

Executive Summary: Health Impact Review of H-0915.3/15

Concerning Commercial Janitorial Services

Evidence indicates that there are high rates of injury among commercial janitors, that these employees often report having inadequate time to complete their work, and that reducing workload and rushing among these employees would likely decrease workplace injury disparities by race/ethnicity, English proficiency, country of origin, education, and income. However, it is not clear from available studies if the specific standards required in H-0915.3/15 would lead to decreased work intensity and rushing.

DRAFT BILL INFORMATION

Summary of Draft Bill:

- Requires the Department of Labor & Industries (L&I) to develop rules creating workload standards for employees performing commercial janitorial services which must, at a minimum, provide that:
 - The maximum square footage of cleanable area for a full-time janitor's eight-hour shift cannot exceed 30,000 square feet.
 - Heavy equipment such as floor buffers and janitor carts must be kept on each floor.
 - Janitors are prohibited from carrying cleaning equipment weighing more than twenty pounds if they must use stairs to access different floors.
- Requires L&I to establish a health and safety training program for commercial janitorial employees and supervising managers by rule that provides a minimum of eight hours of training each year.
- Stipulates that in order for a commercial janitorial service business to qualify for the retail sales tax exemption under RCW 82.04.050(2)(d) the business must meet several criteria including maintaining records documenting compliance with the workload standards and training requirements established under L&I rule described above.
- Requires the Joint Legislative Audit and Review Committee to assess the performance of the retail sales tax exemption for commercial janitorial businesses by December 1, 2024.

HEALTH IMPACT REVIEW

Summary of Findings:

The health impact review found the following evidence regarding the provisions in H-0915.3/15:

- Strong evidence that at a least a proportion of the industry would comply with new workload standards for commercial janitors.
- A fair amount of evidence that reduced workload and rushing among commercial janitorial employees would lead to reduced injury rates among this population.
- Very strong evidence that reducing injury rates among commercial janitorial employees will decrease workplace injury disparities.
- Evidence indicates that there are high rates of injury among these workers; that time pressure is common among these employees; and that time pressure is a significant risk factor for injuries such as those to the hands, wrists, shoulders, and back. However, the specific provisions of H-0915.3/15 are not well researched so it is unclear if they would lead to decreased work intensity and rushing among janitors. Available information and national guidance that relate to the bill provisions are provided in the full review.

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Health Impact Review of H-0915.3/15

Concerning Commercial Janitorial Services

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Contents

Introduction and Methods	1
Analysis of H-0915.3/15 and the Scientific Evidence	2
Logic Model.....	3
Summaries of Findings	4
Annotated References	7

Introduction and Methods

A health impact review is an analysis of how a proposed legislative or budgetary change will likely impact health and health disparities in Washington state ([RCW 43.20.285](#)). For the purpose of this review ‘health disparities’ have been defined as the differences in disease, death, and other adverse health conditions that exist between populations ([RCW 43.20.270](#)). This document provides summaries of the evidence analyzed by State Board of Health staff during the health impact review of the third draft of H-0915.3/15.

Staff analyzed the content of H-0915.3/15 (3rd draft) and created a logic model depicting possible pathways leading from the provisions of the draft bill to health outcomes. We consulted with experts and conducted objective reviews of the literature for each pathway using databases including PubMed and Google Scholar.

The following pages provide a detailed analysis of the bill including the logic model, summaries of evidence, and annotated references. The logic model is presented both in text and through a flowchart (Figure 1). The logic model includes information on the strength of the evidence for each relationship. The strength-of-evidence has been defined using the following criteria:

- **Not well researched:** the literature review yielded few if any studies or only yielded studies that were poorly designed or executed or had high risk of bias.
- **A fair amount of evidence:** the literature review yielded several studies supporting the association, but a large body of evidence was not established; or the review yielded a large body of evidence but findings were inconsistent with only a slightly larger percent of the studies supporting the association; or the research did not incorporate the most robust study designs or execution or had a higher than average risk of bias.
- **Strong evidence:** the literature review yielded a large body of evidence on the relationship (a vast majority of which supported the association) but the body of evidence did contain some contradictory findings or studies that did not incorporate the most robust study designs or execution or had a higher than average risk of bias; or there were too few studies to reach the rigor of ‘very strong evidence’; or some combination of these.
- **Very strong evidence:** the literature review yielded a very large body of robust evidence supporting the association with few if any contradictory findings. The evidence indicates that the scientific community largely accepts the existence of the association.

Staff made modifications to these criteria at the start of the 2015 legislative session beginning January 12, 2015. Therefore strength-of-evidence rankings may not be comparable between reviews completed before and those completed after this date.

This review was subject to time constraints, which influenced the scope of work for this review. The annotated references are only a representation of the evidence and provide examples of current research. In some cases only a few review articles or meta-analyses are referenced. One article may cite or provide analysis of dozens of other articles. Therefore the number of references included in the bibliography does not necessarily reflect the strength-of-evidence. In addition, some articles provide evidence for more than one research question so they are referenced multiple times.

Analysis of H-0915.3/15 and the Scientific Evidence

Summary of H-0915.3/15 (3rd draft)

- Requires the Department of Labor & Industries (L&I) to develop rules creating workload standards for employees performing commercial janitorial services which must, at a minimum, provide that:
 - The maximum square footage of cleanable area for a full-time janitor's eight-hour shift cannot exceed 30,000 square feet.
 - Heavy equipment such as floor buffers and janitor carts must be kept on each floor.
 - Janitors are prohibited from carrying cleaning equipment weighing more than twenty pounds if they must use stairs to access different floors.
- Requires L&I to establish a health and safety training program for commercial janitorial employees and supervising managers by rule that provides a minimum of eight hours of training each year.
- Stipulates that in order for a commercial janitorial service business to qualify for the retail sales tax exemption under RCW 82.04.050(2)(d) the business must meet several criteria including maintaining records documenting compliance with the workload standards and training requirements established under L&I rule described above.
- Requires the Joint Legislative Audit and Review Committee to assess the performance of the retail sales tax exemption for commercial janitorial businesses by December 1, 2024.

Health impact of H-0915.3/15

Evidence indicates that there are high rates of injury among commercial janitors, that these employees often report having inadequate time to complete their work, and that reducing workload and rushing among these employees would likely help decrease workplace injury disparities by race/ethnicity, English proficiency, country of origin, education, and income. However, it is not clear from available studies if the specific standards required in H-0915.3/15 would lead to decreased work intensity and rushing among commercial janitors.

