Washington State Janitorial Workload Study

Progress report to the Legislature

January 2022

SHARP Report #102-123-2022

Acknowledgments

Table of Contents

Executive Summary

This is the second progress report to the Washington State Legislature describing advances in the Washington State Janitorial Workload Study. This research study is being conducted by the Department of Labor and Industries (L&I) Safety & Health Assessment & Research for Prevention (SHARP) to address high injury rates among janitors. The study will help quantify the physical workload of janitors so that their workload can be correctly assigned to reduce work-related injuries among janitors.

One of the primary goals of this research is to develop a method to calculate workload in a way so janitorial firms can determine safe workloads for janitors based upon a combination of the work assigned, tools, and environment they will be working in. There are many different environments where janitors work, as well as myriad combinations of tasks, equipment, and cleaning methods. Given constraints on research methods due to COVID-19 restrictions and the limited timeframe, research has focused on one type of environment, commercial office buildings, to develop this workload tool.

This phase continues data collection through surveys and interviews while also developing educational materials. Previous components of the study and detailed methods are provided in the June 2020 report.

The majority of the analysis is ongoing, and brief progress reports on the status of all six (6) current study components are included in this report. These include:

1. **Statewide survey of janitors**: A statewide survey of janitors continues which is providing rich data to inform additional analysis. Analyses and manuscript writing are underway for multiple research topics related to the data collected of this statewide survey. Working abstracts of manuscripts are included in this report.
2. **Statewide survey of janitorial employers**: An online, statewide survey of janitorial firms was launched in June of 2021, with postcards being mailed to 1,850 janitorial businesses, identified from agency records. The original statewide survey of janitorial firms was halted after too few responses. Summary data is presented in this report and the survey will launch again in spring 2022 for further data collection because the response rate was extremely low.
3. **Injured worker interviews**: COVID-19 impacts interrupted interviews of individual injured workers, but will resume once staff returns to L&I offices. When that happens, the research team will print and mail large batches of interview requests.
4. **Workload assessment**: The COVID-19 pandemic severely curtailed efforts to observe the necessary number of janitorial work tasks and how janitors complete those tasks. Yet, this break in field work allowed an opportunity to analyze the data collected in more thorough and meaningful ways, thus mitigating some of the limitations of the number of janitors observed. Detailed preliminary results are provided in this report.

5. **Develop and test a workload calculator**: All data collected in this study will help develop an online calculator that can assist employers and labor groups in determining safe workloads when developing worksite contracts, or in-house cleaning schedules and assigning appropriate staffing levels. A beta version of this tool is currently planned for early Spring of 2022.
6. **Education and training documents**: In formative work, both the diversity of the janitorial workforce and the need for culturally and linguistically appropriate safety and health training resources for low-literacy populations was identified. To this end, SHARP research staff are developing educational materials to identify hazards and general health information to help janitors and employers to keep workers safe. All documents are available in multiple languages (English, Spanish, Russian, Vietnamese, Bosnian, Chinese (Traditional), Amharic, Somali, and Tagalog). Published educational and training documents are available on the [study website](#).

Introduction

Background & Scope

Recent research demonstrates that janitorial work is considered labor intensive with a demanding pace, and high musculoskeletal and cardiovascular loads (Hagner and Hagberg, 1989; Seixas et al., 2013; Søgaard et al., 1996). The body parts most affected by this type of work are the back, legs, and arms (Seixas et al., 2013). The main factors that may influence these exposures are work procedures (tasks), the environment, tools/methods, individual factors, and organizational and psychosocial contexts.

With these risks in mind, the number of janitors and cleaners (excluding maids and housekeeping cleaners) employed in Washington State increased by about 20% between 2013 and 2018 (BLS, 2020). An increase in workload was also found.

A study of union and non-union janitors found a reported increase of work intensity of 8.6% over a three year period (Seixas, 2013). In Minnesota, Green et al. (2019) conducted survey research to identify the relationship between workload and injury and found that an increase in self-reported workload was correlated with occupational injury.

Janitorial Study: Legislative Mandate

The Washington State Legislature provided the Department of Labor & Industries, Safety & Health Assessment & Research for Prevention (SHARP) Program funds in 2018 to conduct research to address the high injury rates of the janitorial workforce. The research must:

- Quantify the physical demands of common janitorial work tasks.
- Assess the safety and health needs of janitorial workers.
- Identify potential risk factors associated with increased injury risk in this workforce.
- Measure workload based on body strain per specific janitorial work tasks.

The department must conduct interviews with janitors and their employers to:

- Collect information on risk factors.
- Identify the tools, technologies and methodologies used to complete work.
- Understand the safety culture and climate of the industry.
- Issue an initial report to the legislature on June 30, 2020.
- Determine usable support tools (the workload calculator) to reduce risk of injury.

A note on terms. Public sector cleaning workers are generally called "custodians," while those in the private sector are called "janitors." This report generally refers to all workers as "janitors."

Methodology

The research team will use a variety of methods to understand the physical workload of janitors and their capacity to perform such work, including:

- Worksite visits, whereby janitorial task observations can be made to collect biomechanical and physiological workload estimates.
- Survey and interview data to assess psychosocial and safety climate perceptions.
- Injured worker interviews to collect more detailed data about the environmental and workplace characteristics in which the injury occurred.

Workplace factors and the amount of time performing work determine the risk factors and exposures on individual workers. A worker's capacity (both physical and psychological) will determine whether the workload is too high for an individual worker. Where the workload factors exceed a worker's capacity negative health outcomes are expected to occur. Thus, identifying both factors provides the necessary information to develop a measure to help avoid workplace injuries among janitorial workers.

Study components

This study involves a multidisciplinary team of occupational health and safety researchers, and includes multiple phases and components. SHARP is currently in the process of developing a beta version of the workload calculator and will begin testing the function of the calculator in early 2022. In addition data analysis from site visits and statewide surveys continues and educational training materials are under development.

Figure 1 represents the Janitorial Workload Study timeline (shaded area indicates completed work)
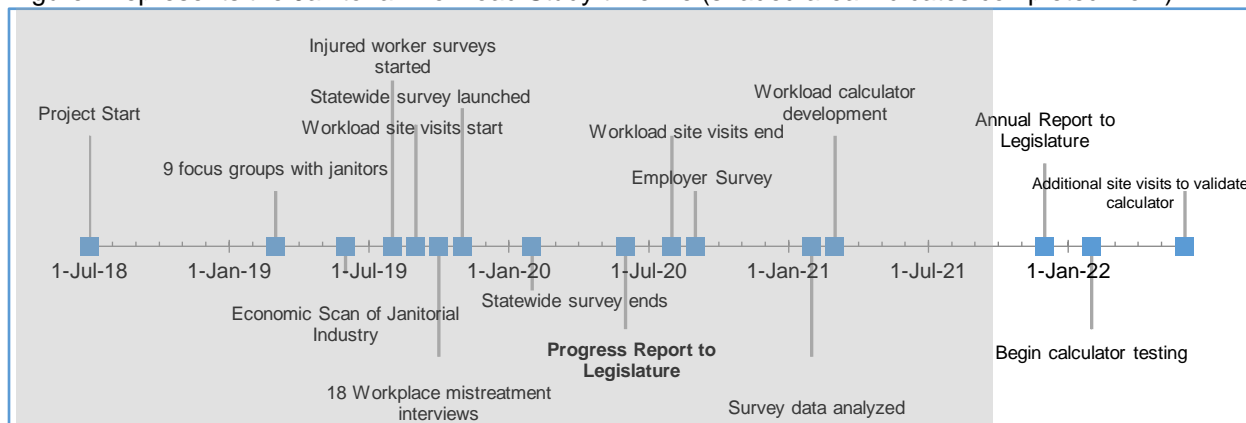
Prior research was completed in the first phase of this study to understand current issues facing janitors at work including safety and health training, workload, work pace, and equipment issues, as well as to understand levels of workplace mistreatment, bullying, and violence. In addition, that research included an economic scan of the janitorial industry in Washington State, and nationally. These formative research findings were included in the 2020 report to the legislature.

