

Role of union women's committees in improving psychosocial outcomes among tradeswomen

Pranav Srikanth

A thesis

submitted in partial fulfillment of the
requirements for the degree of

Master of Science

University of Washington

2022

Committee:

Marissa G. Baker

Noah Seixas

Hendrika W. Meischke

Program Authorized to Offer Degree:

Environmental and Occupational Health Sciences

© Copyright 2022

Pranav Srikanth

University of Washington

Abstract

Role of union women's committees in improving psychosocial outcomes among tradeswomen

Pranav Srikanth

Chair of the Supervisory Committee:
Marissa Baker
Environmental and Occupational Health Sciences

Objective: This study investigates the role that union women's committees have in reducing gendered psychosocial exposures and mental health outcomes among tradeswomen in the sheet metal industry.

Methods: A cross-sectional survey measured stress, anxiety, depression, social support, job satisfaction, and concern of injury among tradeswomen (n=56). Regression models were developed for these outcomes, in which women's committee involvement (measured via one question that asked respondents about the extent of their involvement in women's committees) was assessed as an effect modifier. Predictors including bullying, discrimination and harassment, and work-life balance were included in these models.

Results: Women's committee involvement was significantly associated with social support, which was high among respondents. Women's committee involvement had a significant positive interaction effect with bullying on job satisfaction and a significant negative interaction effect with work-life balance on overall social support. Women's committee involvement had a positive interaction effect with work-life balance on both depression and overall social support.

Conclusions: Tradeswomen are exposed to gendered psychosocial hazards such as bullying and discrimination. Union women's committee involvement has a positive impact on social support and can mitigate the effects of bullying on job satisfaction. However, it remains unclear whether women's committees can reduce the impacts of other gendered exposures, and whether they have any impact on mental health outcomes. Reducing barriers to employment of women in the construction industry through women's committees can help meet worker demand and promote equity.

1. Introduction

Construction workers are routinely exposed to chemical, physical, and ergonomic safety hazards, which puts them at risk of injuries and illnesses such as musculoskeletal disorders, physical trauma, respiratory illness, and skin irritation^{1,2}. Workers who are new to the industry, such as apprentices, not only need to navigate these hazards, but are also subject to psychosocial stressors, including high stress and bullying^{3,4}. These psychosocial stressors, in addition to others such as poor organizational support and high job demands, contribute to a higher risk of injury for apprentices in the industry³. This risk is exacerbated in underrepresented groups, as discrimination and harassment based on race and gender are associated with a higher risk of injury⁵.

The demand for construction workers is highly variable, as fluctuations in the economy can often dictate employment⁶. The construction industry has been experiencing above average growth, and is expected to grow 7% over the next decade⁶⁻⁸. However, there is a shortage in skilled workers in the trades, resulting in higher worker demand than supply⁹⁻¹¹. Therefore, removing barriers to employment of underrepresented groups, particularly women, is crucial to meet industry worker demand¹⁰.

The construction industry, which currently employs over 8 million workers, is male dominated, with women accounting for only 4% of the national workforce and less than 9% of management positions¹². Women are therefore disproportionately affected by psychosocial hazards, as they are not only exposed to the same job demands as male workers, but are also exposed to gendered psychosocial stressors such as sexual harassment and isolation in the workplace⁵. Addressing such disproportionate hazards promotes the general concept of equity and is beneficial for the industry, as it reduces barriers to employment. Attrition is more likely among apprentices, and even more likely among women and minorities¹³; therefore, changes that mitigate gendered exposures could reduce attrition and increase female recruitment. Reducing exposure to psychosocial stressors would not only benefit women in the trades but would make a safer work environment for all workers.

The low percentage of women in the construction industry results in numerous gendered safety hazards. Personal protective equipment is often unavailable or ill-fitting for women's bodies, as companies can be disincentivized to invest in women-specific equipment when the majority of workers are men^{5,14-16}. Sanitary facilities for women are also often lacking¹⁴.

Tradeswomen are also exposed to discrimination, stemming from social norms about who belongs in the trades, leading to sexual harassment, discrimination, overcompensation, and skill underutilization^{14,17}. While sexism and harassment in the industry is now less overt, it still exists and continues to negatively affect the work experiences of tradeswomen^{5,18}. Bullying and harassment often go unreported, especially in male-dominated setting such as the construction industry, as victims do not want their coworkers to view them as weak¹⁹. Sexual harassment concerns of tradeswomen are often minimized as an overreaction or over-sensitivity¹⁸; yet, women continue to experience inappropriate and dangerous behaviours directed towards them^{14,20}.

Tradeswomen experience personal safety concerns and less job security, which leads to an increase in stress¹⁴. Perceived stress is higher in women, and is associated with job strain, discrimination and bullying, work-life balance, isolation, safety climate, and lack of social support⁵. This leads to a 20% higher injury rate in women, and an overall reduced standard of health and safety^{5,14}.

The industry has aimed to reduce gendered exposures by introducing training programs for management and workers to reduce sexism, and union-based anti-discrimination policies¹⁸. However, these strategies do not impact systematic and organizational factors that influence gendered exposures of tradeswomen. The construction industry systematically employs practices that lean on stereotypical assumptions of gender roles, and therefore exclude women²¹. The masculine culture of construction results in long hours and rigid work schedules, which prevents diversification of the industry²². Jobs in the trades typically requires travel and employee flexibility, with little to no assistance from organizations for work-life balance. Tradeswomen often have more family responsibilities than their male counterparts; yet, companies neglect to provide any assistance or flexibility to balance work and family responsibilities²³. In general, workplaces that have low flexibility in their scheduling or that do not promote work-life balance have shown poorer mental health outcomes²³.

Many workers often work on multiple jobs at the same time, making it difficult to characterize the impact of one specific jobsite's work environment on an individual's exposure to psychosocial stressors. Trade unions bridge this gap, and have been identified as crucial in addressing gendered exposures²⁴. Unionization has been shown to have positive effects on workplace health and safety, as workplaces are put under higher scrutiny²⁵. The existence of union-appointed safety representatives and union health and safety committees have had positive impacts on workplace health by reducing workplace accidents²⁶. With the emergence of government policies aiming to improve work-life balance in the trades over the past decades, unions have been influential in increasing the assistance available to their members²⁷. More recently, women's committees in unions have been identified as an approach to reducing gendered exposures in construction. Women's committees strive to achieve gender equality in the workplace, by integrating women into leadership positions in their unions and creating a forum to address gendered concerns²⁴. Women's committees may be effective in providing social support and reducing perceptions of isolation. However, it is difficult to evaluate the impact that women's committees can have, as their effects can be collinear with the effects of other workplace programs and characteristics, making it challenging to distinguish whether the observed effects are due to women's committees or due to a more supportive work environment overall.

In the sheet metal trade, workers are unionized in the International Association of Sheet Metal, Air, Rail and Transportation Workers (SMART). This union spans the United States and Canada, and consists of 208,000 members in approximately 100 local unions²⁸. At the international level, SMART has a women's committee that provides tradeswomen with networking and workshop opportunities, to promote their involvement in union leadership²⁸. Many local unions also have

women's committees, which aim to provide training to tradeswomen and discuss with union leadership about gendered concerns.

Here, we investigate the role that women's committees at union locals play in improving psychosocial and mental health outcomes of tradeswomen. This work is important for understanding how union women's committees may promote well-being for women construction workers, and can lead to an increased understanding of strategies that can be used to increase retention and reduce attrition among women in the trades. Identifying which gendered exposures and health outcomes are affected by union women's committees can inform interventions to mitigate gendered exposures. This study will therefore provide a starting point for future research that will improve the experiences of tradeswomen via women's committees across the international SMART union.