Pathways to health impacts

The potential pathways leading from the provisions of H-0915.3/15 to decreased health disparities are depicted in Figure 1. There is strong evidence that at a least a proportion of the industry would comply with new workload standards for commercial janitors.¹⁻¹⁰ There is a fair amount of evidence that there are high rates of injury among commercial janitors; that these employees often report having inadequate time to complete their work; and that reducing workload and rushing among these employees would likely help decrease injury rates.¹¹⁻¹⁹ However it is not clear from available studies if the specific standards required in H-0915.3/15 would lead to decreased work intensity and rushing. There is very strong evidence that interventions to reduce injury rates among commercial janitors would decrease injury disparities by race/ethnicity, English proficiency, country of origin, education, and income.^{11,13,15,18,20-22}

Due to time limitations we only researched the most direct connections between the bill and decreased health disparities. For example, potential pathways that were not researched include:

- Evidence for how injuries impact ability to work/income and how income impacts health.
- Evidence for the wider public health implications of inadequately cleaned buildings.
- Evidence for the effectiveness of tax incentives in increasing compliance with labor laws.

Logic Model

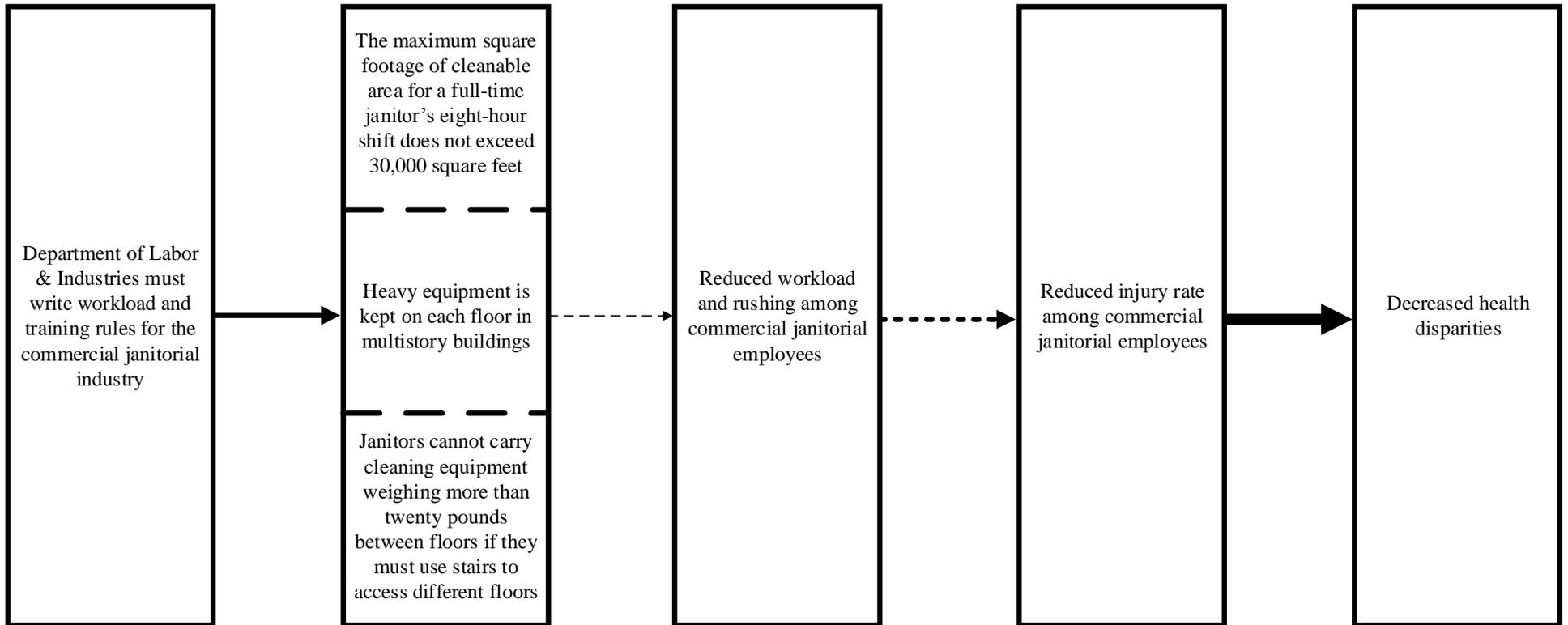
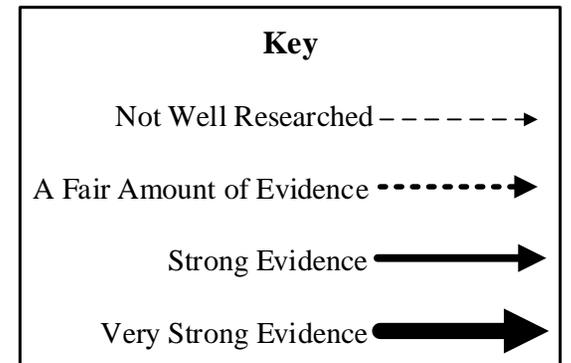


Figure 1
H-0915.3/15 3rd Draft
Concerning Commercial Janitorial Services



Summaries of Findings

Will workload and training rules from the Department of Labor and Industries lead to compliance among commercial janitorial companies?

There is strong evidence that at a least a proportion of the industry would comply with new workload standards for commercial janitors.¹⁻¹⁰ Evidence in relation to labor laws indicate that implementation of, for example, wage and benefit laws are followed by increases in wages and access to benefits.¹⁻⁹ Evidence specific to health and safety standards also supports that these regulations are associated with decreases in fall, injury, and fatality rates and that at least a proportion of the industry complies with these standards.¹⁰ While these studies are not specific to workload standards for commercial janitors, they do indicate that passage of labor laws and health and safety standards is generally followed by industry compliance. This evidence does not indicate that all employers comply with health and safety and labor laws, but experts in worker protection and workplace injury in Washington have indicated that these standards encourage compliance and provide a mechanism to protect workers in the case of noncompliance.

Will the workload standards for commercial janitorial employees required by H-0915.3/15 lead to reduced workload and rushing among commercial janitors?

