFSS sample had a higher prevalence of obesity than all other workers as well as higher depression.

Given that 30% of Janitors in this study made less than or equal to $25,000 in annual household income, the negative economic impacts of these overlapping conditions and circumstances could be severe. Having a more highly physically active workload coupled with the burden of arthritis, lower SES, and lack of health insurance coverage, can make the job harder and may result in pain and/deteriorating health. Preventing costly and disabling injuries (from occurring or worsening) through proper ergonomics should be a major focus for improving the health of Janitorial workers, which might include assessing job design/organization, tools, and workload. Policies for recognizing and treating work-related injuries and providing support for return-to-work should also be considered. When trying to manage and prevent work-related injuries such as these, clinicians and advocates should keep in mind these co-occurring chronic conditions.

Work-Related Injuries and Illnesses

The prevalence of self-reported work-related injuries in the past year was higher than that of all others workers but not significantly different between the two groups in this study.

TABLE 2. Health Characteristics of Janitors Compared With All Other Workers, Washington State Behavioral Risk Factor Surveillance System Data, 2011 to 2017

Health Characteristics	Years	Janitors $n = 490$	All Other Workers $n = 38{,}885$	*P*-Value
	2011–2017	Percentage or mean (95% confidence interval)	Percentage or mean (95% confidence interval)	
General health status (%)				**<0.0001**
Excellent		17.4 (12.8, 21.9)	21.2 (20.6, 21.7)	
Very good		**28.7 (23.7, 33.8)**	**37.8 (37.2, 38.5)**	
Good		37.5 (32.0, 43.0)	31.2 (30.5, 31.8)	
Fair or poor		**16.4 (11.9, 20.9)**	**9.8 (9.4, 10.2)**	
Number of days in past month physical health not good (mean)		**3.5 (2.7, 4.4)**	**2.5 (2.4, 2.6)**	–
Number of days in past month mental health not good (mean)		3.9 (3.0, 4.8)	3.3 (3.2, 3.4)	–
Number of days poor health in past month limited usual activities (mean)		3.4 (2.2, 4.6)	2.7 (2.6, 2.9)	–
Inadequate sleep, <7 h per night (%)	2013, 2014, 2016	**43.5 (35.0, 51.9)**	**33.4 (32.4, 34.3)**	**0.01**
BMI (%)				0.05
Underweight		2.1* (0.1, 4.2)	1.4 (1.3, 1.6)	
Healthy		30.4 (24.9, 35.9)	35.8 (35.1, 36.5)	
Overweight		34.0 (28.4, 39.5)	36.4 (35.7, 37.1)	
Obese		**33.5 (28.0, 39.1)**	**26.4 (25.8, 27.0)**	
With no health care coverage (%)		**18.3 (13.6, 23.0)**	**13.6 (13.0, 14.1)**	**0.02**
Any time in the past year needed to see Dr. but did not because of cost (%)		15.2 (11.2, 19.2)	14.0 (13.5, 14.5)	0.52
Delayed getting medical care in past year (%)	2013–2017	26.8 (21.2, 32.3)	26.2 (25.6, 26.8)	0.84
Health conditions, ever been told by a doctor				
Angina or coronary heart disease (%)		2.9* (1.0, 4.9)	1.4 (1.2, 1.5)	**0.02**
High blood pressure (%)	2011, 2013, 2015, 2017	28.2 (22.1, 34.3)	22.8 (22.1, 23.4)	0.06
Asthma (%)		16.1 (11.8, 20.3)	13.9 (13.4, 14.4)	0.29
Arthritis including rheumatoid arthritis, gout, lupus, and fibromyalgia (%)		**21.9 (17.4, 26.4)**	**15.9 (15.5, 16.4)**	**0.003**
Diabetes (%)		7.2 (4.6, 9.8)	5.5 (5.2, 5.8)	0.33
Depressive disorder including major or minor depression, and dysthymia (%)		**24.0 (19.1, 28.9)**	**18.3 (17.8, 18.8)**	**0.01**
Serious mental illness (%)	2011–2016	5.5* (1.8, 9.2)	2.2 (1.9, 2.4)	**0.006**

Unless otherwise indicated, questions asked all years 2011 to 2017. Bold font indicates significant difference between janitors and all other workers at $P < 0.05$, Rao-Scott chi-square test for categorical data; difference in means compared with confidence intervals.

*Estimate is unstable, 25% < coefficient of variation (CV) < 50%.

