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RESEARCH ARTICLE

# Perceived Workplace Health and Safety Climates: Associations With Worker Outcomes and Productivity

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**Introduction:** This study investigates the associations between perceived workplace health and safety climates and a variety of worker and employer outcomes.

**Methods:** Self-reported data were collected from an employee health assessment offered at 3 companies ($n$=959) in 2014. Independent variables included 2 climate variables: perceived safety climate and perceived health and well-being climate. Logistic regression models, performed in 2016–2017, explored the associations between the 2 climate variables and 3 sets of outcomes: worker outcomes, worker health behaviors, and employer outcomes.

**Results:** Perceived workplace safety climate was positively associated with physical activity and optimal sleep. Stronger perceived workplace health and well-being and safety climates were related to less depression, higher job and life satisfaction, less back pain, and higher general health. Stronger perceived climates of workplace safety and health and well-being were associated with less productivity loss.

**Conclusions:** Conditions of work, such as perceived climate, are associated with improved worker behaviors (physical activity and sleep), worker outcomes (depression, job and life satisfaction, back pain, and general health), and employer (productivity) outcomes.

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## INTRODUCTION

In recent years, the field of worker health and safety has seen the emergence of interventions aimed at simultaneously protecting and promoting both worker health and worker safety.[1] Much of this work has been guided by the National Institute for Occupational Safety and Health's Total Worker Health (TWH) program. TWH is defined as policies, programs, and practices that integrate protection from work-related safety and health hazards with the promotion of injury and illness prevention efforts to advance worker well-being.[2]

As a center of excellence within the TWH Program, the Center for Work, Health, & Well-being (CWHW) at the Harvard T.H. Chan School of Public Health has developed a conceptual model to specify the causal pathways through which policies, programs, and practices are expected to influence worker health and safety outcomes.[3] The present research seeks to assess the overall conceptual model by exploring select sections of the model illustrated in Figure 1. The framework used to support this analysis is guided by the key assumption

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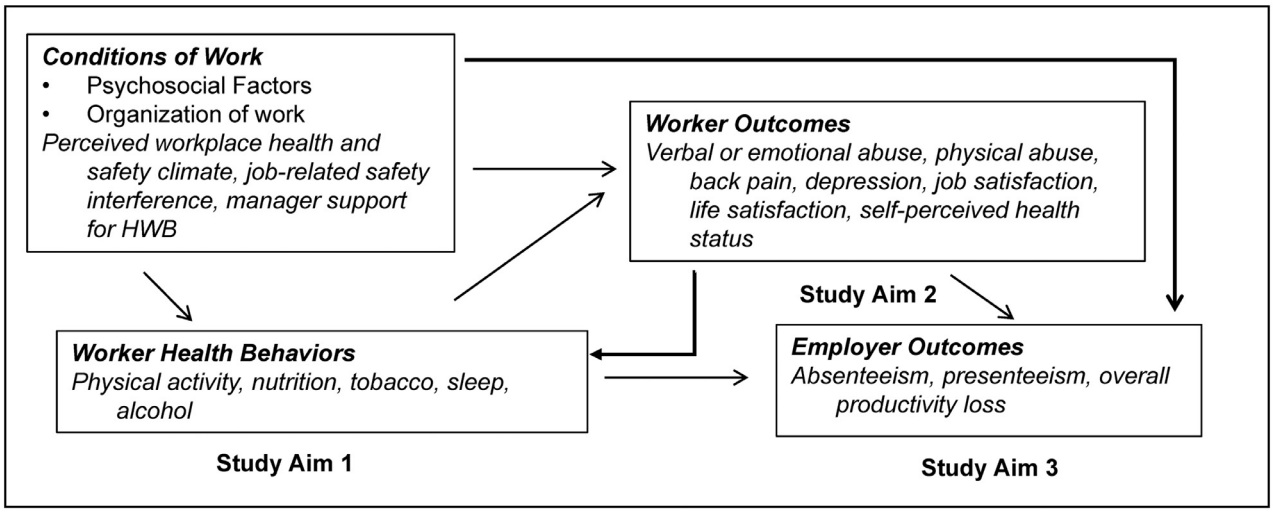


**Figure 1.** Conceptual model adapted from Sorensen et al.[3]
HWB, health and well-being.

that conditions of work include both psychosocial and organizational factors. This study sought to measure the conditions of work using self-reported measures of perceived workplace health and workplace safety climates.

Workplace climate refers to how employees experience and perceive their workplaces. This includes perceptions about their job, as well as organizational practices, procedures, and behaviors that are rewarded and supported.[4] Prior research has demonstrated that workplace climate affects job satisfaction, accident risk, and injury rates.[5–7] This study seeks to investigate the relationship between perceived health and safety climates to outcomes at both the individual level (worker outcomes and worker health behaviors) and organizational level (employer outcomes). Because employee safety and health promotion programs have historically functioned independently within organizations,[8] this study utilizes 2 measures of perceived workplace climate: the health and well-being (HWB) climate and workplace safety climate.