We were not able to find any research that has been conducted on the impacts of creating maximum square footage requirement for commercial janitors or other cleaning occupations or rules prohibiting 20 pounds or more to be carried between floors. The impact of these specific rules on workload, rushing, and injury rates is therefore not well researched. While there is a fair amount of evidence that there are high rates of injury among commercial janitors, that these employees often report having inadequate time to complete their work, and that reducing workload and rushing among these employees would likely help decrease these injury rates,¹¹⁻¹⁹ it is not clear from available studies if the specific standards required in H-0915.3/15 would lead to decreased work intensity and rushing. We found one study which indicated that moving large machines such as buffing machines into elevators and over thresholds presented manual handling problems and that cleaners reported inadequate supplies of equipment which required them to move equipment between floors. These were identified as concerns by janitors, supervisors, and researchers who observed janitorial staff at work.¹⁹ Workers' compensation data from Washington State show that falling down stairs ("slippery and/or while carrying objects") was one of the most common activities resulting in a fall from elevation.¹⁸ This information indicates that requiring large equipment to be available on every floor and restricting the weight of what can be moved between floors without access to an elevator could potentially help decrease injuries among these workers.

While there are not industry standards on square footage for commercial janitorial services, and the variability between work spaces, cleaning requirements, and available equipment have been voiced as reasons for not creating square footage maximums,¹⁸ there are a number of formulas being used by the industry to determine how many janitors are needed to clean a given space. Guidance developed by the U.S. Department of Education, the National Center for Education Statistics, and the National Forum on Education Statistics provides a five-tiered system of cleanliness and square footage estimates. Level 1 cleaning results in a spotless building such as what would be found in a hospital setting. A custodian with proper supplies can clean 10,000 to 11,000 square feet to Level 1 standards in an eight hour period. Level 2 is the uppermost

standard for most school cleaning and is generally intended for restrooms, kindergarten areas, food service areas, etc. In an eight hour shift a custodian could clean approximately 18,000 to 20,000 square feet to Level 2 standards. Level 3 cleaning is the normal level for most school facilities. This level is acceptable to most stakeholders and does not pose a health risk. A custodian can clean approximately 28,000 to 31,000 square feet in eight hours to Level 3 standards. Level 4 cleaning is not normally considered acceptable in a school environment. A custodian could clean to 45,000 to 50,000 square feet in 8 hours to Level 4 standards. Level 5 cleaning can lead to an unhealthy situation. A custodian can clean 85,000 to 90,000 square feet in an 8 hour period to Level 5 standards. These guidelines note that the above figures are estimates and that the actual number of square feet that can be cleaned will vary depending on the workspace.²³

Will reducing workload and rushing among commercial janitorial employees lead to reduced injury rates among this population?

There is a fair amount of evidence that reduced workload and rushing among commercial janitorial employees would lead to reduced injury rates among this population. Evidence indicates that there are high rates of injury among these workers; that time pressure is common among these employees; and that time pressure is a significant risk factor for injuries such as those to the hands, wrists, shoulders, and back.¹¹⁻¹⁹ A study conducted in Washington State found that 39% of non-union and 76% of union janitors reported that they did not have enough time to complete their work.¹⁵ Lifting heavy loads, repetitive motion, unnatural postures, and moving heavy equipment between floors have also been identified as injury risk factors for janitors.^{11-17,19} Due to time limitations we focused this literature search specifically on injury risk factors for janitors and other cleaning professions and did not expand the scope to include evidence among other professions. Including publications from other occupations would likely further bolster the evidence for the link between rushing, fatigue, overexertion and workplace injury.

Will reduced injury rates among commercial janitorial employees decrease health (workplace injury) disparities?

There is very strong evidence that reducing injury rates among commercial janitorial employees will decrease workplace injury disparities.^{11,13,15,18,20-22} Evidence indicates that the janitorial/cleaning workforce is disproportionately represented by lower income individuals; foreign-born individuals; and those who speak English as a second language, have limited English proficiency, or low levels of educational attainment.^{11,15,21} These populations are not only highly represented among janitorial and other cleaning workers, but they also have higher rates of injury even within these specific occupations.^{11,13,20-22} Washington and international data indicate that injury rates in general (including data from outside of the janitorial occupation) are also higher among these populations,^{20,22} indicating that decreasing rates of injury among commercial janitorial workers will likely decrease workplace injury disparities by race/ethnicity, English proficiency, country of origin, education, and income.

Other considerations

We also considered the efficacy of occupational health and safety training in reducing injuries among janitorial workers. We did not identify many studies on the efficacy of training among this particular occupation, but several recent review articles have considered the body of evidence on the efficacy of training across all occupations.²⁴⁻²⁶ Because this body of literature is

not specific to commercial janitors, and authors of review articles have come to different conclusions about evidence (as a result of differing review methodologies), we have not included this research in the logic model on page 3. A systematic review conducted by Robson et al. included high quality studies published between 1996 and 2007. The authors conclude that there is strong evidence that training is effective in improving health and safety related behavior in the workplace. However, they found that that the studies on the efficacy of these trainings on decreasing injury rates were inconsistent. Robson et al. only included studies published after 1995 because a review conducted by Cohen and Colligan included literature published up to 1996.²⁴ Cohen and Colligan found mostly positive effects of safety training on health, although they note concerns about the validity of fully attributing observed decreases in injury rate to trainings.²⁶ A review conducted by Burke et al. included studies conducted between 1971 and 2008 and found that when hazardous event/exposure is high, highly engaging safety training was more effective than less engaging training both in increasing safety knowledge and safety performance (e.g. decreased injury rates).²⁵ Despite the varying methodologies and conclusions, the authors of these three review articles highlight the value and emphasize the necessity of workplace safety trainings.²⁴⁻²⁶ Robson et al. recommend that workplaces continue to deliver trainings to address health and safety risks but note that it is important to consider comprehensive interventions to reduce workplace injury.²⁴

Annotated References

1. Dube A. *Minimum Wages and the Distribution of Family Incomes*. 2013.

In this working paper Dube concludes that there is “robust evidence that minimum wage increases lead to moderate increases in income at the lower tail of the family income distribution.” The author analyzed 23 years (1990-2012) of data from the March Current Population Survey, controlling for division-specific time effects, state linear trends, and state-specific business cycle effects to determine the impacts of increases in minimum wages on poverty. The findings indicate that minimum wage increases lead to sizable reductions in the percent of the affected population living at less than 50% of the poverty line. In addition, Dube reviewed the current U.S. papers on minimum wages and family income distribution. Twelve studies (which included 54 reported elasticities of the poverty rate with respect to minimum wage) met the author’s inclusion criteria for the review. Forty-eight of the 54 estimates of poverty rate elasticity in these studies indicate a decrease in poverty in response to minimum wage increases. One study found an increase in poverty, but this publication used unconventional methods. The author points out the limitations of the 12 studies included in this review such as limited sample length, exclusion of more recent years, omission of demographic and other covariates, and the use of questionable estimators.