Continuing data collection and analyses:

Initial data collection and analyses continued in the second year of the study. There are five main areas of work, including:

- **Statewide survey of Janitors**: Survey complete, initial analyses completed, see the next section for details.
- **Statewide survey of janitorial employers**: This will be re-launched Spring 2022. This report includes results from the first survey of employers.
- **Injured worker interviews:** Ongoing, a qualitative review of the results will be presented in the next annual report.
- **Workplace site visits:** Seventeen site visits were completed, at 5 different worksites. Detailed analyses will continue through early 2022. Preliminary results are provided in the Workload Assessment section of this report.
- **Workload calculator development and testing:** As the workplace site visit data is analyzed, along with some data from the statewide surveys, a workload calculator is being developed to assist janitorial firms in designing workloads that do not exceed an average janitors' work limits. Factors involved in the calculation development include physical and psychosocial exposures, tools and equipment used, and the workplace environment.

Introduction: References

BLS (Bureau of Labor Statistics) (2020). Occupational Employment Statistics. https://www.bls.gov/oes/tables.htm

Seixas N, Domínguez C, Stover B, Simcox N. (2013, August). Janitors Workload and Health and Safety. Department of Environmental and Occupational Health Sciences, University of Washington.

Green, D.R., Gerberich, S.G., Kim, H., et al. (2019). Occupational injury among Janitors: injury incidence, severity and associated risk factors. J Occup Environ Med. 61(2):153-161.

Hagner, I. M., & Hagberg, M. (1989). Evaluation of two floor-mopping work methods by measurement of load. Ergonomics.32(4):401-408.

Søgaard, K., Fallentin, N., & Nielsen, J. (1996). Work load during floor cleaning. The effect of cleaning methods and work technique. European Journal of Applied Physiology and Occupational Physiology. 73(1-2):73-81.

State of Washington. Washington State Fiscal Information. (2018). 2018 Supplemental (revised 2017-19 Biennium) Operating Budget. ESSB-6032. Available at: http://fiscal.wa.gov/.

Progress Reports of Research Study Components

Janitorial work has high physical demands and chemical exposures, and janitors/custodians have a high rate of work-related injuries and illnesses – from musculoskeletal disorders, respiratory disease, and traumatic injuries – when compared to other occupations. The study's research components explored both causes and interventions to mitigate risks for workers.

1. STATEWIDE SURVEY OF JANITORS

Introduction

To reduce this burden of occupational injury and illness, information on what the tasks, workload, pace, and other exposures of janitors/custodians is needed. The statewide survey was conducted by a contracted survey research company to gather this detailed information, which will inform future study activities and guide the creation of injury/illness prevention materials, education/training materials, intervention activities, and outreach.

Methods

A statewide survey from November 2019-February 2020 sought to sample from the entire commercial janitorial population of Washington to capture robust variation within union, non-union, injured, non-injured, of various company sizes, working in a variety of building types, across geographic areas, and of all demographic characteristics.

Surveying the janitorial workforce is difficult. Primarily, the challenge lies in the fact that there are no state licensing requirements, no registry, no certification, low levels of unionization, no trade journals or associations, and no easily accessible lists of all janitors that provide both names and contact information. Additionally, some janitors are employed directly by large firms, or are self-employed or owners of cleaning businesses in which they are the only cleaner, and are therefore not identifiable as an employee of a janitorial company

To identify this population, SHARP created a data linkage process. The first step was to identify workers who were employed by Janitorial Services firms using Washington Employment Security Department (ESD) data; these firms were identified by hours reported by employers within the North American Industrial Classification System (NAICS) code '561720 Janitorial Services'.

SHARP staff also had contact and claim information for janitors who had filed workers' comp claims, and a good working relationship with the union that represents janitors. That union maintains membership rolls.

These data sources had differing data security and legal requirements that must be met, resulting in a complex web of data sharing agreements and data transfer protocols.

The final data linkage process was completed by a data specialist that was not part of the research team to ensure that the research team did not have access to personal identifiers. The linkage was performed as follows:

1) Workers were first identified that were employed by janitorial service firms using Employment Security Department data.
2) These names were then matched to Department of Licensing data for drivers' license data – to capture name and contact information.
3) Workers' compensation claims for janitors (identified by risk class) and union membership data was then added. The union sent their membership list to the research company directly.

The final sample size compiled through this process was 16,664 workers, and the research company selected an initial sample of 12,847 to contact. An additional 1,263 were selected on December 18, 2019 to increase the number of responses. The research company sent initial mailings to the initially selected sample on Nov 1, 2019.

Figure 2. Statewide Survey Data Linkage Process
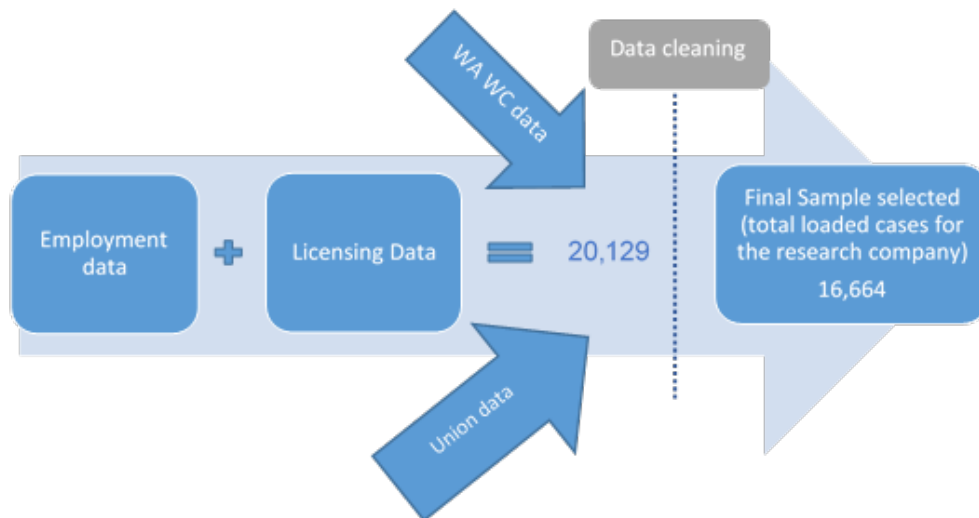
A survey was then mailed to all 16,664 workers. It was available in: English, Spanish, Vietnamese, Somali, Chinese – Traditional, Chinese – Simplified, Russian and Amharic. The full survey mailing packet included the in-language instructions for workers to call in. Workers were provided with a unique identifying pin number so that only workers who had been identified by the sampling process (verifiably janitors and custodians) were able to access the survey.