2. Methods

This study is part of a larger randomized control trial evaluating the effectiveness of mentorship in improving women's outcomes in the construction trades. The parameters of the parent study, including its randomization, have no effects on this study, as this study was conducted on baseline data collected before intervention. Both studies were conducted in conjunction with the Sheet Metal, Air, Rail and Transportation (SMART) union, which represents approximately 208,000 members in approximately 100 locals spanning North America. Psychosocial outcomes and women's committee involvement were assessed using an online survey. The survey also assessed safety (injury and risk avoidance) and work experiences (exposure to physical and psychosocial hazards). The University of Washington Human Subjects Division determined this project to be minimal risk.

2.1 Recruitment

Locals: In conjunction with SMART International leadership, we recruited local unions into our parent mentorship study. Recruitment was targeted to those locals with at least five women apprentices; twenty locals fulfilled these criteria and were recruited into the randomized control trial. In collaboration with SMART International leadership, each local identified a project coordinator to serve as the point of contact between the University of Washington study team and the local and assist with participant recruitment. This coordinator was chosen by each local, and is an apprenticeship coordinator/instructor, women's committee member, or union business agent.

Apprentices: We worked with each local's on-site project coordinator to identify potential apprentice tradeswomen. Eligible apprentices were at least 18 years old and were enrolled in an affiliated apprenticeship program, with at least 1 year left before completion. All eligible apprentices were contacted by the UW study coordinator to explain the study and answer questions, and were welcomed to attend an optional information with the study team in a live Zoom format to learn more about the program. Prior to enrolling in the study, interested

apprentices underwent informed consent. Upon enrollment, each apprentice took an online survey, detailed below.

2.2 Survey Development and Metrics Collected

Upon entry into the study, apprentices completed a baseline survey. This survey was developed in REDCap^{29,30}, and consisted of previously validated scales and adaptations of previously validated scales as used previously in surveys of tradeswomen. The survey will also collect individual characteristics and data on social determinants of health.

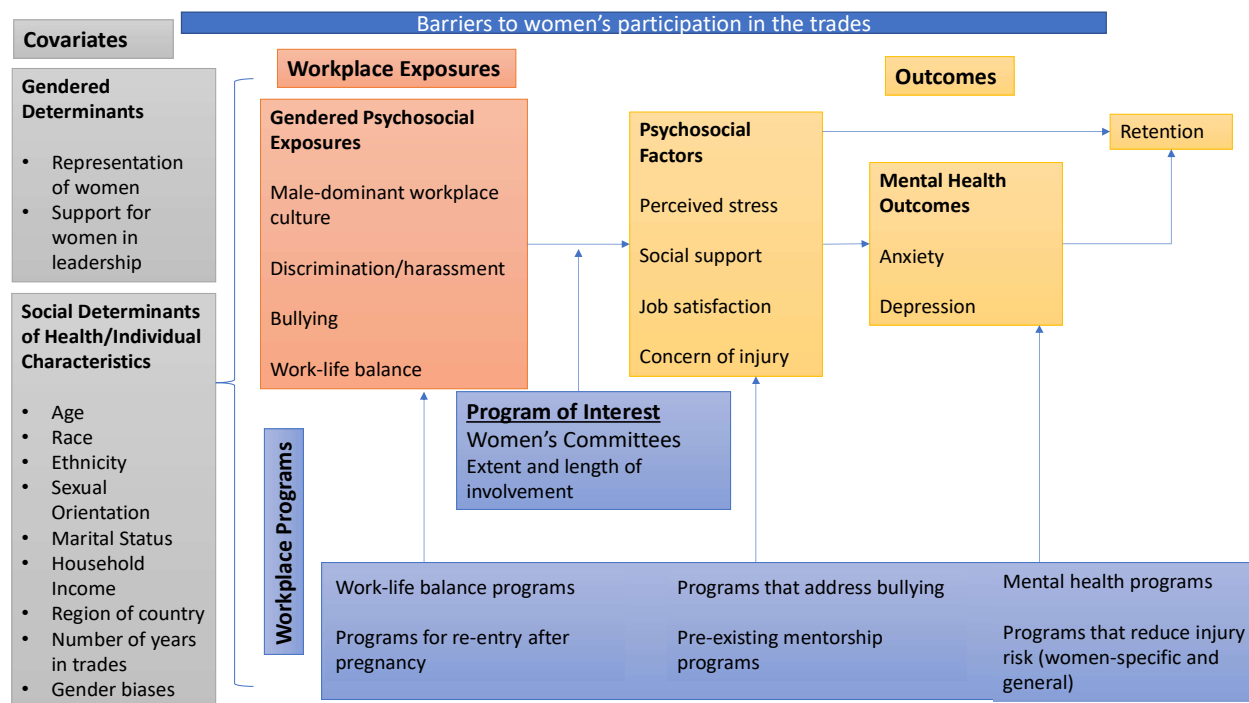


Figure 1: Conceptual model of the exposures and outcomes related to the experiences of tradeswomen. An arrow indicates that a direct relationship is expected between the variables or groups of variables.

Based on literature, we initially developed a conceptual model (Figure 1) of the exposures, determinants, and outcomes that may be related to the experiences of tradeswomen. This conceptual model is based on previously proposed conceptual frameworks for safety climates³¹, in which situation-related factors such as workplace programs and exposures, as well as individual characteristics, impact workplace safety and consequently, safety outcomes. Traditionally, these frameworks have viewed safety outcomes as physical injuries; however, our conceptual model adapts these frameworks for psychological outcomes based on previous conceptual frameworks that describe the relationship between workplace factors and psychological outcomes³².

To guide survey development and analysis in this study, we created a second simplified conceptual model (Figure 2) which focuses on women's committees, as well as exposures, determinants, and outcomes that may be impacted by these women's committees. Information on retention and workplace programs other than women's committees and mentorship programs

were not obtained, to reduce survey length and ensure that respondents and union local coordinators were not overburdened. Region of country was also not included as a demographic covariate to ensure deidentification. The survey assessed six outcomes relevant to this manuscript: perceived stress (assessed via the Perceived Stress Scale-10 [PSS-10] validated scale³³; Cronbach's alpha = 0.899), social support (8 questions, adapted from the Generic Job Stress Questionnaire³⁴ as used in previous surveys of tradeswomen by the research team⁵, covering friends and family support, co-worker support, and supervisor support; Cronbach's alpha = 0.653), job satisfaction (5 questions adapted from Spector's 36 question Job Satisfaction Scale³⁵; Cronbach's alpha = 0.677), concern of injury (never or almost never, less than half the time, about half the time, more than half the time, always or almost always), anxiety (assessed via the General Anxiety Disorder-7 [GAD-7] validated scale³⁶; Cronbach's alpha = 0.899), and depression (assessed via the Patient Health Questionnaire-9 [PHQ-9] validated scale³⁷; Cronbach's alpha = 0.856).