2. Applebaum E. MR, Elliott L., Kroeger T. *Good for business? Connecticut’s paid sick leave law*. Center for Economic Policy Research, New York, NY;2014.

Connecticut’s paid sick leave law went into effect in January 1, 2012. In this analysis the authors conducted a stratified random sample survey of Connecticut business owners with 50 or more employees in industries covered by the paid sick leave law. Responses were weighted to be representative of the size of the establishment being surveyed. Of the 251 employers surveyed 88.5% provided at least 5 days of paid leave that could be used to cover illness to some or all of their employees. After the law took effect 93.7% of those surveyed offered paid leave for illness.

3. Brenner MD. *The economic impact of the Boston living wage ordinance*. *Industrial Relations*. 2005;44(1):59-83.

In this mixed-methods study of Boston’s living wage ordinance, Brenner conducted a quantitative review of employment records among city contract workers affected by the law, as well as interviews with city contractors to understand ways in which they adjusted to the policy three years after implementation of the ordinance. In 1999 Boston adopted an ordinance that required all city contractors holding a contract of at least \$100,000 (or a subcontract of at least \$25,000) and employing more than 25 full time employees for private firms or 100 full time employees for non-profits pay their employees \$8.23 per hour. The author attempted to survey 140 firms holding 200 contracts that would be affected by the law. Seventy-two firms responded (51% response rate). There were no significant differences between the firms that responded and the overall population of firms affected by the law who hold city contracts, however, the overall population of firms is heavy with human services organizations, which have more low-wage workers, and may absorb costs differently due to their business model and organizational mission/values than other private enterprises. Brenner compared outcomes for firms that did and those that did not increase their wages in response to the ordinance. Twenty-three percent of all firms in the sample had to raise wages to comply with the ordinance. Over 88% of the firms immediately complied with the minimum wage law when their contracts became subject to the

ordinance. Firms directly affected by the ordinance saw the proportion of workers earning less than \$9.25 fall from nearly 25% to less than 5%.

4. Drago R, Lovell V. *San Francisco's Paid Sick Leave Ordinance: Outcomes For Employers and Employees*. Institute for Women's Policy Research;2011.

The Institute for Women's Policy Research conducted an evaluation of San Francisco's Paid Sick Leave Ordinance. The authors conducted telephone surveys with 1,194 employees (response rate not noted) in San Francisco in January and February of 2010, about 3 years after implementation of the ordinance. They also interviewed 727 employers in July through December of 2009 (response rate 19%). Over half of surveyed employees reported benefiting from the Ordinance (i.e. employer became supportive of paid sick days, they received more paid sick days, or they were better able to care for themselves or their families). Nearly 35% of employees who had direct contact with customers reported that their employers were more supportive of workers using paid sick days as a result of the ordinance. Black, Latino, and low-wage workers were most likely to report benefiting from the ordinance but were also the most likely to report employer non-compliance. About one-sixth of employers were not in compliance with the law at the time of the employer surveys. One-third of surveyed employers indicated that they had made some change to their sick leave policy (i.e. implemented a policy, increased the number of days available, expanded coverage to more of their workforce).

5. Dube A, Naidu S, Reich M. Can a citywide minimum wage be an effective policy tool? Evidence from San Francisco. *Institute of Industrial Relations Working Paper Series: University of California, Berkely*. 2005.

Dube et al. analyzed the economic impacts of San Francisco's 2003 citywide minimum wage policy which increased the minimum wage from \$6.75 to \$8.50 per hour (an increase of 26%) and adjusted annually for the cost of living. The authors surveyed restaurants (the industry with the greatest proportion and absolute number of minimum wage workers in the city) immediately prior to implementation of the policy (response rate 38%; n=354) and interviewed the same restaurants again nine months later (n=301). They authors highlight that the surveys were done by telephone but do not indicate who answered the survey questions (e.g. business owner, manager, or other employee). They also interviewed restaurants that were not impacted by the policy change either because their small size exempted them from coverage during the first year of the policy or because they already paid above the new minimum wage to serve as a control group. They authors also interviewed restaurants in other nearby cities (i.e. Oakland and Berkeley) that also served as controls. These control cities were similar to San Francisco in restaurant establishment and employment prior to implementation of San Francisco's minimum wage policy. The authors found that there was a substantial increase in pay for the treatment group between the pre- and post-survey and relatively stable wage distribution for the control group. Prior to the policy implementation 52% of the surveyed restaurant employees in San Francisco made less than \$8.50 per hour; this declined to 4% at the follow-up interviews. In the control group this percent remained relatively stable, going from 46% to 42%.

6. Fairris D. The impact of living wages on employers: A control group analysis of the Los Angeles ordinance. *Industrial Relations*. 2005;44(1):84-105.

Fairris evaluated the impact of the 1997 Los Angeles Living Wage Ordinance on employers. An estimated 6,500 workers and 375 firms were directly affected by the living wage component of

the ordinance. The author analyzed interview data from 48 structured, in-person interviews with employers collected by the Survey of Los Angeles Living Wage Employers (response rate 68%). Fairris also analyzed data from the Survey of Diversity in Human Resource Practices, which were surveys of employers that were not subject to the living wage ordinance and therefore served as a control group (response rate 23%; n=184). Both survey groups were asked about conditions when the surveys were conducted (2001-2002) and those prior to the living wage ordinance. The author found that living wage establishments had a significantly higher increase in starting wages for low-wage occupations than nonliving wage businesses with a difference of \$1.66 per hour. When living wage employers were asked what starting wages they would offer in the absence of the living wage ordinance their mean answers were not significantly different than the mean starting wages actually observed in the control group.

7. Livingston S, Wylie S, et al. *A Health Impact Assessment of Paid Sick Leave in Vermont*. Vermont Department of Public Health;2015.