Topics

The questionnaire covered an extensive range of topics. Please refer to Appendix A for the full questionnaire (English, as mailed to respondents). Main topic areas included:

- **Demographics**: Age, gender, race/ethnicity, income, marital status.
- **Organization/tasks:** Workload, time, intensity and tenure, staffing, building type.
- **Other information:** Supervisors, 2nd jobs, extra tasks.
- **Occupational injury, health, and psychosocial data:** Workers' compensation claim/reporting, sleep, depression, BMI, general health rating.
- **Workplace safety:** Hazards, protective equipment, safety policies.
- **Workplace protection:** Discrimination and harassment.

These topics were selected by consulting the entire team of multi-disciplinary researchers to help identify primary hazards, physical outcomes, and help quantify workload/tasks (to supplement data collected in-person during the workload assessment component of the study).

The survey was pre-tested and pilot-tested on SHARP staff and on a selection of L&I janitors for clarity and timing. Interviewers from the survey research company also performed some pre-testing in other languages and made suggestions for clarifications.

Summary of Research Activity to Date

Multiple research reports, anticipated to be published scientific manuscripts, are in progress using the information provided by janitors in response to this survey. Below are the draft abstracts of the research manuscripts in progress. Once published, detailed summaries and copies of the journal articles will be available upon request.

_____

Manuscript working title:

Work-related injury burden, workers' compensation claim filing, and barriers: results from a statewide survey of janitors

First author:

Naomi J. Anderson, MPH

Working abstract:

"Janitors are a low-wage, ethnically and linguistically diverse, hard-to-reach population of workers with a high burden of occupational injury and illness. Data from an extensive multi-modal (mail, phone, web) survey of janitors in Washington were analyzed to characterize their working conditions and occupational health experiences. The survey included questions on demographics, work organization and tasks, health and safety topics, and discrimination and harassment. The survey was administered in eight (8) languages. There were 620 complete interviews. The majority completed the survey by mail (62.6%), and in English (85.8%). More than half of responding janitors were

female (56.9%), and the mean age was 45 years. Twenty percent reported having a (health-care provider diagnosed) work-related injury or illness (WRII) in the past twelve months. Women, and janitors who were Latino had significantly higher relative risk of WRII. Increased risk was also associated with several work organization factors that may indicate poor working conditions, insufficient sleep, and possible depression.

Half of injured janitors did not file workers' compensation (WC) claims. Janitors reported a high percentage of WRII, which exceeded previously published estimates from Washington State. Women and Latino janitors had significantly increased risk of WRII, and janitors' working conditions may influence the unequal distribution of risk. WRII surveillance via WC or medical care usage in janitors and other low-wage occupations may reflect substantial underreporting. Characterizing the nature of janitors' work experience can help identify avenues for prevention, intervention, and policy changes to protect the health and safety of janitors."

_____

Manuscript working title:

Relationship among job demand-control-support, burnout, and work-related musculoskeletal complaints in commercial cleaners.

First author:
Wonil Lee, PhD

Working abstract:
"Janitors' jobs require repetitive work, and typically have low skill discretion, decision latitude, and social support. Previous studies have found high job demands, low job control, and social support lead to high stress levels This study investigated the relationships between job demand-control-support, burnout, and musculoskeletal symptoms among commercial cleaners in Washington State. Structural equation modeling analysis was performed using data from 208 participants. Results indicated that burnout had a full mediation effect on the relationship between job demand and musculoskeletal complaints, between job control and musculoskeletal complaints. This study shows the importance of awareness of janitorial worker burnout and recommends periodical monitoring to mitigate it and eventually to reduce musculoskeletal complaints."

Additional topics to be addressed utilizing janitorial worker responses to the statewide survey include:

- Occupational health and safety between union and non-union janitors.
- Correlation between personal protective equipment (PPE) availability, use and health outcomes.
- Safety climate and occupational safety and health.

Statewide Survey References

Smith, C.K., Anderson, N.J. (2017). Work-related injuries among commercial janitors in Washington State, comparisons by gender. Journal of Safety Research. 62:199-207.

Anderson, N. J., Bonauto, D.K., Adams, D. (2014). Prioritizing industries for occupational injury prevention and research in the Services Sector in Washington State, 2002–2010. Journal of Occupational Medicine and Toxicology. 9:37-51.

Alamgir, H., Yu, S. (2008). Epidemiology of occupational injury among cleaners in the healthcare sector. Occupational Medicine. 58:393-399.

Chang, J.H., Wu, J.D., Liu, C.Y., Hsu, D.J. (2012). Prevalence of musculoskeletal disorders and ergonomic assessments of cleaners. American Journal of Industrial Medicine. 55:593-604.

Krause, N., Scherzer,T., Rugulies, R. (2005). Physical workload, work intensification, and prevalence of pain in low wage workers: Results from a participatory research project with hotel room cleaners in Las Vegas. American Journal of Industrial Medicine. 48:326-337.

Charles, L.E., Loomis, D., Demissie, Z. (2009). Occupational hazards experienced by cleaning workers and janitors: A review of the epidemiologic literature. Work. 34:105-116.

Lee, S.J., Nam, B., Harrison, R., Hong, O. (2014). Acute symptoms associated with chemical exposures and safe work practices among hospital and campus cleaning workers: A pilot study. American Journal of Industrial Medicine. 57:1216-1226.

Panikkar, B., Woodin, M.A., Brugge, D., Hyatt, R., Gute, D.M. (2014). Characterizing the low wage immigrant workforce: A comparative analysis of the health disparities among selected occupations in Somerville Massachusetts. American Journal of Industrial Medicine. 57:516-526.

Zock, J. (2005). World at work: cleaners. Occupational and Environmental Medicine. 62:581-584.

Green, D.R., Gerberich, S.G., Kim, H., et al. (2019). Occupational injury among Janitors: injury incidence, severity and associated risk factors. J Occup Environ Med. 61(2):153-161.

Green, D.R., Gerberich, S.G., Kim, H., et al. (2019). Janitor workload and occupational injuries. Am J Ind Med. 62(3):222-232. doi: 10.1002/ajim.22940.

2. STATEWIDE SURVEY OF JANITORIAL EMPLOYERS

Introduction

In June of 2021 an online survey of janitorial firms was launched to understand the economic, safety, and health needs, barriers, and challenges faced by janitorial firms in Washington State. This information will assist the research project in developing safety and health educational material, and to identify areas where barriers and challenges exist, in an effort to find solutions to increase the safety of janitorial workers.

Methods

The SHARP research team designed and launched the survey using the Survey Monkey web platform. Postcards about the survey, including a web link to take the survey, were mailed out to 1,850 businesses around the state. The business information came from Labor & Industries (L&I) records of businesses who report under the North American Industrial Classification System (NAICS) code 561720 Janitorial Services. Reminder postcards were sent to the same addresses three weeks after the first postcard.