Analyses of WC data indicate that work-related injury risk may be higher for the industry group containing Janitors than other industries[2] overall and in several injury types, with women at particularly high risk.[1] The WA BRFSS data may not reflect this due to the small sample size, which limits our analyses and ability to stratify injury rate by other characteristics such as sex or race. This population differs from the overall WA population and may be harder to reach through traditional telephone sampling than workers in other occupations, such as those with no cellphone for personal use. Low-wage, immigrant, and/or Hispanic worker populations, including many Janitors, may also not be aware of the WC system (or how to navigate the system, if they lack internet access) or of their right to seek medical care for an occupational injury or illness.[9,46,47] Janitors may also face barriers to reporting an injury to their employer, such as fear of consequences.[47]

Mental Health

The percentage of Janitors reporting being diagnosed with a depressive disorder was significantly higher and has been reported previously[11] as a risk for commercial Janitors, including being a factor in occupational injury. While the percentage of Janitors with ''Serious Mental Illness'' was also higher than that of all other workers, the estimate was unstable. Mental health resources should be available to workers, but this is likely limited by their access to health care coverage.

Workload and Stress

While more Janitors were engaged in heavy physical labor on the job, they were less active outside of work and had a higher proportion of obesity than all other workers. This differs from previous WA BRFSS work (pre-2011 methodology changes, not comparable) which looked at obesity by occupation and found that occupations with physically demanding occupational activities had significantly lower prevalence of obesity compared with non-physically demanding jobs.[24] That study found an obesity prevalence rate for all workers of 24.6%, while ''Cleaning and Building Services'' (which includes Janitors) to be one of the top 4 occupational groups for obesity, with an obesity prevalence of 29.5%.[24] The same study found that obesity prevalence was related to lower educational level and lower annual household income,[24] which are both common in this population of Janitors. The racial and ethnic diversity of Janitors may also play a role, as in a national study, not limited to the working population, the prevalence of obesity was higher in Hispanic adults than in the non-Hispanic white population[48] and Janitors had twice the percentage of Hispanic workers compared with all other workers.

TABLE 3. Work Injuries, Activities, and Behavioral Risk Characteristics of Janitors Compared With All Other Workers, Washington State Behavioral Risk Factor Surveillance System Data, 2011 to 2017

Work Injury, Activities, and Behavioral Risks	Years	Janitors $n = 490$	All Other Workers $n = 38{,}885$	*P*-Value
		Percentage or mean (95% confidence interval)	Percentage or mean (95% confidence interval)	
In past year, injured at work or been told by health care professional work-related illness (%)		7.9 (4.8, 11.0)	6.0 (5.7, 6.4)	0.1812
Not used internet in past 30 days (%)	2013–2017	**12.4 (8.6, 16.2)**	**5.6 (5.3, 6.0)**	**<0.0001**
Do not have a cellphone for personal use (%)		**6.7 (4.5, 9.0)**	**2.9 (2.7, 3.1)**	**<0.0001**
Activity level at work (%)	2012, 2013, 2015			**<0.0001**
Mostly sitting or standing		7.1* (3.2, 11.0)	62.9 (61.7, 64.1)	
Mostly walking		**52.0 (41.8, 62.1)**	**20.4 (19.4, 21.5)**	
Mostly heavy labor or physically demanding work		**40.9 (30.9, 51.0)**	**16.7 (15.7, 17.6)**	
No physical activities or exercises besides work in past month (%)		**24.5 (19.5, 29.5)**	**16.8 (16.3, 17.3)**	**0.0006**
Fell at least once in the past year, among 45 years and older (%)	2012, 2014, 2016	7.1* (3.2, 11.0)	11.1 (10.5, 11.7)	0.102
Always wear seatbelt (%)		92.1 (89.1, 95.1)	92.1 (91.7, 92.5)	0.2927
Binge drinking in past 30 days (%)		18.0 (13.5, 22.4)	20.2 (19.6, 20.7)	0.6386
Current cigarette smoker (%)		**21.8 (17.0, 26.6)**	**15.1 (14.5, 15.6)**	**0.0018**
Used marijuana in past 30 days (%)		**34.1 (26.2, 42.1)**	**21.9 (21.1, 22.8)**	**0.0006**

Unless otherwise indicated, questions asked all years 2011 to 2017. Bold font indicates significant difference between janitors and all other workers at $P < 0.05$, Rao-Scott chi-square test; difference in means compared with confidence intervals.

*Estimate is unstable, 25% < coefficient of variation (CV) < 50%.