The Vermont Department of Public Health and stakeholders conducted a Health Impact Assessment (HIA) to analyze the likely health effects of a statewide paid sick leave policy. Engaged stakeholders included a diverse group including businesses, service providers, schools, physicians, and child care providers. The authors found that this leave policy would increase access to paid leave particularly among low wage workers, part-time workers, and those employed by small businesses. The authors cite evidence from three evaluations of paid sick leave policies (Seattle, San Francisco, and Connecticut). The 2009 evaluation of San Francisco's policy found that the proportion of employers with sick leave policies increased from 73% to 91% following the ordinance. The evaluation authors estimated that only 9% of employers were not in compliance. The HIA authors note that these three evaluations found that access to paid sick leave was expanded.

8. Romich J, Bignell W, Brazg T, Johnson C, Morton J, Song C. *Implementation and Early Outcomes of the City Of Seattle Paid Sick And Safe Time Ordinance: Final Report*. University of Washington. Prepared for: City of Seattle--Office of City Auditor;2014.

Romich et al. evaluated the City of Seattle Paid Sick and Safe Time Ordinance which passed in September 2011 and became effective on September 1, 2012. The authors 1) conducted two surveys of over 300 randomly sampled employers who were subject to the ordinance, 2) conducted over 80 interviews with employers and workers (recruited through random, snowball, and convenience sampling) and, 3) analyzed confidential employment data from the State of Washington Employment Security Department. The employer surveys were conducted July through October 2012 (baseline, response rate 63%) and September through November 2013 (follow-up, response rate 79%). They found that one year after implementation of the ordinance 83% of surveyed employers were aware of the ordinance by the end of the first year (a rate that had increased since implementation). The authors indicate that the ordinance applied to about 11,000 employers when it took effect. There was an increase in the number of employers offering leave at one-year post implementation with the greatest increase in the percent of employers offering paid leave among the Food and Accommodation sector which saw an increase from 14% to 75% of employers. Thirty-four percent of employers reported that they had expanded their policies to include safe leave and employers who implemented new leave policies may also have included safe time. Ninety-six percent of employers with full time workers offered leave to these workers, 62% of those with part-time workers offered leave to those

workers, and 26% of workers with seasonal or temporary workers offered leave to these employees. Seventy-six percent of employers provided sufficient paid leave to full-time employees, with large employers being the least likely to offer adequate leave. Employers of seasonal and temporary workers only have to provide sick and safe leave for workers after they have worked for 180 days, so many of these workers may not qualify for leave under the ordinance. Thirty-nine percent of surveyed employers reported that they did not cover part- and full-time workers or were not providing the minimum required leave hours for full-time workers. The authors learned from interviews with 33 Seattle workers that 15 of these workers were unaware of the ordinance before being interviewed. Nineteen of these workers had not received paid leave prior to the ordinance, 12 of whom reported that they still did not have access to leave after the ordinance was implemented. Ten of the 16 workers interviewed in Wave 2 (12 months after implementation) reported that they still did not have access to paid leave.

9. Waldfoegel J. Family and medical leave: Evidence from the 2000 surveys. *Monthly Labor Review*. 2001;124(9).

Waldfoegel cites two past surveys (conducted in 1995), two years after enactment of the Family and Medical Leave Act (FMLA) which found that the Act led to increased FMLA benefits for employees. Two-thirds of covered establishments reported changing their leave policies to comply with the law and covered businesses were more likely than their counterparts to offer FMLA. These surveys did show that 41.9% of employees had not heard of the law. The author notes that several other studies of FMLA have found that family leave coverage increased following passage of the Act. Waldfoegel analyzed 2000 Survey of Employees data (n=2,558 employees) and 2000 Survey of Establishments data (n=1,839 private businesses) to determine impacts of the Act seven years after implementation. The surveys showed that while only 33.5% of businesses not covered by the law offered FMLA benefits, 83.7% of those covered by the law did. The author found that while awareness of the law had increased since 1995 not all employees were aware of the law or if they are covered in 2000.

10. Safe Work Australia. *The Effectiveness of Work Health and Safety Interventions By Regulators: A Literature Review*. 2013.

In 2013 Safe Work Australia published a review of the literature on occupational health and safety regulations. This report includes a number of components including a summary of studies evaluating the impacts of regulations (page 14). The authors identified 11 studies on this topic, two of which were conducted on Washington State health and safety regulations. Five of these studies measured the impacts of regulations on measures such as injury or fatality rates. Each of these five studies found that the regulations were associated with decreased rates of injury, fatality, falls, or exposure to hazards. While most of these studies did not fully explore the mechanisms for these reductions, several studies accounted for potential confounding factors in order to isolate compliance with the regulation as at least one likely contributor to these reductions. Two of these studies did explore rates of compliance. An evaluation of Washington's 2000 ergonomics rule found that companies required to comply earlier with the rule were more likely than those with more time to comply to report that they were taking actions required by the rule. This evaluation also found that after enactment of the regulation a higher percentage of companies reported that they were taking specific safety-promoting actions as a result of recommendations from the Division of Occupational Health and Safety. Another study found

that compliance with a biological agents regulation in the UK was high in some settings and quite low in other settings.

11. Burgel BJ, White MC, Gillen M, Krause N. Psychosocial work factors and shoulder pain in hotel room cleaners. *American Journal of Industrial Medicine*. 2010;53(7):743-756. Burgel et al. used data from the 2002 Hotel Room Cleaner Study conducted at five unionized casino hotels in Las Vegas. The original study had a response rate of 74% (n=941)—and for this analysis Burgel et al. used data from 493 participants who had complete data for 21 variables of interest. Data was collected using a survey tool provided in English, Spanish, or Serbo-Croatian. Pain was measured through self-report and past and current physical job demands were measured using a physical workload index, a work intensification index, an ergonomic index, and questions about hours worked, beds made, etc. Fifty-six percent of respondents reported severe or very severe shoulder pain. There were significant differences in reported pain by race/ethnicity with Latino and Native American, and “other” respondents the most likely to report severe or very severe pain. Individuals born outside of the US and those with lower levels of educational attainment were also significantly more likely to report this level of pain than those born in the US. Eighty-five percent of respondents were born outside of the US. A higher score on the physical workload index (more physical work demands) or on the physical workload intensification compared to five years ago were both significantly associated with higher rates of severe or very severe pain. They also found that those with shoulder pain reported lower supervisor and social support. The original study was partially funded by two unions. This study was conducted with hotel cleaners and may not be fully generalizable to commercial janitors.