There were 52 questions in the survey, with multiple open-ended requests for additional information, a copy of the survey questions are in Appendix B.

Summary of Research Activity to Date

There were only 25 responses to the online survey. Based upon the limited data received from the initial survey, it may be that the response was low due to the length of the survey, and the existence of open-ended questions.

The table below highlights some of the information that was received from survey respondents, the majority of whom replied they were a manager at the janitorial firm, or the owner.

Table 1. Descriptive results from the Janitorial firm survey - 2021

What type of building do you most often clean? (n=24)	Percent
Commercial office buildings	79.2%
Educational facilities (e.g. school, university, daycare)	12.5%
Residential apartment buildings	16.7%
Medical/Healthcare facilities (e.g. nursing home, hospital)	37.5%
Industrial (e.g. warehouse, manufacturing)	29.2%
Hospitality (e.g. restaurants, hotels)	4.2%
Other, (please specify): (Other responses included retail sites, different office buildings, and homes)	29.2%
How many janitors do you employ? (n=23)	
0-5	47.8%
5-20	39.1%
More than 20	13.0%
How long has your company been in business? (n=24)	

Less than 1 year	0.0%
1-2 years	4.2%
3-5 years	29.2%
6-10 years	8.3%
11-15 years	4.2%
16-20 years	16.7%
More than 20 years	37.5%

Does the building owner/building manager ever request that your crew perform tasks not listed in the contract? (n=22)

Yes	81.82%
No	13.64%
I don't know	4.55%

What information do you use to estimate the crew size to fill a contract for cleaning services? (n=23)

Software (please specify)	13.0%
Industry guide (please specify organization or book name)	0.0%
Company data (share any specifics you want)	17.4%
Knowledge gained from industry experience	78.3%
I don't know	4.4%
Other (please specify)	8.7%

Do you have a plan in place to protect janitors who are working alone? (n=17)

Yes	88.2%
No	5.9%
I don't know	5.9%

Examples of responses to working alone:

PPE (including panic buttons)

Security in building

Janitors do not work alone

Cell phone

Do you have a formal safety and health program? (n=17)

Yes	70.6%
No	29.4%

Next Steps

Based upon the information gathered, the survey will be shortened and begin telephone follow-up calls in an effort to increase participation. These new methods must first be approved by the Washington State Institutional Review Board prior to beginning the second phase of this survey, which is estimated for Spring 2022.

3. INJURED WORKER INTERVIEWS

Introduction

The injured worker interview component of the Washington State Janitorial Workload Study identifies janitors who have filed existing workers' compensation claims, and interviews them about their injury and work experiences. These interviews yield information that is not already in the administrative workers' compensation data – for example, workers can provide more detail surrounding the circumstances of the injury (safety climate, training, hazards present in their workplace) and what could have been done to prevent the injuries.

In-depth interviews are also valuable for workers to be able to describe their experiences in their own words. Many workers with occupational injuries find it helpful to talk about their experiences, and feel proud of sharing their stories to help prevent future injuries. The detailed information janitors share about their injuries, work organization, tasks, hazards, and health can be used to help generate and inform prevention materials.

Methods

Claims are extracted from Washington workers' compensation claim filings for the previous 30-60 days. For example, an August 28, 2019 extract identified 69 claims filed by workers in the selected Janitorial Risk Classes from July 1, 2019 through August 1, 2019 (with injury dates ranging from January-July 2019). The risk classes included were "6602-03 Janitorial Cleaning Services, NOC" and "6602-05 Janitors, NOC." This excludes subclasses devoted to contract window washing services (-02), residential janitorial workers (-04), pest control (-08), portable cleaning & washing (-10), and street/building decorating hanging of flags/buntings (-12).

Selection criteria includes all claims filed and those where further information is required to understand injury cause. Claims are selected for interviews if the researchers believe there may be an opportunity to develop safety and health prevention materials based upon the circumstances of the injury.

An average of 68 new claims met these criteria, per month. Periodically, the team reviews the claims list and selects a percentage for potential interviews. These janitors are first contacted via letter then a bilingual staff member contacts them by phone. Currently, letters and calls are conducted in English and Spanish. A language interpretation line is available for workers who prefer another language.

While injury description and claim information is used to inform prevention materials (by identifying a common hazard or exposure experience to focus on), personal identifiers are not used to protect worker privacy.

Summary of research activity to date

As of December 1, 2021, 16 interviews have been completed (seven in English, nine in Spanish). Of the 16 completed interviews, the injury event types included:

- Struck against stationary object
- Caught in or compressed by equipment or object
- Overexertion/repetitive motion
- Falls
- Violence

Next steps

Janitor experiences in their own words help identify issues and inform prevention and intervention efforts. The injured worker interview process will continue through the first half of 2022. Results will be analyzed on a rolling basis as interviews are completed. Injury descriptions and comments from janitors will be used to identify common hazards and issues faced by janitors in Washington, and to generate prevention materials and interventions. Efforts are underway to increase response rate.

4. WORKLOAD ASSESSMENT

Introduction

Janitorial work is labor intensive with a demanding work pace, and high musculoskeletal and cardiovascular workloads (Hagner and Hagberg, 1989; Seixas et al., 2013). Green et al. (2019) identified the relationship between workload and injury via survey, and found that as self-reported workload increased so too did occupational injury. Kumar and Kumar (2008) conclude that repetition, posture, and static muscle use are the major risk factors for janitors' musculoskeletal discomfort and disorders.

The workload assessment aims to quantify the physical workload of janitors and identify potential risk factors associated with increased risk of injury so workload can be appropriately assigned. Various workplace factors together with exposure duration determine the workload risk factors and exposures on an individual janitor. A janitor's capacity determines whether workload is too high and may put them at risk for negative outcomes.

This conceptual model is illustrated in Figure 3, below. The 2020 report described the research activities that informed this year's work. There are three major sections:

- The first one is the workload assessment via workplace measurements, aiming to identify the three elements enclosed in the top dotted rectangle.
- The second section models a method to understand work pace issues regarding how the work is organized and completed (work organization).
- The final section covers psychosocial factors – job demand, job control, social support, and burnout. These contribute to musculoskeletal issues and injury.

