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Safe cleaning and disinfection during the COVID-19 pandemic: The role of Janitors in the safe re-opening of California

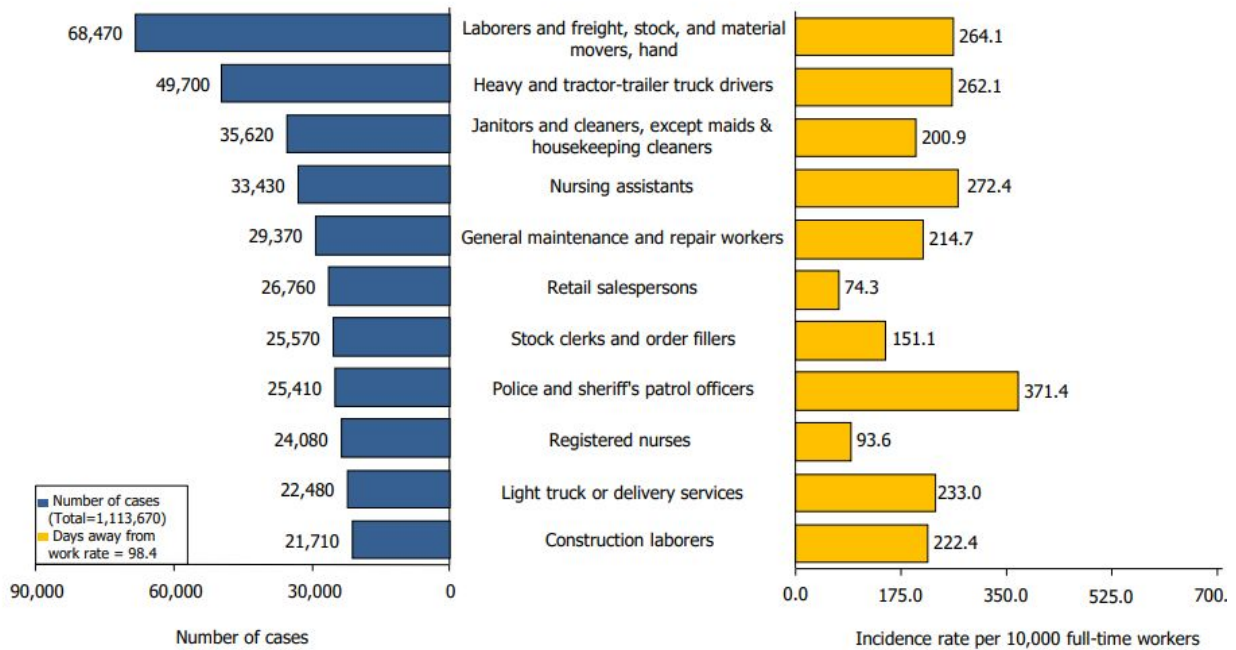
Background

Re-opening California involves enhanced cleaning and disinfection services as one of the key mitigation measures for effective infection control. A common interest exists between government, building owners/contractors, and labor to ensure that buildings will be safe to repopulate as California reopens to the public. However, cleaning and disinfecting surfaces according to CDC recommendations will require adequate time; inappropriate productivity requirements will inevitably lead to inadequate cleaning and disinfection. Thus, this study will provide valuable information to inform effective and credible cleaning productivity standards required to maintain public health and safety during and beyond the COVID-19 pandemic.

A statewide survey will assess the current working conditions (prevention measures, productivity requirements, etc.) and knowledge of CDC recommendations for cleaning and disinfecting during the COVID-19 pandemic. A detailed time motion study and ergonomic analysis will provide physical exposure measurements and time on task information while assessing for risk of musculoskeletal disorders.

The occupation of Janitors and Cleaners ranked third in the number of nonfatal injuries and illnesses with days away from work, with 35,260 cases reported in 2018¹. Janitors and cleaners are exposed to high physical demands that increase risk of musculoskeletal and cardiovascular conditions²⁻⁶. Ergonomic workload, measured by task frequencies, posture risk assessment tools and perceived exertion scores have been positively associated with injury occurrence⁷.

Nonfatal occupational injury and illness number of cases with days away from work and incidence rates for selected occupations with 20,000 cases or more, all ownerships, 2018



Eleven occupations had 20,000 or more days-away-from-work cases across all ownerships. Laborers and freight, stock, and material movers accounted for approximately 6 percent of total cases. Police and sheriff's patrol officers had the highest rate of injury and illness among these occupations.

[View data](#)

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Source: U.S. Bureau of Labor Statistics, U.S. Department of Labor, November 2019

Janitorial work is measured by hourly production rates. Production rates have increased over time from 3000-3500 ft²/hr. in the 1990s to 5000-8000 ft²/hr. currently. The increasing rate leads to a more cursory cleaning. However, thorough surface cleaning is required prior to disinfection to prevent the spread of COVID19; therefore, productivity rates must be reassessed to ensure safe and effective working conditions. The employment of an ergonomic analysis that provides information on time and motion is an effective approach to improving operational efficiencies while identifying injury and illness risks.

Project Aims

This project will be carried out by researchers from the Northern California Center for Occupational and Environmental Health, a collaboration between UC Berkeley, San Francisco and Davis campuses. The specific programs include experts from the UC Ergonomics Program, the Labor Occupational Health Program, and UC Davis Agricultural Safety & Health Program.