12. Chang JH, Wu JD, Liu CY, Hsu DJ. Prevalence of musculoskeletal disorders and ergonomic assessments of cleaners. *American Journal of Industrial Medicine*. 2012;55(7):593-604.

Chang et al. analyzed data from cleaners working in public buildings in Taiwan. The authors randomly selected 25% (200) of the employees of three large cleaner-staffing contractors (response rate 90%). Trained interviewers conducted in-person interviews with participants between 2008 and 2009 using a combination of the Nordic Musculoskeletal Questionnaire. They also collected biometric measurements from participants while performing cleaning tasks. The authors conducted univariate logistic regression and then included each significant risk factor in their multivariate logistic regression analysis. The researchers found that experiencing time pressure was a significant risk factor for musculoskeletal pain in the hand/wrist (OR 2.76), shoulder (2.24), and lower back (2.21). There was not a significant association between musculoskeletal pain and education level, exercise, or body mass index.

13. Fernandes R, Pataro SMS. Heavy physical work and low back pain: The reality in urban cleaning. *Revista Brasileira de Epidemiologia*. 2014;17(1):17-30.

Fernandes and Pataro conducted a cross-section census of 657 urban cleaning workers in Salvador, Bahia, Brazil who provided services to the city. Six hundred twenty-four of the workers participated in the study, leading to a 95% response rate. All of the respondents were male, 367 were waste collectors, 118 were drivers, 84 were cleaning agents, and 55 were maintenance workers. Participants filled out a questionnaire including items on behaviors, sociodemographic factors, and physical demands at work. The survey included an adapted version of the Nordic Musculoskeletal Questionnaire to identify pain or discomfort in the

previous 12 months and the Job Content Questionnaire to identify psychosocial demands. Over 77% of the respondents reported pain or discomfort in the past 12 months and nearly 63% reported pain at a level and/or frequency high enough to be classified as a Musculoskeletal Disorder (MSD). Over 85% of respondents reported working overtime. The researchers indicate that this is likely because they were not able to finish all required tasks in an eight hour shift. Using multivariate logistic regression the authors found that frequent exposure to trunk flexion and rotation, longer working hours, higher psychosocial demand (i.e. low control, lack of social support, work dissatisfaction), and lower educational attainment were associated with higher rates of lower back pain. Dynamic work (walking or running) was protective against lower back pain. Because this sample only included 84 cleaning agents, the results may not be fully generalizable to commercial janitors.

14. Kumar R, Kumar, S. Musculoskeletal risk factors in cleaning occupation—a literature review. *International Journal of Industrial Ergonomics*. 2008;38(2):158-170.

Kumar and Kumar conducted a review of the literature on cleaning occupations and workplace injury and health published between 1979 and 2005. The authors indicate that 2004/2005 data from the United States Department of Labor show that the median earnings of building cleaners in the United States is approximately half that for all other occupations. Kumar and Kumar indicate that the literature is in general agreement that the greater the physical demand the greater the probability of musculoskeletal injury. They cite evidence that repetitive motion, unnatural and static postures, other physical exposures, and psychosocial exposures increase the risks of musculoskeletal injuries. They also cite four studies which have found that cleaners report overexertion and excessive work rates and that time pressure, workload, and lack of control over rest/work are psychosocial risk factors. They summarize the literature and indicate that cleaners often do not have enough time to recover between tasks leading to a higher risk of injury and they cite five studies indicating that monotony and work intensity are key problem areas for cleaners. The authors provide a number of recommendations to improve health for cleaning staff and decrease costs for employers including giving employees greater control of their work assignments, work pace, and tools/machines.

15. Seixas N, Dominguez C, Stover B, Simcox N. *Janitors Workload and Health and Safety Study*. University of Washington Department of Environmental and Occupational Health Sciences;2014. 1351-0711.

Seixas et al. worked with a group of key informants who were unionized and non-unionized janitors in Washington State who helped design a cross-sectional study and conduct interviews in English, Spanish, and Vietnamese. The authors compared the exposures and injury outcomes between unionized (n=276) and non-unionized janitors (n=78) and also compared these experiences with those of union security officers (76). They cite evidence from Washington's 2007-2011 workers' compensation claims indicating that overexertion was the top claim for janitors and cleaners. This article indicates that janitors and cleaners had the 16th highest injury rate for all occupations in the US in 2010. Participants provided information on health, pain, and injuries for the present, the past year, and two years prior. About 76% of the non-union janitors and 84% of the union janitors had a high school education or less. Sixty-nine percent of non-union and 59% of union janitors indicated that they were not at all or only somewhat comfortable speaking English. Eighteen percent of union janitors and only one non-union janitor reported being born in the United States. Fifty-eight percent of union janitors and 32% of non-union

janitors reported skipping their breaks at least weekly. Non-union janitors reported the highest work intensity, but union janitors reported the greatest increase in work intensity over the past three years (an increase of 8.6% for union janitors and 2.3% for non-union janitors). Security officers reported a decrease in work intensity over the past three years. Union janitors reported increasing injury rates in the past three years while non-union janitors reported decreasing injury rates, and security officers reported fairly stable injury rates (significance not reported). Over 33% of non-union and 36% of union janitors reported lifting 50 pounds at least once per day and about 15% of non-union and 20% of union janitors reported carrying loads over 30 pounds at least seven feet or more. Thirty-nine percent of non-union and 76% of union janitors reported that they did not have enough time to complete their work. Seventy-four percent of non-union and 93% of union janitors reported that their job required very fast work. The authors found a statistically significant increase in poor/fair general health; back, leg, and arm pain; and work stress with increasing work intensity. This study was partially funded by SEIU Local 6.

16. Unge J, Ohlsson K, Nordander C, Hansson G-Å, Skerfving S, Balogh I. Differences in physical workload, psychosocial factors and musculoskeletal disorders between two groups of female hospital cleaners with two diverse organizational models. *International Archives of Occupational and Environmental Health*. 2007;81(2):209-220.