Figure 3. Workload Conceptual Model: Simplified and outlining areas currently being analyzed.
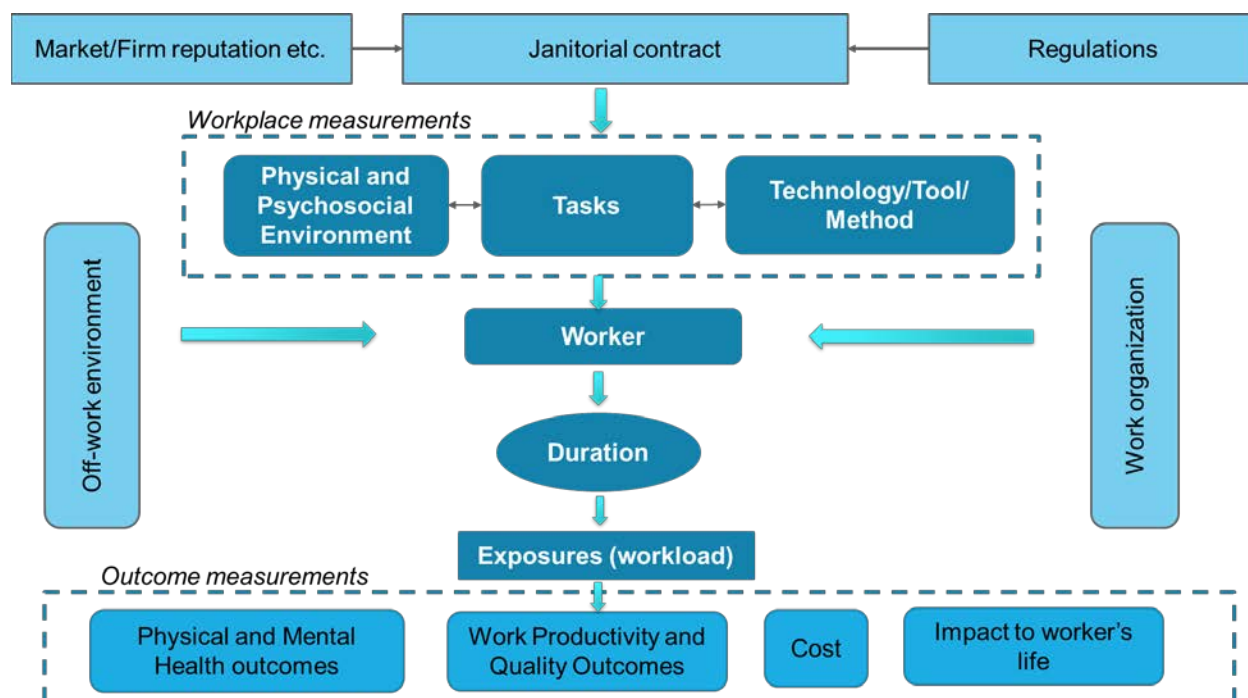
Methods

This project considers musculoskeletal loading, repetitive motions, and awkward postures or cardiovascular demand such as fast work pace. The goal of workload assessment is to develop a workload calculator (see section 5 for details). Using the framework presented in the 2020 report, the focus is set on these three main elements:

1) The cleaning **task** and risk factors, by their nature of effort requirement.
2) The **location** to be cleaned, such as restroom, office cubicles, elevators, etc.
3) The **tools**, technology and methods, utilized to accomplish the cleaning tasks, such as vacuum machines, mops, dusters, etc.

These factors comprise a whole janitor job. This portion of the study catalogs workload through in-person worksite observation and measurement. Various realistic combinations of these factors will be measured from data collected in participating sites by our janitorial service partners. The data from these sites forms the workload calculator -- providing an appropriate workload index to perform a safe janitorial job.

The COVID pandemic halts worksite visits

Between August 2019 to March 2020, 13 janitors in five offices from three janitorial employers participated in this study. Observation halted with the COVID-19 pandemic.

By that time, 17 individual worksite visits were completed. The data, including observer diaries, time studies through video and biomechanical analyses, ergonomic evaluations, and direct instrumentation measurements covering approximately 80 hours of various cleaning tasks have been processed and analyzed.

Field data from a significant number of janitors was originally anticipated, but only a few janitorial firms agreed to this effort. The pandemic also hampered these plans. The importance of collecting more data are:

1) To learn of variations in different tasks done in different worksites.
2) To increase sample size so that the results are more accurate.

Solutions

Several solutions were identified to address these issues. The parallel janitor survey results were examined to see whether there are other task/location/tool variations that may need to be considered in the workload calculator development. The calculator structure will be made flexible to allow a variation adjustment. Instead of obtaining more sample data for better accuracy, a more sophisticated data analysis protocol was adopted. These methods, although much more time consuming, provide more accurate results so that less sample data are needed.

During site visits, staff used two primary methods to gather information: observational and instrument measurement.

Observational methods of musculoskeletal workload

Musculoskeletal workload, commonly known as biomechanical exposures includes such factors as repetitive motions, awkward posture, and forceful hand exertion. This workload was assessed using the following methods:

1) Manual Tasks Risk Assessment, version 2.0 (ManTRA) – addresses awkward postures, repetitive motion of the shoulder.
2) Revised Strain Index (Strain Index) – addresses repetitive motion, repetitive exertion and awkward postures of the hand and wrist, and considers jobs with multiple subtasks (Garg et al. 2017).
3) Recommended Cumulative Recovery Allowance (RCRA) – addresses forceful exertions, awkward posture and repetitive motion of the back and shoulder, and considers jobs with multiple subtasks (Gibson and Potvin 2016).

Instrument measurements

Two instruments are used to quantify cardiovascular workload as well as back posture (biomechanical workload).

1) Fitbit Zip pedometer (user's manual) -- measures steps taken.
2) Zephyr BioHarness™3 (user's manual) -- records continuous heart rate and back postures during task performance.

Workload assessment units

Workload assessment units were developed to categorize data that was gathered. Based on three factors (task, location, and tool), all the collected data were processed and analyzed, and 13 unique tasks, 16 unique locations, and 23 unique tools were cataloged, for a total of 60 unique task-location-tool combination units. Overall, there are 116 worker to task combinations in the database. Table 2 shows an example of the level of detailed categorization for one common task - trashing. All of the workload assessment measures are compiled based on such organization, and are the fundamental building elements for the final calculator development.

Table 2. An example of a unit of workload assessment analysis using the trashing task and the corresponding levels of location and tool.

Task	Location	Tool
Trashing	Conference room	Trash can with liner/large bin
	Cafeteria	Trash can with liner/small bin
	Kitchen/coffee bar	Trash can without liner/large bin
	Office/cubicle	
	Reception/lobby/elevator landing	
	Restroom	

Research findings to date

The analysis of this data, based on the organization described above, is underway and on schedule to complete a beta version of the workload calculator. In this section, several examples are used to demonstrate the knowledge gained from the janitorial workload assessment.

Using instrument measurements taken during site visits, a hierarchy of the most demanding tasks can be created based on the number of steps and the energy per hour needed by task. Table 3 identifies the steps and calories needed to perform different janitorial tasks per hour. Based on the instrumentation measurement:

- Dust mopping was the most demanding among all observed tasks in terms of cardiovascular demands as measured by steps walked and calories spent.
- Restroom cleaning required the least walking, and locker room cleaning the least energy per hour.

Table 3. Average steps and calories per hour required by janitorial task, as measured on site. The highest numbers in the respective measure are in **bold**. The lowest numbers are underlined.

Task	Steps/hr	Calories/hr
Check/replace soap dispenser	2198.9	228.6
Cubicle cleaning	1291.8	192.0
Damp mopping	1682.2	218.1
Dust mopping	**3915.3**	**288.1**
Dusting and wiping surfaces	1503.8	217. 1
Elevator cleaning (vacuuming, wiping surfaces)	1225.7	179.2
Glass door cleaning	1327.8	196.7
Locker room cleaning (showers, restrooms, floors, wiping)	1080.5	121.1
Restocking supplies (e.g., paper towels)	852.2	126.1
Restroom cleaning (wiping, toilets, floors, garbage)	808.8	137.3

Task	Steps/hr	Calories/hr
Scrubbing floors using a machine	2450.8	230.5
Trashing	1992.2	210.9
Vacuuming	1620.3	227.0
Across all tasks (Average)	**1661.2**	**206.9**

Different tools used for the same task also affected janitorial workload. Table 4 below demonstrates how different vacuums and their attachment types affected the amount of walking and energy needed to perform vacuuming tasks. Our data indicate:

- An upright vacuum appeared the least demanding tool for floor-vacuuming tasks,
- A backpack vacuum with a narrow orifice suction head resulted in the most walking and energy to complete a task.