The primary aims of this study are to:

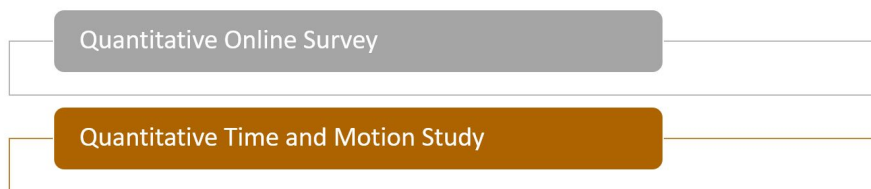
- 1) Determine the proportion of California janitorial workers who have various types of COVID-19 prevention measures at their worksites, including employee symptoms screening, use of masks/gloves/hand sanitizer, engineering controls (ventilation), and organizational controls (six foot separation markings, masks and/or screening of building occupants, expanded sick pay).
- 2) Determine knowledge and implementation of worksite CDC Cleaning & Disinfection Recommendations among janitors.
- 3) Measure the time required to clean and disinfect, according to CDC recommendations, to develop safe production rates for janitorial work by venue type.
- 4) Assess the types of cleaning and disinfection tasks that are typically carried out by janitors, additional tasks performed for COVID-19 prevention, and how this translates to tasks per square foot (density) and task duration (rate) by venue.

Methods

The proposed project utilizes a mixed methods approach (Figure 1) that incorporates qualitative and quantitative data from janitors in two major regions (Los Angeles and San Francisco).

Figure 1. Mixed methods approach that includes qualitative and quantitative data collection.

Methodology



1. **An online survey** will be sent to over 30,000 janitors statewide to assess workers' experiences with COVID-19 prevention measures at their worksites. This survey will be distributed by the SEIU-USWW to their members, by the Maintenance Cooperation Trust Fund to non-union workers, and by Building Skills Partnership and others who are interested and able to promote this effort with janitors. We expect approximately 2000 responses.
2. **A quantitative time and motion study** will be used to determine the task durations and frequency as well as magnitudes of physical exposures and the physiological workload for cleaning and disinfecting over typical 8-hour shifts (Figure 2). This psychophysical study will involve observations of workers carrying out their tasks at a pace that they






can sustain for the duration of their shift. Workers will be videotaped while wearing biomechanical and physiological measurement tools.

The analysis will involve workers (N=128) from 4-5 different work venues (Table1) representing the sectors in which janitors work.

Table 1.

Five work venues representing the sectors in which janitors work.
1. Office settings
2. High Tech/R&D settings
3. Airports
4. Retail/big box/malls
5. High Traffic/public venues

Figure 2. Outcome measures used for the time and motion study and ergonomic assessment.

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 - **Video data- Time & Motion Study**
Provides the time required to complete cleaning and disinfecting procedures for use in determining time allotted to the tasks/job
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 - **Lumbar Motion Monitor Probability of High Risk for Low Back Injury**
Uses acceleration, velocity and loads handled to determine overall risk for low back injury
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 - **Heart Rate data- Physiological Workload**
Assess whether tasks performed are below the acceptable levels of physiological workload
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 - **ActivePAL data- Physical Activity & METS**
Quantifies physical activity and overall METS.
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 - **Xsens data – Kinematic Assessment**
Quantifies the frequency, duration and magnitude of time spent reaching, forward trunk bend and %time spent performing other occupational physical activities

Deliverables & Impact

The researchers will develop a summary report that summarizes the findings from the survey and the time and motion study. Recommendations for cleaning and disinfecting times will be specified for pandemic and non-pandemic cleaning requirements. Cleaning & disinfecting productivity guidelines will help ensure consistency of proper cleaning practices across work venues in the state of California that could mitigate community and occupational spread of COVID-19. A separate set of guidelines for cleaning (no COVID-19 disinfecting) will be produced

to support reasonable janitorial productivity requirements beyond COVID-19 that mitigate the risk of musculoskeletal injuries and cardiovascular strain.

Budget & Timeline

The overall budget includes support for approximately 10 researchers and 5 graduate students from the Northern California Center of Occupational and Environmental Health across three University of California campuses who will collaborate on this project (Table 2). A more detailed budget can be provided upon request.

Table 1. Overall Budget

Online Survey	Included
Time and Motion study	\$311,800 for 5 venues
	\$259,475 for 4 venues

Research Team

Carisa Harris Adamson, PhD, CPE is an Associate Professor in the Department of Medicine at the University of California, San Francisco and Deputy Director of the Center of Occupational and Environmental Health at the University of California at Berkeley. She is the Director of the UCSF/UCB Ergonomics Research Program and has over 15 years of experience in academia, research and consulting related to the prevention of work related musculoskeletal and cardiometabolic disorders. She will be the Principal Investigator of this study.

Melissa Afterman, MS, CPE is an EH&S specialist for the Department of Occupational Medicine at UCSF. She consults with UCSF/UCB Ergonomics Research Program and is an instructor for the Center of Occupational and Environmental Health on-line Ergonomics curriculum. She is a Board-Certified Professional Ergonomist.

Meg Honan, MS, CPE is an EH&S specialist for the Department of Occupational Medicine at UCSF. She consults with UCSF/UCB Ergonomics Research Program and is an instructor for the Center of Occupational and Environmental Health on-line Ergonomics curriculum. She is a Board-Certified Professional Ergonomist.

Alan Barr, MS is the Senior Engineer at the UCSF/UCB Ergonomics Research Program. He has over 20 years of experience running laboratory and field studies related to ergonomics.

Fadi Fathallah, PhD is a Professor in Biological and Agricultural Engineering at University of California, Davis. His research focuses on exposure assessment and the development of interventions for the prevention of musculoskeletal disorders among agricultural workers. He is the Associate Director of the Western Center of Agricultural Health and Safety and is also the Associate Vice Provost for Global Education and Services

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