Unge et al. cite two studies which found that downsizing and/or lean production among cleaning staff is associated with decreased musculoskeletal health. The authors aim was to analyze physical workload, psychological factors, musculoskeletal disorders, and work organizational factors among female cleaners in two county hospitals in Sweden. One hospital used a tradition organization (TO: large groups of cleaners, limited authority, worked individually, cleaning-only tasks, and little feedback) and the other used an extended organization (EO: small groups of cleaners, group-based agreement, group-cleaning, cleaning work plus other tasks, and frequent and group-based feedback). The study included 135 TO participants (89% response rate) and 111 EO participants (95% response rate). The TO participants were more likely than the EO participants to be immigrants. Physical workload and exertion as well as psychosocial factors (e.g. decision latitude and social support) were assessed through survey questions. Musculoskeletal disorders and levels of stress were assessed through interviews. Physicians and a physiotherapist conducted physical examinations. Forty-six subjects were randomly selected to be observed while working by expert observers. Steps were measured with a pedometer, positions were measured with a tilt sensor, heart rate was recorded with a heart rate monitor, and muscular load was recorded by electromyography. Being a part of the EO group was associated with lower physical workload (e.g. lower heart rate ratio, wrist movement, etc.), lower self-assessed physical workload, and higher decision latitude, lower work demand, and lower complaints and diagnosis in the neck/shoulders than being a part of the TO group.

17. Village J, Koehoorn M, Hossain S, Ostry A. Quantifying tasks, ergonomic exposures and injury rates among school custodial workers. *Ergonomics*. 2009;52(6):723-734.

Village et al. analyzed injuries reported among 581 custodial workers in one large school district in British Columbia, Canada. The authors first conducted focus groups with 22 custodial workers (42% response rate) to inform the larger study. Trained ergonomists observed 25 participants working and created a job exposure matrix. The study cohort included all custodial workers employed by the district between January 2003 and December 2006. Work-related injury data was gathered from injuries filed by participants. The authors found that the rate of injury was

over four times higher for custodial workers than all other district occupations combined. They found that summer work was marked with different work associated with more injury risk factors (e.g. more bending and more lifting) but that the injury rate during the ten month school year was actually higher than the injury rate during the summer months. The authors were not able to explain this with data but speculated that it may be a result of more collaborative work, better coworker and supervisor support, more discretion, and less time pressure present during the summer.

18. Washington State Department of Labor and Industries. *Janitorial Workload, Health, and Safety: Report to Representatives Chris Reykdal and Mike Sells. 2014.*

Washington State workers' compensation data from 2003-2012 indicate that janitorial services have higher accepted claims than the accommodation/food services and security guard sectors and higher than the National Occupation Research Agenda Services Sector as a whole. The service sector, which includes janitors, has consistently fallen in the top 10 on the Department of Labor and Industries prevention index since 2003, which indicates that this sector has a relatively high number of claims. The most frequent types of injury covered by Washington's workers' compensation fund are musculoskeletal injuries to the neck, back, and arms (accounting for 31% of claims). This trend exists among janitors as well. Janitors have a higher percentage of claims related to falls from the same level and lower rates of claims from being struck by or against an object compared to other occupations. The majority of compensable claims among janitors were filed by women (53%) despite the fact that only one-third of janitorial workers nationwide are women. If Washington demographic data is reflective of the nationwide data than this indicates that in Washington female janitors have about twice the rate of compensable injuries as male janitors. However a Washington study conducted by Seixas et al. found that 53% of study participants were female. Almost one-third of janitors who filed worker's compensation claims requested material in a language other than English, the majority of whom requested materials in Spanish. This is higher than the rate for the entire service sector (5.7%) and for the accommodation and food services sector (16.8%). A supplemental PowerPoint presentation provided to members of the workgroup who developed this report indicates that workers' compensation data show that falling down stairs ("slippery and/or while carrying objects") was one of the most common activities resulting in a falls from elevation.

19. Woods V, Buckle P. Musculoskeletal ill health amongst cleaners and recommendations for work organisational change. *International Journal of Industrial Ergonomics. 2006;36(1):61-72.*

Woods and Buckle cite three studies indicating that organizational and psychosocial risk factors for poor musculoskeletal health in cleaning work include lack of control over work and breaks, high workload, and time pressures. The authors sent a questionnaire to a random sample of cleaners from the trade union computerized national membership database who worked in hospitals, schools, and local government offices in the United Kingdom and an additional 2,500 surveys to cleaners at health and government workplaces also represented by unions (overall response rate 31%, n=1,216). According to the trade union database the sample was representative of the workforce in terms of job type and employment sector. The authors also conducted in-person workplace assessments/observations of 67 cleaners. During these observations the cleaners rated their perceived level of exertion. Thirty-eight of these employees agreed to be interviewed as well. The authors also conducted focus groups with six supervisors

and 15 equipment designers, manufacturers, and suppliers to determine the practicality of their recommendations to improve health among cleaners. Seventy-four percent of the survey participants reported experiencing muscle pain, aches, and discomfort in the past year and 23% had missed work as a result. Employees who frequently did tasks which included lifting or moving loads (e.g. lifting equipment, carrying heavy loads, moving furniture) were significantly more likely to report pain and discomfort than those who did not conduct this work or only conducted this work sometimes. For example, those who frequently carried loads had 4.1 higher odds of reporting pain than those who did not do this task (95% CI 2.8-6.1). The primary concerns reported by participants, observed by researchers, and reported by supervisors was lifting and carrying (e.g. buffing machines weighing about 75 pounds, vacuums weighing about 15 pounds). They indicated that moving machines into elevators and over thresholds presented manual handling problems. Cleaners reported inadequate supplies of equipment which required them to move equipment between floors. Seventy-six percent of respondents reported that they always or sometimes did not have enough time to complete their work, and a majority reported having to work fast or intensively to complete their work. Those who frequently had trouble keeping up with their workload had 5.8 times higher odds of reporting pain and discomfort (95% CI 3.0-11.0) than those who did not. The authors did not find an association between control over work/breaks and reported pain. This study was partially funded by UNISON, a trade union in the UK.

20. Piha K, Laaksonen M, Martikainen P, Rahkonen O, Lahelma E. Socio-economic and occupational determinants of work injury absence. *European Journal of Public Health*. 2013;23(4):693-698.

Piha et al. analyzed data from the Helsinki Health Study conducted in Finland with 40,000 municipal employees. The authors included data from full-time, permanent employees (16,471 women and 5,033 men). The mean follow-up time was 3.0 years. They found that high education, occupational class (e.g. managers versus cleaning workers), and income were associated with lower medically confirmed work injury leading to four or more days of absence from work. For example, among women, manual workers (such as cleaning workers) had 4.35 times higher relative risk (95% CI 4.22-4.49) compared to managers and professionals and the lowest income group had 1.84 times higher relative risk (95% CI 1.75-1.94) compared to the highest income group. Among men, youth mentors, firemen, and janitors had the highest rates of injury-related work absences. This study included cleaning occupations but also other occupations and therefore may not be fully generalizable.