Table 4. Average steps and calories per hour while performing vacuuming tasks using different tool and attachment, as measured on site. The highest numbers are in **bold**. Lowest numbers are <u>underlined</u>.

Vacuum and attachment type	Steps/hr	Calories/hr
14" twin motor upright vacuum	<u>554.0</u>	<u>91.0</u>
Backpack vacuum & 12" orifice	**2573.3**	**439.2**
Backpack vacuum & 14" orifice	1994.8	247.4
Backpack vacuum & 18" orifice	1049.3	151. 5
Backpack vacuum & 22" orifice	1682.7	194.5
Battery powered backpack vacuum & 14" orifice	787.8	156.6
Battery powered backpack vacuum & 18" orifice	1012.3	125.7

However, tools of different designs are used for different purposes, such as control, maneuverability, flexibility, and portability from area to area. The data showed:

- The upright vacuum cleaner had the least flexibility, and likely resulted in the largest average back bending angle compared to other backpack vacuums.
- The upright vacuum reached the highest hand/wrist strain, and the wrist angle associated with the maneuver. The cordless (battery powered) backpack vacuum allowed the most natural back position with the least measured back-bending angle.
- The weight of the additional battery pack added to the janitor's effort and resulted in the highest measured heart rate reserve, measured by cardiovascular loading.

Table 5. Average back bending angle, hand strain index, and heart rate reserve (the difference between maximum heart rate and resting heart rate) while performing vacuuming tasks using different tool and attachment, as measured on site. The highest numbers in the respective measure are in **bold**. The lowest numbers are underlined.

Vacuum and attachment type	Forward back-bending angle (degrees)	Hand strain index	Heart rate reserve (%)
14" twin motor upright vacuum	**28.3**	**25.0**	65.4
Backpack vacuum & 12" orifice	12.6	10.0	80.9
Backpack vacuum & 14" orifice	16.6	12.3	77.5
Backpack vacuum & 18" orifice	15.8	7.6	71.6
Backpack vacuum with 22" orifice	11.3	6.3	64.7
Battery powered backpack vacuum with 14" tool	5.6	15.0	**82.2**
Battery powered backpack vacuum with 18" tool	14.0	17.4	75.3
All vacuuming tools - Average	14.3	13.2	76.0
All vacuuming tools - Std. Deviation	6.8	7.9	11.6

Limitations

Due to the challenge included in the 2020 report of how difficult it was to gain access to make site visits, and the COVID-19 interruption, the janitorial workforce sample was limited and the observed tasks may not represent all possible janitorial tasks. Additionally, the pandemic has led to possible changes in janitorial services or an increase in focus for specific tasks.

For example, additional tasks such as disinfection of served areas may fall within janitorial services. Specific high contact surfaces requiring possible different or additional cleaning tools and protocols were outside of the current observation data. When the public health restrictions, due to the pandemic have eased, attempts will be made to continue the efforts to contact janitorial companies and building management in order to capture such changes.

Work pace industry standard issues

Workload is influenced by work pace. For example, within a certain time period, if more restroom fixtures must be cleaned, the number of exertions and amount of back bending may also increase. Therefore, the work pace will be used as a modifier in the workload calculator development.

First, the team investigated various industry criteria and guidelines to set standard work pace, including InfoClean 2.0 Easy Workloading Software from the American Institute for Cleaning Sciences. The work pace is defined, per industry standards, as the time

assigned to complete the scope of the task, such as completing the cleaning of a certain amount of square footage of an office, or the number of fixtures in restrooms.

This contrasts to the <u>actual</u> time that a janitor needed to complete the assigned task. The actual time required was measured and compared with the time allotted, using the standard work pace. For the current research of commercial office building janitors, the International Sanitary Supply Association (ISSA) standard cleaning time data are used as the comparison. ISSA data are updated periodically. The most recent version was published in 2021 (ISSA, 2021).

Methods

To determine the length of time a janitor needed to complete specific tasks, a time study was performed through field visits to evaluate the work pace of janitors in commercial buildings. A stopwatch and video camera were used to measure the time spent on cleaning tasks.

The data was grouped by reviewing whether the combination of task, location, and tool matched the ISSA standard cleaning time – its task/tool/object category. The work pace of 116 task/location/tool combinations were calculated.

From the ISSA standard cleaning time data and the characteristics of the task that were measured (e.g., square feet cleaned), the actual cleaning time was determined for each task/location/tool combination. Where ISSA standard times were not available, cleaning time records and equipment manual specifications (Ferguson Enterprises, LLC and Tennant Company) were used. These values were then compared with the actual cleaning time during site observation. The percent deviation was calculated to determine the difference between the observed time and the standard time.

Absolute percentage deviation was calculated using the following the equation:

$$Absolute\ percentage\ deviation\ = \left|\frac{Standard\ time - Observed\ time}{Standard\ time}\right| \times 100$$

Finally, the mean absolute percentage deviation (MAPD) was calculated by the observed task to evaluate the magnitude from which the observed work pace deviated from the standard work pace.

Research findings to date

The results in Table 6 show that janitors' work paces most often deviated from the standard work pace when scrubbing floors followed by restocking supplies, and dust mopping. Across all tasks, the MAPD was 48.7%. The difference, or deviation, between observed times and standard times among floor scrubbing, supply restocking, dust mopping, and vacuuming tasks exceeded 50%. This means that the industry standard times were different (either less or more time estimated), than was actually observed.

Table 6. Deviations in work pace by cleaning task, as represented by the mean absolute percentage deviation (MAPD): the difference between observed cleaning times and industry standard times.

Task	Number of observations	MAPD (%)
Scrubbing floors	2	132
Restocking supplies (e.g., paper towels)	2	99
Dust mopping	2	50.5
Vacuuming	24	50.4
Elevator cleaning	4	49.5
Trashing	36	49.3
Locker room cleaning	3	49.3
Glass door cleaning	6	43.2
Dusting and wiping	23	42.4
Damp mopping	5	42.2
Restroom cleaning	7	38.3
Cubicle cleaning	1	36
Check/replace soap dispenser	1	31
All Cleaning Tasks	**116**	**48.7**

Different locations effect specific tasks. For example, when vacuuming was performed in stairways/landings, the work pace deviated from the standard. In addition, the MAPD in the hard floor operation was higher than the MAPD average.

Table 7. Deviations in vacuuming task work pace by cleaning locations, as represented by the mean absolute percentage deviation (MAPD): the difference between observed cleaning times and industry standard times.

Vacuuming Location	Number of observations	MAPD (%)
Carpet	11	42.5
Carpet/hard floor	1	12
Elevator	1	13
Hard floor	4	72.3
Office/cubicle	1	38
Stairways/Landings	3	108.3
Walk-off mat	3	21.3
All Vacuuming Locations	**24**	**50.4**

The MAPD was highest when trashing was performed in the cafeteria or break room. With the exception of trashing in the kitchen/coffee bar and reception, the MAPD of this task was higher than the average MAPD across all locations.