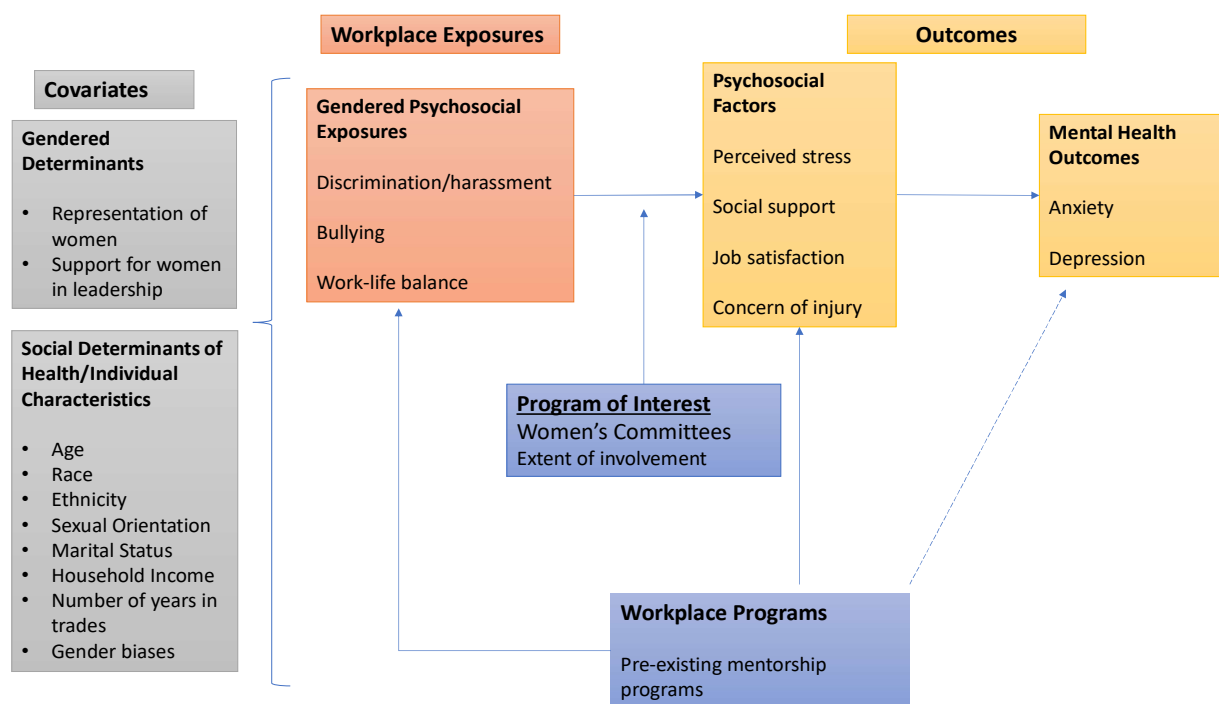


Figure 2: Conceptual model of the exposures and outcomes assessed in this study. An arrow indicates that a direct relationship is expected between the variables or groups of variables.

PSS-10 scores can range from 0 to 40, with higher scores indicating higher stress^{33,38}. While there are no established cut-off scores for the PSS-10, normative data from a sample of the United States population indicated that women in the United States have a mean PSS-10 score of 13.7³⁸; therefore, 13.7 will be used as a cut-off score for high stress. For anxiety measured via the GAD-7, cut-off scores of 5, 10, and 15 indicate mild, moderate, and severe anxiety respectively³⁶. Similarly, for depression measured via the PHQ-9, cut-off scores of 5, 10, and 15 indicate mild, moderate, and high likelihoods of major depressive disorder respectively; however, in our survey, one question on suicidal ideation from the PHQ-9 was excluded, reducing the range of possible scores.

Respondents were asked whether their union local had a women's committees (yes/no). Those who indicated that their local had a women's committee were subsequently asked how involved they were in the women's committee (not at all, very little, somewhat, quite a bit, very) and how long they had been involved in the women's committee (less than 6 months, 6 months to 1 year, 1-2 years 2-5 years, more than 5 years). Respondents were also asked if they believed there was adequate representation of women at their local union (4-point agreement scale) and if they feel there is support for women to enter leadership positions in their local union (no, somewhat, yes). The survey also assessed whether the local union had a pre-existing mentorship program (yes/no), how involved respondents were in the mentorship program (not at all, very little, somewhat, quite a bit, very), and whether they have an informal support person or mentor figure through their union (yes/no).

Work-life balance was also assessed, by averaging responses to two questions asking respondents how hard it is to take time off work for personal or family matters and how often their job demands interfere with their personal lives (Cronbach's alpha = 0.620). The first of these questions was scored on a 4-point difficulty scale (0=very hard, 1=somewhat hard, 2=not too hard, 3=not at all hard), and the second was scored on a 4-point frequency scale (0=often, 1=sometimes, 2=rarely, 3=never).

Discrimination and harassment were evaluated as a single measure, by averaging responses to five questions (Cronbach's alpha = 0.687), asking respondents whether they feel discriminated against based on age, race/ethnicity, or gender, and whether they had been threatened, sexually harassed, or harassed in any other way (all yes/no questions). Respondents were also asked how often they had been the subject of bullying in the past 6 months (not been bullied, once or twice, now and then, about once a week, many times a week). Social determinants of health and individual characteristics were also collected, including age, race, ethnicity, sexual orientation, marital status, household income, individual perceptions of gender biases (Cronbach's alpha = 0.596), and how long they had been in the trades. Other variables collected in the survey are not discussed in this manuscript. In total, 56 tradeswomen completed the survey.

2.3 Survey Data Analysis

Raw data were downloaded from REDCap, and questions were scored and combined into scales, explained above. Some questions were reverse coded when combining questions into scales, to ensure that all questions were either in the affirmative or negative, which simplifies interpretation of the scale and its results. Descriptive statistics were then compiled for each measure.

Two-sample t-tests were performed on each of the outcomes, stratified by whether a women's committee exists at the local, to determine if the existence of a women's committee at a local union results in a significant difference in stress, social support, job satisfaction, concern of injury, anxiety, or depression. For social support, separate t-tests were performed for each of family and friends support, supervisor support, male co-worker support, female co-worker support, and overall support.

Guided by the conceptual model in Figure 2, linear regression models were developed for the outcomes of overall social support, stress, job satisfaction, concern of injury, anxiety, and depression. All six models included the three measures of gendered psychosocial exposures described by Figure 2 (discrimination and harassment, work-life balance, and bullying), as well as the extent of women's committee involvement, as predictors. Women's committee involvement was also included as an interaction term with each of discrimination and harassment, work-life balance, and bullying in all models. Demographic variables and other covariates were included if they had a significant relationship with the outcome in bivariate analyses. To increase degrees of freedom, race and sexual orientation were treated as binary variables: white compared to non-white for race, and straight/heterosexual compared to other for sexual orientation. Regression models were assessed for multicollinearity by calculating variance inflation factors (VIFs) for the predictors in each model; variables with a $VIF > 5$ would be excluded. K-fold cross-validation was used to estimate model performance outside of our sample, and to assess whether overfitting may be present.

3. Results

Demographics and individual characteristics of the tradeswomen who responded to the survey ($n=56$) are summarized in Table 1. Respondents were predominantly white (64.3%) and heterosexual (58.9%) with 0-4 years of experience in the industry (74.0%). 42.9% of respondents were between the ages of 26 and 34, and 23.2% had a household income between \$50,000 and \$74,999 (which was the most prevalent income bracket).

3.1 Descriptive Statistics

Descriptive statistics for the outcomes and predictors are summarized in Table 2.

51.8% of tradeswomen had a PSS-10 score that indicated high stress (greater than 13.7). On the PHQ-9 for depression, 48.2% had scores indicating a low likelihood of major depressive disorder (less than 5), while only 3.6% had scores indicating a high likelihood of major depressive disorder (greater than or equal to 15). On the GAD-7 for anxiety, 50.0% of respondents had low anxiety scores (less than 5), while only 5.4% had high scores (greater than or equal to 15).