21. Premji S, Krause N. Disparities by ethnicity, language, and immigrant status in occupational health experiences among Las Vegas hotel room cleaners. *American Journal of Industrial Medicine*. 2010;53(10):960-975.

Premji and Krause used a participatory research approach and involved room cleaners in all aspect of the study of unionized hotel room cleaners in Las Vegas, Nevada. The authors conducted eight focus groups to inform the survey tool. The authors included five unionized hotels in the study and conducted surveys with 941 employees (74% response rate) between March and April of 2002. Pain or discomfort, missed days of work, and other variables were collected through survey self-report. Ninety-nine percent of participants were women, 76% were Hispanic, 89% spoke English as a second language (ESL), 85% were immigrants, and 88% had a high school education or less. Seventy-eight percent of room cleaners reported work-related pain

in the previous 12 months. In this same time 32% of participants reported their pain to management and 24% filed a workers' compensation claim. Hispanic and ESL participants were more likely to report work-related pain in their past year than their counterparts. There was no difference between immigrants and non-immigrants in work-related pain. However Hispanic, immigrant, and ESL workers were more likely than their counterparts to report missing work in the past year as a result of work-related pain. Non-Hispanic and non-immigrant employees as well as those who spoke English as a first language were 50% more likely than their counterparts to have their workers' compensation claims accepted. This study was partially funded by the Culinary Workers Union Local 226 in Las Vegas.

22. Sears JM, Bowman SM, Silverstein BA. Trends in the disproportionate burden of work-related traumatic injuries sustained by Latinos. *Journal of Occupational and Environmental Medicine / American College of Occupational and Environmental Medicine.* Oct 2012;54(10):1239-1245.

Sears et al. indicate that many studies have found a disproportionate rate of occupational injuries among Latino workers both as a result of Latinos working in more risky occupations and having higher rates of injury even within specific occupations (nine studies cited). The authors cite data from Washington State indicating that the percentage of nonfatal occupation injuries resulting in days away from work increased among Latino workers between 1997 and 2004 and that occupational fatalities among Latinos have increased more steeply in Washington than in the country as a whole. The authors used Washington State Trauma Registry data from 1998 to 2008 to analyze the changes in the odds that a work-related traumatic injury was sustained by a Latino worker. After controlling for potential confounding factors they found a 5% mean annual increase in the odds that a work-related traumatic injury was sustained by a Latino. This was a significant increase.

23. U.S. Department of Education, National Center for Education Statistics, National Forum on Education Statistics. *Planning Guide for Maintaining School Facilities.* NCE 2003-347, prepared by T. Szuba, R. Young, and the School Facilities Maintenance Task Force. Washington, DC. 2003.

This guidance indicates that there are no nationwide standards of cleanliness but that a five-tiered system is emerging to help guide decision-making. Level 1 cleaning results in a spotless building such as what would be found in a hospital setting. A custodian with proper supplies can clean 10,000 to 11,000 square feet to Level 1 in an eight hour period. Level 2 is the uppermost standard for most school cleaning and is generally intended for restrooms, kindergarten areas, food service areas, etc. In an eight hour shift a custodian could clean approximately 18,000 to 20,000 square feet to Level 2 standards. Level 3 cleaning is the normal level for most school facilities. This level is acceptable to most stakeholders and does not pose a health risk. A custodian can clean approximately 28,000 to 31,000 square feet in eight hours to Level 3 standards. Level 4 cleaning is not normally considered acceptable in a school environment. A custodian could clean to 45,000 to 50,000 square feet in 8 hours to Level 4 standards. Level 5 cleaning can lead to an unhealthy situation. A custodian can clean 85,000 to 90,000 square feet in an 8 hour period to Level 5 standards. These guidelines note that the above figures are estimates and that the actual number of square feet that can be cleaned will vary depending on the workspace.

24. Robson LS, Stephenson CM, Schulte PA, Amick BC, Irvin EL, Eggerth DE, Chan S, et al. A systematic review of the effectiveness of occupational health and safety training. *Scandinavian Journal of Work, Environment & Health*. 2012; 38(3):193-208.

Robson et al. conducted a review of the literature on the efficacy of occupational health and safety training published between 1996 and November of 2007. They conducted a comprehensive literature review and identified 22 applicable randomized control trials. The authors rated the methodological quality of the studies and only included studies which they ranked as “fair” or “good” in their final analysis. They found strong evidence that training improves workers’ health and safety related behavior in the workplace. The authors identified ten studies which directly measured injury and illness rates in response to training, and they concluded that inconsistent findings indicate that the evidence for this relationship is insufficient. Robson et al. do indicate that they still recommend that workplaces continue to deliver trainings to address health and safety risks but note that the inconsistent findings on the direct connection between training and injury rates indicates that it is important to consider comprehensive interventions to reduce workplace injury.

25. Burke MJ, Salvador RO, Smith-Crowe K, Chan-Serafin S, Smith A, Sonesh S. The dread factor: How hazards and safety training influence learning and performance. *Journal of Applied Psychology*. 2011;96(1):46-70.

Burke et al. conducted a review of the literature on the efficacy of occupational health and safety training published between 1971 and December of 2008. The authors included quasi-experimental and experimental studies and computed the effects of safety training on knowledge and safety performance (e.g. injury rates) through meta-analysis. The authors conclude that the evidence indicates that when hazardous event/exposure is high, highly engaging safety training is more effective than less engaging training both in increasing safety knowledge and safety performance.

26. Cohen A, Colligan M. *Assessing Occupational Safety and Health Training: A Literature Review*. National Institute for Occupational Safety and Health;1998.

Cohen and Colligan conducted a review of the literature (including reports), primarily drawing from literature published between 1980 and 1996. They included 80 publications in their analysis. The authors found that these studies provided “overwhelming evidence to show the merits of trainings in increasing worker knowledge of job hazards, and in effecting safer work practices and other positive actions in a wide array of worksites.” Cohen and Colligan do note the limitations of the studies including concerns about the validity of fully attributing observed decreases in injury rate to trainings.