Table 8. Deviations in trashing task work pace by cleaning locations, as represented by the mean absolute percentage deviation (MAPD): the difference between observed cleaning times and industry standard times.

Trashing Locations	Number of observations	MAPD (%)
Cafeteria/break room	1	75
Conference room	4	52
Kitchen/coffee bar	5	25.6
Office/cubicle	13	62.8
Reception/lobby/elevator landing	11	38.9
Restroom	2	60
All Trashing Locations	**36**	**49.3**

Limitations

Several challenges and limitations were identified during this analysis. Several cleaning methods observed during the site visits are not included in the industry standard references. For example, the activity of squeezing cleaning solution from a small chemical bottle directly onto floor before mopping, rather than using a bucket with cleaning solution, is not included. Also excluded is standard times for vacuuming vinyl hard floor, though times for vacuuming carpeted floor is included. The industry needs a collaborative effort to create a more comprehensive listing of cleaning techniques in order to more fully capture all the tasks janitors are required to complete.

Psychosocial factors and musculoskeletal complaints

Psychosocial factors, another measurement of workplace exposures, includes many factors such as time pressure, burnout, and coworker support. Time pressure, a metric of psychological workload, has been correlated with hand/wrist, shoulder, and lower back discomfort in a study on cleaners with low decision latitude and control (Chang et al., 2012). A job environment lacking work autonomy can increase job stress on cleaners. When this stress accumulates, it can lead to burnout and other negative consequences, such as sickness, job turnover, and absenteeism (Schaufeli and Bakkerm 2004; Schaufeli et al., 2009).

Burnout is defined as "a state of mental and physical exhaustion caused by one's professional life" (Leiter et al., 2014, pp. 32). Burnout is officially an occupational phenomenon (but not a medical condition) recognized by the World Health Organization (WHO, 2019). It negatively affects job performance, decreasing effectiveness and productivity at work, and is known to cause mental health issues such as anxiety and depression (Maslach et al., 2001). If there is no opportunity for promotion despite hard work, and few ways to acquire skills and education through work, the likelihood of burnout is higher (Maslach et al., 2001; Schaufeli and Bakkerm 2004). Due to the professional nature of janitorial work, janitors are vulnerable to these conditions.

This investigation focused on relationships between psychosocial factors (job demands, control, and support), burnout, and musculoskeletal symptoms. This throws light on the importance of managing these elements among cleaners.

Survey

Data from our statewide survey of janitors was also used to investigate workload issues. A total of 208 survey responses were obtained regarding job demands, job control, and job support and used for the current analysis.

Research findings to date

In this analysis, the largest age group was 30–39 years old (27%), followed by 18–29 years old (25%). Among the sample, 40.4% were male. Most participants had 1–4 years (47%). The majority of survey participants were white (73%), 7% were Black/African American, 7% were Latino/Hispanic, and 13% were other/more than one. The most common building janitors reported working in was commercial office buildings (37%).

Results in Table 9 showed that:
- Regarding job demand, 53% of janitors said they often work very fast, and 65% said they often need a lot of energy to perform their work.
- More than 50% of the janitors reported that the work sometimes or often demanded too much effort.
- More than 70% of janitors responded that they were mentally exhausted some of the time, often or always.
- More than 50% janitors answered that they often or always had physical exhaustion.

Table 9.Perceptions of job demands, job control, social support and burnout among janitors.

	Frequency (Percent)	Frequency (Percent)	Frequency (Percent)	Frequency (Percent)	Frequency (Percent)
Job demand	**Almost never**	**Seldom**	**Sometimes**	**Often**	
Do you work very fast?	3 (1%)	9 (4%)	86 (42%)	110 (53%)	
Does your work require a lot of energy?	4 (2%)	5 (2%)	64 (31%)	135 (65%)	
Does your work demand too much effort?	27 (13%)	51 (24%)	81 (39%)	49 (24%)	
Do you have enough time to complete your job?	12 (6%)	36 (17%)	59 (28%)	101 (49%)	
Does your work often involve conflicting demands?	63 (30%)	52 (25%)	64 (31%)	29 (14%)	
Job control	**Almost never**	**Seldom**	**Sometimes**	**Often**	
Do you have the possibility of learning new things through your job?	52 (25%)	55 (26%)	70 (34%)	31 (15%)	
Does your work demand precise finger movements?	58 (28%)	57 (27%)	48 (23%)	45 (22%)	
Does your work require creativity?	75 (36%)	50 (24%)	60 (29%)	23 (11%)	
Do you have to do the same thing over and over again?	2 (1%)	2 (1%)	28 (13%)	176 (85%)	
Do you have a choice in deciding how you do your work?	27 (13%)	29 (14%)	65 (31%)	87 (42%)	
Do you have a choice in deciding what you do at work?	61 (29%)	47 (23%)	65 (31%)	35 (17%)	
Social support	**Strongly disagree**	**Disagree**	**Neither agree nor disagree**	**Agree**	**Strongly agree**
My supervisor can be relied upon when things get tough on my job	18 (9%)	28 (13%)	33 (16%)	71 (34%)	58 (28%)
My supervisor is willing to listen to my job-related problems	19 (9%)	19 (9%)	27 (13%)	76 (37%)	67 (32%)
My supervisor really does not care about my well-being	70 (33%)	51 (25%)	42 (20%)	25 (12%)	20 (10%)
My coworker(s) can be relied upon when things get tough on my job	11 (5%)	23 (11%)	61 (29%)	70 (34%)	43 (21%)
My coworker(s) is willing to listen to my job-related problems	10 (5%)	24 (11%)	46 (22%)	89 (43%)	39 (19%)
My coworker(s) really does not care about my well-being	59 (28%)	59 (28%)	60 (29%)	24 (12%)	6 (3%)
Burnout	**Never**	**Some of the time**	**Often**	**Always**	
How often are/were you mentally exhausted after work	55 (27%)	83 (40%)	36 (17%)	34 (16%)	

	Frequency (Percent)	Frequency (Percent)	Frequency (Percent)	Frequency (Percent)	Frequency (Percent)
How often are/were you physically exhausted after work	13 (6%)	89 (42%)	53 (26%)	53 (26%)	

The janitors reported high rates of musculoskeletal complaints with the most affected body part being the back, followed by the hands and the shoulders.

Table 10. Prevalence of musculoskeletal complaints among janitors by body part

	Frequency (Percent)
Musculoskeletal complaints	
Neck	82 (40%)
Shoulder	97 (47%)
Elbow	38 (18%)
Hand	99 (48%)
Back	127 (61%)
Knee	74 (36%)
Foot	85 (41%)
Janitors reporting at least one body part	**160 (77%)**

5. WORKLOAD CALCULATOR DEVELOPMENT

As the data processing and analyses of the field data are close to completion, the development of a beta version of the janitorial workload calculator will begin, as planned. The calculator will serve three purposes:

1) To assist managers and supervisors in designing janitorial jobs by assigning various tasks to individual janitors.
2) To assist managers and supervisors in evaluating workload issues for individual janitors who performs certain number of tasks with designated productivity expectations.
3) To assist company safety and health professionals who want to evaluate workload issues of individual janitors and identify possible solutions to address these issues.