Respondents had an average job satisfaction of 3.07 (on a scale of 1 to 4, with 4 indicating high satisfaction). The majority of respondents agreed or strongly agreed with all the questions in the job satisfaction measure (percent agreement ranging from 57.1% to 89.3%).

The majority of tradeswomen who responded to the survey reported either never being concerned of injury (46.4%) or being concerned less than half the time (33.9%).

Respondents had a mean overall support scores of 4.24 ($SD = 0.55$) on a scale of 1 to 5. The majority of respondents reported that their supervisors and co-workers often or always looked out for their safety at work, and could often or always be relied upon if a difficult situation arose at work. 58.9% of respondents reported that their family and friends often or always look out for

their wellbeing, and 60.7% reported that their family and friends could often or always be relied upon if a difficult situation arose.

Table 3 summarizes women's committees and other local union characteristics. 73.2% of respondents indicated that their SMART local has a women's committee. Of these, 56.1% reported not participating in their local women's committee, while 9.8% reported high participation. Of respondents who were involved in their local women's committee, 44.4% had been involved for 2 to 5 years, while the rest had been involved for less than 2 years.

T-tests indicated a significantly higher family and friends support among respondents whose local union had a women's committee compared to respondents whose local union did not have a women's committee ($p < 0.01$). No other outcomes were significantly different when stratified by existence of a women's committee.

3.2 Regression Models

Linear regression models were developed for the outcomes of stress, job satisfaction, overall social support, concern of injury, depression, and anxiety (Table 4). All models had VIFs < 3 .

Results from the model for stress (Table 4) Identifying as non-white (compared to those who identified as white) had a significant negative association with stress ($\beta = -6.68$; 95% CI: -11.69, -1.67).. Women's committee involvement had no significant interaction effects with the discrimination and harassment, bullying, or work-life balance measures, and no significant main effect on stress. This model explained 54% of the variance in stress ($R^2 = 0.54$, average R^2 from cross-validation = 0.32).

Results from the model for overall social support (Table 4) found that extent of women's committee involvement had a significant positive association with social support ($\beta = 1.24$; 95% CI: 0.26, 2.21). A one unit increase in the work-life balance measure was associated with a 0.53 unit increase in mean overall social support (95% CI: 0.10, 0.95); however, extent of women's committee involvement had a significant negative interaction effect with work-life balance on overall social support ($\beta = -0.37$; 95% CI: -0.61, -0.13), such that the overall social support of respondents who are more involved in women's committees is less affected by work-life balance. This model explained 53% of the variance in overall social support ($R^2 = 0.53$, average R^2 from cross-validation = 0.36).

Results from the model for job satisfaction (Table 4) found that a one unit increase in the bullying measure significantly decreased mean job satisfaction by 0.46 (95% CI: -0.80, -0.12). Extent of women's committee involvement had a significant positive interaction effect with the bullying measure on job satisfaction ($\beta = 0.16$; 95% CI: 0.00, 0.31), such that who are more involved in women's committees experience more reduction in job satisfaction due to increased bullying. Women's committee involvement did not have a significant main effect on job satisfaction ($\beta = -0.03$; 95% CI: -0.97, 0.91). Identifying as non-white (compared to those who identified as white) also had a significant positive association with job satisfaction ($\beta = 0.37$;

95% CI: 0.06, 0.67). This model explained 69% of the variance in job satisfaction ($R^2 = 0.69$, average R^2 from cross-validation = 0.45).

The model for concern of injury (Table 4) suggested that a one unit increase in the discrimination and harassment measure may increase mean concern of injury by 2.26 (95% CI: -0.77, 5.29). Women's committee involvement had no significant main or interaction effects on concern of injury. This model explained 29% of the variance in concern of injury ($R^2 = 0.29$, average R^2 from cross-validation = 0.14).

Results from the model for anxiety (Table 4) found that a one unit increase in stress measured by the PSS-10 significantly increased mean anxiety (GAD-7) score by 0.56 (95% CI: 0.34, 0.79). Women's committee involvement had no significant main or interactions effects on anxiety. This model explained 79% of the variance in anxiety ($R^2 = 0.79$, average R^2 from cross-validation = 0.52).

Results from the model for depression (Table 4) found that a one unit increase in stress measured by the PSS-10 significantly increased mean depression (PHQ-9) score by 0.48 (95% CI: 0.29, 0.66). Women's committee involvement had no significant main or interactions effects on depression. A one unit increase in the work-life balance measure was significantly negatively associated with depression ($\beta = -4.38$; 95% CI: -7.82, -0.94). Extent of women's committee involvement had a positive interaction effect with work-life balance on depression ($\beta = 2.88$; 95% CI: 0.81, 4.95), such that respondents who are more involved in women's committees experience less reduction in depression scores as work-life balance increases. This model explained 81% of the variance in anxiety ($R^2 = 0.81$, average R^2 from cross-validation = 0.44).

4. Discussion

While union women's committees have been identified as a possible approach to address gendered workplace exposures, research has not evaluated whether these women's committees improve psychosocial and mental health outcomes among tradeswomen.

The majority of respondents reported that a women's committee exists at their local union; however, more than half of respondents indicated that they did not participate in their local women's committee, and of those who did report participating, half indicated participating very little. These low levels of women's committee participation may indicate that tradeswomen are not interested or incentivized to participate in women's committees. As women may also take on more caregiving and domestic responsibilities than their male counterparts, it is possible that tradeswomen feel they do not have time to participate in women's committees. Further work is needed to assess factors that influence participation in women's committees among these tradeswomen.

Overall, respondents indicated high levels of social support, especially in the workplace, as more than 75.0% of respondents reported that their supervisors and co-workers looked out for their safety at work and could be relied upon if a difficult situation arose at work. Supervisor and co-worker support at local unions where a women's committee exists was not significantly different

than support at local unions without a women's committee. However, in regression analyses, women's committee involvement was significantly associated with overall social support, suggesting that actual involvement may be necessary to experience the support benefits of women's committees. Work-life balance, which was generally high among respondents, had a significant positive main effect on overall social support in regression analyses; however, women's committee involvement had a significant negative interaction effect with work-life balance on overall social support, suggesting that involvement in women's committees reduces the impact that work-life balance has on social support. Per SMART, women's committees can help tradeswomen through methods to improve work-life balance support³⁹. Therefore, it is possible that tradeswomen who participate in women's committees have greater access to work-life balance support programs, making work-life balance a less relevant predictor of overall social support. Increasing work-life balance supports provided by women's committees can not only reduce the conflict between work and personal life, but may also improve retention and facilitate recruitment of women into the industry, especially those who have more family-related responsibilities than their male counterparts.

41.1% of respondents indicated experiencing bullying in the last six months. Regression analyses found that bullying had a significant negative association with job satisfaction; however, women's committee involvement had a significant interaction effect with bullying on job satisfaction, suggesting that involvement in women's committee can mitigate the effects of bullying on job satisfaction. As bullying has previously been connected not only to job dissatisfaction⁴⁰, but also to adverse psychological outcomes⁴⁰, reduced physical health⁴¹, and increased intent to leave⁴¹⁻⁴³, the role of women's committees in mitigating the effects of bullying is important. Determining which components and programs of women's committees have the greatest impact on bullying can provide opportunities for improved or new anti-bullying programs, and therefore improve workplace health, safety, and retention. Previous qualitative research has indicated that seeking support is one of five main coping strategies among victims of workplace bullying⁴². Therefore, women's committees can further mitigate the consequences of bullying by providing support groups and positive coping resources for tradeswomen who experience bullying.