Non-white workers may also be more likely to work nonstandard hours[49–51] which can negatively affect health. According to 2004 data from the US Bureau of Labor Statistics, about 20% of full-time Building and Grounds Cleaning and Maintenance Occupations workers worked something other than a regular daytime schedule (evening, night, rotating, shift, or other irregular shift)[52] and this number has likely increased as working hours and nonstandard shifts increase, especially in occupations such as Janitors.[49,50,53] Using National Health Interview Survey (NHIS) data from IPUMS for 2010 to 2017, approximately 33% of ''Building cleaning and pest control workers'' (in which Janitors would be classified), worked a schedule other than a regular daytime shift.[54] Shiftwork has also been tied to sleep issues and metabolic disorders, along with a host of other health issues[55] that likely negatively impact Janitors' functioning at work and home,[51] as well as their ability to seek care during regular business hours. In our analysis, 43% of Janitors reported inadequate sleep, which has been identified as a possible risk factor for obesity and other health issues.[56,57] The physical nature of the job, inadequate sleep, along with the possibility of nonstandard work hours, likely contribute to Janitors engaging in less physical activity/exercise outside of work compared with all other workers.

These overlapping health concerns, such as low SES, limited access to health care coverage, arthritis, depression, mostly heavy labor, and inadequate sleep, may cause and compound the vulnerability and stress of Janitors. A higher proportion of Janitors than all other workers reported that they were current cigarette smokers, and had used marijuana in the last 30 days (recreational marijuana use has been legal in Washington State since 2012). This may reflect an effort by Janitors to cope with the workload, stress, and pain that they face on the job coupled with limited options to manage or improve the circumstances.

Limitations and Strengths

There are several limitations to this study. Primarily, the BRFSS is a cross-sectional, self-report survey and as such is subject to recall bias and social desirability bias, which may influence which events respondents recall or report at the time of the interview. Response rates for the WA-BRFSS are lower than those of some other states conducting the BRFSS, and telephone surveys responses generally have been declining over time, and this may introduce non-response bias.[31–37] While the work-related injury question used on the WA-BRFSS captures injuries broadly, it requires a work-related illness to have been diagnosed by a doctor or other health-care professional, and likely represents an undercount. Work is not the focus of the BRFSS, and adding questions to further explore occupational connections is limited by constraints on survey length. Additionally, the population of Janitors is unique, as they may be harder to contact than the general working population (eg, working nonstandard shifts[51] and less access to personal cellphones) and may be under-represented in BRFSS sampling, which does not account for industry and occupation in its weighting. Small numbers mean that some of the estimates are unstable (large CIs and CVs), which limits inference. While the BRFSS does ask about other constructs that influence worker health status, such as sex, race/ethnicity, education, and income, the sample size for Janitors was too low to explore these. Future work with larger/combined samples from more years/other states could be valuable, as other studies have identified ethnic disparities in occupational injuries, particularly for Latinx workers.[58,59] Workers face many additional factors that influence their work and health behaviors, such as fear of reprisal for immigrant workers,[60] that are not covered on the BRFSS. However, this study fills a gap in the research in characterizing a vulnerable worker population that is not often described in occupational health and safety literature and identifies unique needs. This study also leverages the power of a unique data source for occupational health and safety surveillance. The BRFSS is an optimal system for accessing state-level health-related behavior data by occupation due to the large sample size, breadth of topics, and the cost-effectiveness and efficiency of integrating worker health into an existing large-scale surveillance system. The BRFSS is also not subject to the same underreporting of work injury and illness that is present in workers' compensation or hospital discharge data, which depends on employer and physician

reporting and recognition. Occupational profiles can easily be generated from BRFSS data where I/O questions are asked, and adding I/O to the BRFSS Core to make such data available to all states would be valuable.

CONCLUSIONS

Janitors have a higher prevalence of inadequate sleep, arthritis, and depression, and may benefit from health promotion efforts to increase access to health care and mental health services. To improve overall worker health, further ergonomic interventions and policies for safe and healthy work should be explored. Janitors face a unique burden of hazardous work and low wages, along with the challenges of a diverse population whose workers are less likely to have access to technology and may need culturally- and language-appropriate training and services. This study demonstrates the utility of BRFSS data to characterize the health status of a specific occupational group; other high-risk industry and occupational groups may benefit from using these data to supplement traditional injury-based sources of occupational health and safety data. Characterizing vulnerable worker populations using BRFSS data can be a tool to better assess and inform injury prevention efforts and suggest avenues for health promotion and policy changes to protect workers and improve overall worker health, but do not negate employers' responsibility to provide a safe workplace.

Required BRFSS Citation

Data Source: Washington State Department of Health, Center for Health Statistics, Behavioral Risk Factor Surveillance System, supported in part by the Centers for Disease Control and Prevention, Cooperative Agreements: U58/SO000047-1 (2011), U58/SO000047-2 (2012), U58/SO000047-33 U58SO000047-02W1 (2013), U58/SO000047-4 3U58SO000047-03W1 (2014), NU58/DP006066-01 (2015), NU58/DP006066-02-02 (2016), and NU58/DP006066-03-00 (2017).

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