The overall objective of the calculator is to assign tasks to janitors with managed workload so that their health will be protected while work productivity is optimized.

Additional manuscripts in progress

Working title:
Methods for Measuring Physical Workload among Commercial Cleaners: A Scoping Review.

First author(s):
Wonil Lee, PhD

Jia-Hua Lin, PhD

Working manuscript abstract

"Commercial cleaning work is labor-intensive, and previous research and insurance claim data show that it exposes workers to risks of work-related musculoskeletal disorders. The workload in the job-planning and operation phases is directly relevant to the risks. Thus, an understanding of the methods used to assess physical workload is essential. This scoping review summarizes the methods used in studies to evaluate physical workloads. A literature search and screening of PubMed, Web of Science, and Scopus databases, as well as full-text reviews led to the selection of 48 studies. Most of these studies used direct measurements, and many applied more than one workload measurement method. Moreover, previous studies have examined the effects of tasks, environments, and tools on workload. This scoping review describes the advantages and disadvantages of various methods for both researchers and safety practitioners. This review may inform future research and injury reduction efforts on study designs and workload measurement methodology."

_____

Working title:

Cleaning in the 21st Century: The human factors and ergonomics research and applications for the centuries-old occupation

First author(s):

Jia-Hua Lin, PhD

Working manuscript subject

This review aims to summarize the current state of research in the musculoskeletal disorders among the janitorial work force. The review will be organized around the balance theory developed by Carayon and Smith, 2000.

_____

Working title:

Franchising in the Janitorial Services Industry: Effects on Working Conditions

First author(s):

Michael Foley, Darrin Adams

Working manuscript abstract

Introduction

With low entry barriers, market competition in the janitorial services industry is intense. Such competition can be expected to put downward pressure on wages, to increase workloads for janitors, and to undermine safety performance. There has also been an increase in the number of janitorial services firms operating under a franchised organizational form.

Franchise arrangements further lower barriers to entry by providing small entrepreneurs with a ready list of accounts to service along with financing to pay the franchise acquisition fee. However, the franchise contract imposes significant conditions for performance standards, payment of royalties, and management fees. These conditions can be expected to intensify pressures to reduce labor costs, leading to lower wages and higher worker turnover.

Methods

In Washington State in 2018 over 600 franchised janitorial services firms were identified out of a total of over 1400 firms in the industry. For 120 of these franchised firms, their administrative records for workers compensation were matched with unemployment insurance records. Descriptive statistical methods were then used to compare franchised janitorial firms to traditionally organized firms on such measures as firm size and turnover, workers' compensation claims rates, and worker earnings and turnover.

Results

A high proportion of franchised firms were found not reporting any "covered" employees, indicative of the presence of single-person operations or family-employment. Further, franchise-organized janitorial firms were smaller and had higher turnover. Workers employed by franchised firms had lower wage rates, lower earnings and higher turnover. They also had higher workers' compensation claims rates for injuries leading to more than three lost workdays.

Conclusions

The franchised organizational form in janitorial services is found to be associated with a worsening of overall working conditions and, in particular, with elevated time-loss claims rates. Given the extent of self- and family-employment among janitorial franchises this organizational form raises issues for the enforcement of labor and occupational safety and health standards.

Workload Assessment References

Chang, J. H., Wu, J. D., Liu, C. Y., & Hsu, D. J. (2012). Prevalence of musculoskeletal disorders and ergonomic assessments of cleaners. Am. J. Ind. Med., 55(7), 593-604.

Garg A, Moore J. S., & Kapellusch J. M. (2017). The Revised Strain Index: an improved upper extremity exposure assessment model. *Ergonomics.* 60, 912-922. doi: 10.1080/00140139.2016.1237678.

Gibson, M., & Potvin, J. (2017). Calculating the maximum acceptable effort for an isolated subtask while still accounting for the demands of all other subtasks. *The XXIXth Annual Occupational Ergonomics and Safety Conference.*

Green, D. R., Gerberich, S. G., Kim, H., Ryan, A. D., McGovern, P. M., Church, T. R., ... & Arauz, R. F. (2019). Janitor workload and occupational injuries. *American Journal of Industrial Medicine, 62*(3), 222-232.

Hagner, I. M., & Hagberg, M. (1989). Evaluation of two floor-mopping work methods by measurement of load. *Ergonomics, 32*(4), 401-408.

ISSA, 2021, The Official ISSA Cleaning Times: The Cleaning Industry's Most Trusted Tasks, Tools, & Workloading Resource. International Sanitary Supply Association Rosemont, IL.

Kumar, R., & Kumar, S. (2008). Musculoskeletal risk factors in cleaning occupation - A literature review. *International Journal of Industrial Ergonomics, 38*, 158-170.

Leiter, M. P., Bakker, A. B., & Maslach, C. (Eds.). (2014). *Burnout at work: A psychological perspective.* Psychology Press.

Maslach, C., Schaufeli, W. B., & Leiter, M. P. (2001). Job burnout. Annu. Rev. Psychol., 52(1), 397-422.

Schaufeli, W. B., & Bakker, A. B. (2004). Job demands, job resources, and their relationship with burnout and engagement: A multi-sample study. J. Organiz. Behav., 25(3), 293-315.

Schaufeli, W. B., Bakker, A. B., & Van Rhenen, W. (2009). How changes in job demands and resources predict burnout, work engagement, and sickness absenteeism. J. Organiz. Behav., 30(7), 893-917.

Seixas N, Domínguez C, Stover B, Simcox N. (2013, August). *Janitors Workload and Health and Safety.* Department of Environmental and Occupational Health Sciences, University of Washington.

World Health Organization (WHO) (2019, May 28). Burn-out an "occupational phenomenon": International Classification of Diseases https://www.who.int/news/item/28-05-2019-burn-out-an-occupational-phenomenon-international-classification-of-diseases

6. EDUCATION AND TRAINING DOCUMENTS

The diversity of the janitorial workforce and the need for culturally and linguistically appropriate safety and health training resources for janitors in Washington was identified early in our formative work. The SHARP research staff has developed and will continue to develop resources for janitors and have them translated into multiple languages (English, Spanish, Russian, Vietnamese, Bosnian, Chinese (Traditional), Amharic, Somali, and Tagalog). The majority of publications developed to date cover COVID-19 pandemic related safety and health information.

All published educational and training documents are available on the study website.

Conclusions

With a specific charge from the Washington State Legislature, the SHARP Program has developed a multi-tiered, systems approach to understanding the workload and workplace physical and mental exposures that may put janitors at risk of a work-related injury. The SHARP program is currently in the process of analyzing collected data, continuing injured worker interviews, and developing multi-modal educational information for janitors and employers.

Overall, the goal to develop, test, and release a workload calculator intended to keep janitorial workers safe and create a harmonized tool for janitorial companies to bid for contracts is on track. This study is expected to be completed and results reported by July 1, 2023, barring any additional delays due to the COVID-19 pandemic. The third interim report, with progress on all initiatives will be in December 2022.