Results from our regression models indicated associations between discrimination and harassment and concern of injury, anxiety, and depression, despite all three of these outcomes being low among respondents. These results suggest that mental health outcomes among tradeswomen may be improved by intervening on discrimination and harassment. However, women's committee involvement was not observed to mitigate the effects of discrimination and harassment (or other gendered psychosocial exposures) on stress or concern of injury, as there were no significant interaction effects between women's committee involvement and any gendered exposures in the models for stress or concern of injury. It may be possible to reduce discrimination and harassment by developing mandatory training programs at the union level that address discrimination and promote inclusivity. Additional programs by women's committees that provide supports and resources to tradeswomen who experience discrimination and harassment, and empower tradeswomen to report harassment without their concerns being

minimized may be impactful in reducing psychosocial and mental health outcomes caused by workplace harassment.

Depression and anxiety were low among respondents, with approximately half of respondents scoring in the lowest categories on the PHQ-9 and GAD-7. In regression analyses, work-life balance had a significant negative main effect on depression but not on anxiety. However, women's committee involvement had a significant positive interaction effect with work-life balance on depression, suggesting that involvement in women's committees reduces the impact that work-life balance has on depression. Results from our regression models also found that stress was significantly associated with both depression and anxiety. This is consistent with literature that has identified both depression and persistent anxiety as possible consequences of stress⁴⁴. Considering that 51.8% of respondents scored higher than the average PSS-10 score of 13.7 for women in the United States³⁸, it is necessary to reduce stress in this population. Much like health and safety committees promote worker involvement to reduce workplace hazards⁴⁵, women's committees may be able to use a similar approach to reduce gendered stressors. Identifying members of the committee who will lead efforts to reduce workplace stressors, and then providing these workers with training on identifying workplace psychosocial hazards can be effective in improving psychological safety in the workplace as a whole^{45,46}. Understanding how women's committees impact psychosocial outcomes can reduce disproportionality in exposure to psychosocial stressors can improve workplace health and safety standards nation-wide, as the international SMART union spans across North America. This approach can also increase retention in the trades, which is important, as there is a shortage of skilled workers in the trades⁹⁻¹¹ and removing barriers to employment among women can be impactful in meeting demand¹⁰.

4.1 Limitations

This study has several limitations. This study works with unions; as such, tradeswomen involved in the study already have some level of support. Therefore, this study is not generalizable outside of unions. It is also not generalizable outside of the sheet metal trade, as other trade unions may have different support structures. Since this study specifically examines only tradeswomen in the SMART union, it is not generalizable to other unions, trades, or beyond unionized construction workers.

Due to the nature of recruitment in this study, local unions involved already have more than five female apprentices. As a result, this study is inherently biased to examine women's committees in local unions with larger proportions of women. It is possible that exposure to gendered psychosocial stressors is different in locals with less than five women than in those with larger tradeswomen populations; therefore, the findings of this study may not accurately reflect hazards in locals with a smaller proportion of women.

As this study uses self-report measures of psychosocial stressors, it is prone to recall bias and social desirability bias. While this study identifies programs that are effective in mitigating gendered exposures, it does not account for reverse causality. It is possible that locals with women's committees already have a more supportive environment and are innately more inclined to promote programs that improve experiences of tradeswomen independently of their

women's committees. Thus, this study cannot identify causative relationships between women's committee participation and outcomes of interest. Furthermore, the effects of women's committees can be collinear with effects of other workplace programs and characteristics, making it difficult to distinguish impacts due to women's committees or due to an overall more supportive environment.

This study was limited by its sample size (n=56, which was further limited to a sample size of 34-40 in regression models); when coupled with larger numbers of predictors in regression models, this can lead to overfitting. Cross-validation indicated low predictive accuracy in all models, which could indicate overfitting. In future and ongoing work characterizing psychosocial outcomes among tradeswomen, sufficient sample size will be needed to thoroughly explore all factors related to psychosocial and mental health outcomes. However, this study still shows promising relationships that should be explored further. This survey is cross-sectional, and therefore only reflects attitudes at the time of the sample.

5. Conclusions

Women in the construction industry are disproportionately exposed to gendered psychosocial hazards, such as bullying and discrimination⁵, which puts them at higher risk of adverse mental health outcomes and injury and may contribute to higher rates of attrition¹³. While women's committees are prevalent in SMART local unions, participation in women's committees remains low, suggesting that the current setup of women's committees may not provide enough incentive or support for tradeswomen's participation. This study shows that women's committee involvement does have a positive impact on social support and can mitigate the effects of bullying on job satisfaction. However, it remains unclear whether women's committees can reduce the impacts of other gendered exposures, and whether they have any impact on mental health outcomes such as depression and anxiety.

Despite its limitations, this study remains important to occupational health, as identifying and addressing factors related to the mental health of tradeswomen can have long-lasting positive impacts throughout the construction industry and in other similar industries. This study provides preliminary results that can inform future research on women's committees and gendered psychosocial exposures among tradeswomen, which could lead to interventions that aim to address these psychosocial exposures through women's committees. Addressing gendered psychosocial exposures in the construction industry via women's committees can reduce barriers to recruitment of women into the trades, which can help meet worker demand and promote equity in the industry.

6. Acknowledgements

This survey was funded through a CPWR and NIOSH research grant. The findings of this survey do not necessarily reflect the opinion of CPWR or NIOSH. The researchers acknowledge Lily Monsey for coordinating and facilitating the study as the UW study coordinator. The researchers also acknowledge SMART International for their collaboration in this study, and Dr. Kathleen Kerr, Dr. Antonio Olivas-Martinez, Danni Shi, and Hassan Nasif of the University of Washington Statistical Consulting Program for biostatistical consultation.

Table 1: Characteristics of survey respondents (n=56)

		n (%)
Gender	Female	53 (94.6%)
	Other	1 (1.8%)
	Prefer not to answer	2 (3.6%)
Race/Ethnicity	White	36 (64.3%)
	Hispanic/Latinx/Spanish Origin	7 (12.5%)
	Black/African	8 (14.3%)
	Multiracial	2 (3.6%)
	Other	0
	Prefer not to answer	3 (5.4%)
Age	18-25	13 (23.2%)
	26-34	24 (42.9%)
	35-44	17 (30.4%)
	45+	2 (3.6%)
Sexual Orientation	Straight/heterosexual	33 (58.9%)
	Lesbian, gay, homosexual	10 (17.9%)
	Bisexual	9 (16.1%)
	Other	0
	Prefer not to answer	4 (7.1%)
Marital Status	Married	14 (25.0%)
	Single	33 (58.9%)
	Divorced	4 (7.1%)
	Widowed	0
	Domestic Partnership	3 (5.4%)
	Prefer not to answer	2 (3.6%)
Household income	<25000	0
	25000-34999	4 (7.1%)
	35000-49999	10 (17.9%)
	50000-74999	13 (23.2%)
	75000-99999	4 (7.1%)
	100000+	11 (19.6%)
	Prefer not to answer	14 (25.0%)
Education	Less than high school	0
	Finished high school/GED	13 (23.2%)
	Trade/vocational school	9 (16.1%)
	Some college	22 (39.3%)
	Finished college	8 (14.3%)
	Masters/advanced degree	1 (1.8%)
	Prefer not to answer	3 (5.4%)
Time in industry	0-4 years	42 (74.0%)
	5-9 years	10 (17.9%)

10-14 years	3 (5.4%)
15-19 years	1 (1.8%)
20+ years	0

	Mean (SD)
Individual Perceptions of Gender Bias – average of 5 questions	3.30 (0.49)

Table 2: Outcomes of Interest and Predictors (n=56)

	n (%)	Mean (SD)
Overall Stress (<i>PSS-10: 0 = never, 1 = almost never, 2 = sometimes, 3 = fairly often, 4 = very often</i>)		15.70 (7.26)
In the last month, how often have you been upset because of something that happened unexpectedly?		1.66 (0.92)
In the last month, how often have you felt that you were unable to control the important things in your life?		1.57 (1.08)
In the last month, how often have you felt nervous and stressed?		2.04 (1.13)
In the last month, how often have you felt confident about your ability to handle your personal problems?*		1.00 (0.89)
In the last month, how often have you felt that things were going your way?*		1.73 (1.12)
In the last month, how often have you found that you could not cope with all the things that you had to do?		1.31 (1.03)
In the last month, how often have you been able to control irritations in your life?*		1.59 (0.87)
In the last month, how often have you felt that you were on top of things?*		1.54 (0.83)
In the last month, how often have you been angered because of things that happened that were outside of your control?		1.82 (0.90)
In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?		1.25 (1.00)
Distribution of stress scores		
Low Stress (<13.7)	25 (44.6%)	
High stress (>13.7)	29 (51.8%)	
Missing	2 (3.6%)	
Overall Depression (<i>PHQ-9: 0 = not at all, 1 = several days, 2 = more than half the days, 3 = nearly everyday</i>)		5.49 (4.58)

Little interest or pleasure in doing things?	
Feeling down, depressed, or hopeless?	0.55 (0.63)
Trouble falling or staying asleep, or sleeping too much?	0.63 (0.82)
Feeling tired or having little energy?	0.84 (0.85)
Poor appetite or overeating?	1.11 (0.79)
Feeling bad about yourself — or that you are a failure or have let yourself or your family down?	0.80 (0.90)
Trouble concentrating on things, such as reading the newspaper or watching television?	0.70 (0.87)
Moving or speaking so slowly that other people could have noticed? Or so fidgety or restless that you have been moving a lot more than usual?	0.77 (0.95)
Little interest or pleasure in doing things?	0.25 (0.61)

Distribution of depression scores

Low (<5)	27 (48.2%)
Mild (5-9)	20 (35.7%)
Moderate (10-14)	6 (10.7%)
High (≥15)	2 (3.6%)
Missing	1 (1.8%)

Overall anxiety (*GAD-7*: 0 = not at all, 1 = several days, 2 = more than half the days, 3 = nearly every day) 5.80 (4.76)

Feeling nervous, anxious, or on edge	0.89 (0.78)
Not being able to stop or control worrying	0.84 (0.99)
Worrying too much about different things	1.04 (0.89)
Trouble relaxing	0.80 (0.80)
Being so restless that it's hard to sit still	0.50 (0.76)
Becoming easily annoyed or irritable	1.13 (0.92)
Feeling afraid as if something awful might happen	0.61 (0.87)

Distribution of anxiety scores

Low (<5)	28 (50.0%)
Mild (5-9)	18 (32.1%)
Moderate (10-14)	7 (12.5%)
High (≥15)	3 (5.4%)
Missing	0

Job Satisfaction⁺ – total average 3.04 (0.56)

Number of respondents who somewhat or strongly agree that...

The chances for promotion are good	32 (57.1%)
My fringe benefits are good	50 (89.3%)
Promotions are handled fairly	33 (58.9%)
The job security is good	37 (66.1%)
I am proud to be working for my employer	49 (87.5%)

Concern of Injury

Never or almost never	26 (46.4%)
Less than half the time	19 (33.9%)

About half the time	4 (7.1%)	
More than half the time	4 (7.1%)	
Always or almost always	3 (5.4%)	
Overall Support (<i>average of supervisor, co-worker, family and friends support</i>)		4.24 (0.55)
Supervisor support		4.17 (0.79)
<i>Number of respondents who responded "always" or "often"</i>		
Supervisor looks out for your safety at work.	45 (80.4%)	
Supervisor can be relied upon when a difficult situation arises at work.	42 (75.0%)	
Male Co-worker support		4.13 (0.79)
<i>Number of respondents who responded "always" or "often"</i>		
Male co-workers look out for your safety at work.	45 (80.4%)	
Male co-workers can be relied upon when a difficult situation arises at work.	44 (78.6%)	
Female Co-worker support		4.91 (1.79)
<i>Number of respondents who responded "always" or "often"</i>		
Female co-workers look out for your safety at work.	22 (39.3%)	
<i>No female co-workers</i>	23 (41.1%)	
Female co-workers can be relied upon when a difficult situation arises at work.	26 (46.4%)	
<i>No female co-workers</i>	22 (39.3%)	
Family and Friends support		3.76 (0.94)
<i>Number of respondents who responded "always" or "often"</i>		
Family and friends look out for your overall wellbeing.	33 (58.9%)	
Family and friends can be relied upon when a difficult situation arises.	34 (60.7%)	
Work-life balance – <i>average of two questions (higher score indicates more work-life balance)</i>		1.74 (0.73)
How hard is it to take time off during your work to take care of personal or family matters? (0=very hard, 1=somewhat hard, 2=not too hard, 3=not at all hard) – number who responded "very hard" or "somewhat hard"*	22 (39.3%)	
How often do the demands of your job interfere with your family life or personal time? (0=often, 1=sometimes, 2=rarely, 3=never) – number who responded "sometimes" or "often"	21 (37.5%)	
Subject to bullying in last 6 months		
Not subject to bullying	33 (58.9%)	
Once or twice	9 (16.1%)	
Now and then	11 (19.6%)	
About once a week	3 (5.4%)	
Many times a week	0	
Discrimination and Harassment		
<i>Number who responded "yes"</i>		

At your current or most recent jobsite, do you feel in any way discriminated against because of your age?	9 (16.1%)
At your current or most recent jobsite, do you feel in any way discriminated against because of your race or ethnic origin?	7 (12.5%)
At your current or most recent jobsite, do you feel in any way discriminated against because of your gender?	25 (44.6%)
At your current or most recent jobsite, were you sexually harassed by anyone? (<i>Includes any unwelcome sexual advances</i>)	8 (14.3%)
At your current or most recent jobsite, were you threatened or harassed in any other way by anyone?	11 (19.6%)

For all scales, higher scores indicate a more positive outcome.

*Indicates items that were reverse coded

[†]Questions measured on a 4-point agreement scale (1 = strongly disagree, 2= disagree, 3 = agree, 4 = strongly agree)

Table 3: Women's Committees and Union Characteristics (n=56)

	n (%)
Does local have women's committee?	
Yes	41 (73.2%)
No	15 (26.8%)
Missing	
Involvement in women's committee? (% respondents at locals with women's committee)	
Not at all	23 (56.1%)
Very little	9 (22.0%)
Somewhat	5 (12.2%)
Quite a bit	0
Very	4 (9.8%)
Length of involvement (% respondents of those involved in women's committee)	
<6 months	4 (22.2%)
6 months-1 year	4 (22.2%)
1-2 years	2 (11.1%)
2-5 years	8 (44.4%)
5+ years	0
Adequate representation of women in local union?	
Strongly disagree	4 (7.1%)
Disagree	24 (42.9%)
Agree	22 (39.3%)
Strongly agree	6 (10.7%)
Support person/mentor at union?	
Yes	34 (60.7%)
No	22 (39.3%)
Does SMART local have formal mentorship?	
Yes	25 (44.6%)
No	29 (51.8%)
Missing	2 (3.6%)
Involvement in mentorship	
Not at all	8 (32.0%)
Very little	3 (12.0%)
Somewhat	11 (44.0%)
Quite a bit	3 (12.0%)
Very	0

Support for women assuming leadership in union?

No	8 (14.3%)
Somewhat	30 (53.6%)
Yes	17 (30.4%)
Missing	1 (1.8%)

Table 4: Regression analyses for social support, stress, job satisfaction, concern of injury, depression, and anxiety

Predictors	Overall Social Support (n=37)		Stress (n=35)		Job Satisfaction (n=36)		Concern of Injury (n=40)		Anxiety (n=34)		Depression (n=35)	
	β	95% CI	β	95% CI	β	95% CI	β	95% CI	β	95% CI	β	95% CI
More women's committee involvement	1.24*	0.26, 2.21	0.26	-14.42, 14.94	-0.03	-0.97, 0.91	-0.11	-2.42, 2.20	1.63	-7.64, 10.90	-4.79	-13.01, 3.44
Increased Discrimination and harassment	1.06	-0.26, 2.38	21.66	-0.44, 43.75	-0.25	-1.43, 0.92	2.26	-0.77, 5.29	4.69	-9.98, 19.36	1.96	-11.53, 15.45
<i>Women's committee involvement interaction effect</i>	-0.54	-1.20, 0.24	-4.13	-14.04, 5.78	-0.36	-0.96, 0.23	-0.58	-2.05, 0.90	-3.29	-9.29, 2.71	-1.62	-7.08, 3.85
Increased Bullying	-0.36	-0.75, 0.03	-0.74	-6.21, 4.73	-0.46*	-0.80, -0.12	-0.43	-1.28, 0.43	-0.41	-3.95, 3.13	-1.44	-4.74, 1.86
<i>Women's committee involvement interaction effect</i>	0.06	-0.12, 0.24	0.23	-2.21, 2.68	0.16	0.00, 0.31	0.29	-0.11, 0.69	0.04	-1.43, 1.50	0.45	-0.91, 1.82
Increased Work-life balance	0.53	0.10, 0.95	-3.63	-9.26, 2.01	-0.15	-0.52, 0.21	-0.29	-1.26, 0.69	-1.22	-4.97, 2.54	-4.38*	-7.82, -0.94
<i>Women's committee involvement interaction effect</i>	-0.37*	-0.61, -0.13	2.05	-1.30, 5.40	0.05	-0.17, 0.27	0.21	-0.36, 0.78	1.05	-1.27, 3.37	2.88*	0.81, 4.95
Mentorship program exists at local	0.08	-0.24, 0.40	--	--	--	--	--	--	--	--	--	--
Higher PSS Score									0.56*	0.34, 0.79	0.48*	0.29, 0.66
More Job Satisfaction									-2.43	-5.83, 0.97	-2.37	-5.35, 0.61

More Overall social support									1.00	-2.36, 4.37	0.73	-2.30, 3.77
Higher Concern of Injury									0.19	-1.36, 1.73	1.08	-0.27, 2.43
Race, non-White compared to White	--	--	-6.68*	-11.69, -1.67	0.37	0.06, 0.67	--	--	2.06	-1.21, 5.32	--	--
Employed in construction for longer	--	--	--	--	--	--	-0.18	-0.66, 0.30	--	--	--	--

Grey cells indicate that the predictor is not applicable for the outcome.

xx Indicates missing data

-- Indicates that the covariate was excluded from the model, as it did not have a relationship ($p \leq 0.10$) with the outcome in bivariate analyses. Note that the predictors of interest (discrimination, bullying, work-life balance, women's committee involvement) were included in all models regardless of p-values. Similarly, for anxiety and depression models, PSS score, overall support, job satisfaction, and concern of injury were included regardless of p-values, based on the conceptual model in Figure 2.

Bold indicates $p\text{-value} \leq 0.05$

**Indicates $p\text{-value} \leq 0.01$*

References

- 1 OSHA. *Worker Safety Series - Construction*. 2005. URL: <https://www.osha.gov/Publications/OSHA3252/3252.html> (Accessed 25 October 2020).
- 2 ILO. *Construction: a hazardous work*. 2015. URL: https://www.ilo.org/global/topics/safety-and-health-at-work/areasofwork/hazardous-work/WCMS_356576/lang--en/index.htm (Accessed 25 October 2020).
- 3 Bodner T, Kraner M, Bradford B, Hammer L, Truxillo D. Safety, Health, and Well-Being of Municipal Utility and Construction Workers. *Journal of Occupational and Environmental Medicine* 2014;**56**:771–8. <https://doi.org/10.1097/JOM.000000000000178>.
- 4 Riggall M, Skues J, Wise L. Apprenticeship bullying in the building and construction industry. *Education + Training* 2017;**59**:502–15. <https://doi.org/10.1108/ET-09-2016-0150>.
- 5 Curtis HM, Meischke H, Stover B, Simcox NJ, Seixas NS. Gendered Safety and Health Risks in the Construction Trades. *Annals of Work Exposures and Health* 2018;**62**:404–15. <https://doi.org/10.1093/annweh/wxy006>.
- 6 US Department of Labor, Bureau of Labor Statistics. *Construction Laborers and Helpers : Occupational Outlook Handbook: : U.S. Bureau of Labor Statistics*. 2020. URL: <https://www.bls.gov/ooh/construction-and-extraction/construction-laborers-and-helpers.htm#tab-6> (Accessed 20 March 2021).
- 7 Associated General Contractors. *The Economic Impact of Construction in the United States and Washington*. 2020. URL: <https://www.agc.org/sites/default/files/Files/Construction%20Data/WA.pdf> (Accessed 9 March 2021).
- 8 US Department of Labor, Bureau of Labor Statistics. *Construction and Extraction Occupations : Occupational Outlook Handbook: : U.S. Bureau of Labor Statistics*. 2020. URL: <https://www.bls.gov/ooh/construction-and-extraction/home.htm> (Accessed 20 March 2021).
- 9 Clarke L, Herrmann G. Skill shortages, recruitment and retention in the house building sector. *Personnel Review* 2007;**36**:509–27. <https://doi.org/10.1108/00483480710752777>.
- 10 Clarke L, Gribling M. Obstacles to diversity in construction: the example of Heathrow Terminal 5. *Construction Management & Economics* 2008;**26**:1055–65. <https://doi.org/10.1080/01446190802326776>.
- 11 Associated General Contractors. *2020 Sage Construction Hiring and Business Outlook Survey | Associated General Contractors of America*. 2019. URL: <https://www.agc.org/news/2019/12/18/2020-sage-construction-hiring-and-business-outlook-survey> (Accessed 21 March 2021).
- 12 US Department of Labor, Bureau of Labor Statistics. *Employed persons by detailed occupation, sex, race, and Hispanic or Latino ethnicity*. 2020. URL: <https://www.bls.gov/cps/cpsaat11.htm> (Accessed 9 March 2021).
- 13 Bilginsoy C. The Hazards of Training: Attrition and Retention in Construction Industry Apprenticeship Programs. *Industrial and Labor Relations Review* 2003;**57**:54–67. <https://doi.org/10.2307/3590981>.
- 14 Goldenhar LM, Sweeney MH. Tradeswomen’s perspectives on occupational health and safety: A qualitative investigation. *American Journal of Industrial Medicine* 1996;**29**:516–20. [https://doi.org/10.1002/\(SICI\)1097-0274\(199605\)29:5<516::AID-AJIM11>3.0.CO;2-3](https://doi.org/10.1002/(SICI)1097-0274(199605)29:5<516::AID-AJIM11>3.0.CO;2-3).

- 15 Onyebeke LC, Papazaharias DM, Freund A, Dropkin J, McCann M, Sanchez SH, *et al.* Access to properly fitting personal protective equipment for female construction workers. *Am J Ind Med* 2016;**59**:1032–40. <https://doi.org/10.1002/ajim.22624>.
- 16 Ontario Women’s Directorate. *Personal protective equipment for women: Addressing the need*. Industrial Accident Prevention Association. 2006. URL: <https://elcosh.org/record/document/1198/d001110.pdf> (Accessed 9 March 2021).
- 17 Goldenhar LM, Swanson NG, Hurrell JJr, Ruder A, Deddens J. Stressors and adverse outcomes for female construction workers. *Journal of Occupational Health Psychology* 1998;**3**:19–32. <https://doi.org/10.1037/1076-8998.3.1.19>.
- 18 Moir S, Thomson M, Kelleher C. Unfinished Business: Building Equality for Women in the Construction Trades. *Labor Resource Center Publications* 2011.
- 19 McCormack D, Djurkovic N, Casimir G. Workplace bullying: the experiences of building and construction apprentices. *Asia Pacific Journal of Human Resources* 2013;**51**:406–20. <https://doi.org/10.1111/1744-7941.12014>.
- 20 Denissen AM. Crossing the Line: How Women in the Building Trades Interpret and Respond to Sexual Conduct at Work. *Journal of Contemporary Ethnography* 2010;**39**:297–327. <https://doi.org/10.1177/0891241609341827>.
- 21 Dainty AR, Lingard H. Indirect Discrimination in Construction Organizations and the Impact on Women’s Careers. *J Manage Eng* 2006;**22**:108–18. [https://doi.org/10.1061/\(ASCE\)0742-597X\(2006\)22:3\(108\)](https://doi.org/10.1061/(ASCE)0742-597X(2006)22:3(108)).
- 22 Fielden SL, Davidson MJ, Gale AW, Davey CL. Women in construction: the untapped resource. *Construction Management & Economics* 2000;**18**:113–21. <https://doi.org/10.1080/014461900371004>.
- 23 Shannon HS, Robson LS, Sale JEM. Creating safer and healthier workplaces: Role of organizational factors and job characteristics*. *American Journal of Industrial Medicine* 2001;**40**:319–34. <https://doi.org/10.1002/ajim.1106>.
- 24 Phillips K. *Achieving Gender Equality - A Trade Union Manual*. 2008. URL: https://www.ituc-csi.org/IMG/pdf/manuel_ENGOK.pdf (Accessed 3 February 2021).
- 25 Weil D. Enforcing OSHA: The Role of Labor Unions. *Industrial Relations: A Journal of Economy and Society* 1991;**30**:20–36. <https://doi.org/10.1111/j.1468-232X.1991.tb00773.x>.
- 26 Reilly B, Paci P, Holl P. Unions, Safety Committees and Workplace Injuries. *British Journal of Industrial Relations* 1995;**33**:275–88. <https://doi.org/10.1111/j.1467-8543.1995.tb00435.x>.
- 27 Gregory A, Milner S. Trade Unions and Work-life Balance: Changing Times in France and the UK? *British Journal of Industrial Relations* 2009;**47**:122–46. <https://doi.org/10.1111/j.1467-8543.2008.00710.x>.
- 28 SMART. *International Association of Sheet Metal, Air, Rail and Transportation Workers*. n.d. URL: <https://smart-union.org/> (Accessed 20 March 2021).
- 29 Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)—A metadata-driven methodology and workflow process for providing translational research informatics support. *Journal of Biomedical Informatics* 2009;**42**:377–81. <https://doi.org/10.1016/j.jbi.2008.08.010>.
- 30 Harris PA, Taylor R, Minor BL, Elliott V, Fernandez M, O’Neal L, *et al.* The REDCap consortium: Building an international community of software platform partners. *Journal of Biomedical Informatics* 2019;**95**:103208. <https://doi.org/10.1016/j.jbi.2019.103208>.

- 31 Christian MS, Bradley JC, Wallace JC, Burke MJ. Workplace safety: a meta-analysis of the roles of person and situation factors. *J Appl Psychol* 2009;**94**:1103–27. <https://doi.org/10.1037/a0016172>.
- 32 Nakata A, Ikeda T, Takahashi M, Haratani T, Hojou M, Fujioka Y, *et al.* Impact of psychosocial job stress on non-fatal occupational injuries in small and medium-sized manufacturing enterprises. *Am J Ind Med* 2006;**49**:658–69. <https://doi.org/10.1002/ajim.20338>.
- 33 Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav* 1983;**24**:385–96.
- 34 NIOSH. *Organization of Work: Generic Job Stress Questionnaire*. 2021. URL: <https://www.cdc.gov/niosh/topics/workorg/detail088.html> (Accessed 1 April 2022).
- 35 Spector PE. *Job Satisfaction: Application, Assessment, Causes, and Consequences*. SAGE; 1997.
- 36 Spitzer RL, Kroenke K, Williams JBW, Löwe B. A Brief Measure for Assessing Generalized Anxiety Disorder: The GAD-7. *Archives of Internal Medicine* 2006;**166**:1092–7. <https://doi.org/10.1001/archinte.166.10.1092>.
- 37 Kroenke K, Spitzer RL, Williams JBW. The PHQ-9. *J Gen Intern Med* 2001;**16**:606–13. <https://doi.org/10.1046/j.1525-1497.2001.016009606.x>.
- 38 Cohen S. Perceived stress in a probability sample of the United States. *The social psychology of health*. Thousand Oaks, CA, US: Sage Publications, Inc; 1988. p. 31–67.
- 39 SMART. *Build A Committee*. SMART Women. 2018. URL: <https://www.smart-local.org/smart-women/resources/build-committee> (Accessed 18 April 2022).
- 40 Quine L. Workplace Bullying, Psychological Distress, and Job Satisfaction in Junior Doctors. *Cambridge Quarterly of Healthcare Ethics* 2003;**12**:91–101. <https://doi.org/10.1017/S0963180103121111>.
- 41 Nielsen MB, Einarsen S. Outcomes of exposure to workplace bullying: A meta-analytic review. *Work & Stress* 2012;**26**:309–32. <https://doi.org/10.1080/02678373.2012.734709>.
- 42 Karatuna I. Targets' coping with workplace bullying: a qualitative study. *Qualitative Research in Organizations and Management: An International Journal* 2015;**10**:21–37. <https://doi.org/10.1108/QROM-09-2013-1176>.
- 43 Hollis L. *Evasive Actions: The Gendered Cycle of Stress and Coping for Those Enduring Workplace Bullying in American Higher Education*. Rochester, NY: Social Science Research Network; 2017.
- 44 Colligan TW, Higgins EM. Workplace Stress. *Journal of Workplace Behavioral Health* 2006;**21**:89–97. https://doi.org/10.1300/J490v21n02_07.
- 45 Crollard A, Neitzel R, Dominguez C, Seixas N. Training for an Effective Health and Safety Committee in a Small Business Setting. *New Solutions* 2013;**23**:485–503. <http://dx.doi.org/10.2190/NS.23.3.d>.
- 46 Seixas NS, Crollard A, Neitzel R, Stover B, Dominguez C. Intervening at the bottom: can a health and safety committee intervention influence management commitment? *Policy and Practice in Health and Safety* 2013;**11**:61–78.