The first aim of the investigation is to test the associations between perceived organizational safety and HWB climates and worker health behaviors. Behaviors include the following: physical activity, nutrition, tobacco use, sleep, and alcohol use. The second aim is to test the associations between perceived organizational safety and HWB climates and worker outcomes including physical abuse, emotional abuse, depression, job satisfaction, life satisfaction, back pain (frequency and impact on daily life), and self-perceived general health. The third aim is to test the associations between perceived organizational safety and HWB climates and 2 different productivity indicators: the Work Limitations Questionnaire[9] (WLQ) and the Work Productivity and Activity Impairment scale (WPAI).[10]

## METHODS

### Study Sample

Data used in this research were obtained as part of a pilot intervention study disseminating an approach developed at Harvard's CWHW.[11] The CWHW offers guidelines for employers, providing organizational-level tactics to enhance worker safety and HWB. The approach promotes efforts to ensure a safe and healthy work environment by developing policies, programs, and practices that create positive working conditions that often drive safety and HWB at the workplace. Participating companies included 3 medium-sized manufacturing companies (approximately 450 employees each) in Minneapolis during 2014–2015. As part of the study, employees at the participating companies completed a baseline health risk assessment in 2014 ($n$=959; 53% response rate). Data from this baseline assessment were used in this study, representing a cross-sectional approach. The study protocol was reviewed and approved by the HealthPartners IRB.

### Measures

The HealthPartners Health Assessment (HA) is an evidence-based employee assessment described elsewhere in the literature.[12] Using a series of self-reported questions, the HA evaluates individual health status, measures disease risk, and captures behavioral traits and self-reported productivity.

The HA included 2 questions about perceived workplace climate. The first asked, *Overall, how well do you think your workplace promotes your overall health and well-being?* The second asked, *Overall, how safe do you think your workplace is?* The original variables were coded from 0 to 10, with 10 indicating a strong safety or HWB climate. Data exploration techniques (histograms and scatterplots) were used to gauge the distribution of the responses to each of the climate questions. For both questions, the distribution of responses revealed a natural break point at 8; values ≥8 were recoded as having a "stronger" climate and those with ≤7 as having a "weaker" climate. The choice to dichotomize the independent variables was a deliberate one based on the

distribution of the original scale variables, where there were few responses in the 0–7 range and >80% of responses in the range of ≥8. Owing to this distribution, scores ≤7 were categorized as representing a "weaker" climate and those ≥8 as having a "stronger" climate. This choice was designed to help the reader interpret the results for practical application. The final binary safety and HWB climate variables were coded with 0=weaker climate and 1=stronger climate.

All dependent variables were expressed as binary variables. Physical activity, nutrition, sleep, satisfaction (job and life), and general health were coded with 1 being the optimal state. Tobacco, alcohol, abuse (physical and emotional), back pain (frequency and severity), and depression were coded with 0 as the optimal state. As was the case with the 2 independent variables, this was a deliberate choice designed to help the reader interpret the results for practical application. Definitions of the optimal states are included in Table 1.

Two validated productivity measures were included in the HA: the WLQ[9] and the WPAI.[10] The short form WLQ consists of 8 questions and is designed to measure on-the-job limitations owing to health in 4 categories: physical demands, time management, mental–interpersonal, and work output. The recall period for the WLQ is the past *2* weeks and responses are scored on a 5-point scale, including options for *all of the time*, *most of the time*, *some of the time*, *a slight bit of the time*, and *none of the time*. The WLQ scores for each of the 8 questions were averaged, resulting in a scale from 0 to 5. The WPAI consists of 6 questions designed to measure: (1) the amount of work time missed because of health-related and nonhealth-related issues, (2) the number of hours actually worked, and (3) the degree to which a person's health affects both work productivity and regularly scheduled activities. The recall period for all questions is the past *seven* days. The WPAI measure is a coefficient and was calculated for each respondent using the 6 questions from the HA based on the methodology previously described and validated by Reilly and colleagues.[10] Data exploration techniques were used again to view the distribution of responses to each of the productivity scales and to select natural break points for the creation of binary variables. WPAI coefficients equal to 0 were categorized as having "lower" productivity loss and coefficients >0 were categorized as having "higher" productivity loss. The final binary WPAI measure was coded as 1=higher productivity loss and 0=lower productivity loss. WLQ scores ≤4 were categorized as having "lower" work limitations and scores >4 were categorized as having "higher" work limitations. The final binary WLQ measure was coded as 1=higher work limitations and 0=lower work limitations.

### Statistical Analysis

A series of logistic regression models were conducted from 2016 to 2017 corresponding to the 3 specific aims. A two-step approach to modeling was used. Initial bivariate models tested the relationship between the independent and dependent variables alone. When initial models demonstrated significant effects (statistical significance set at the 0.05 level), full models were analyzed including covariates. Full models were adjusted for age, gender, education, and job type.

## RESULTS

The study population started with 1,810 eligible employees across the 3 participating companies. Of these, 959 employees completed the HA in 2014 (53% response rate). It should be noted that 2 of the 3 participating sites experienced HA response rates >60%, higher than the average participation rate for workplace wellness programs.[13] The last of the 3 participating sites experienced low engagement and a HA response rate of only 23%. After adjusting the sample for missing and incomplete data, the final sample of 904 employees was used for the analyses. Table 1 presents descriptive characteristics of the population. No major differences were identified between the 3 participating sites. The population can be described as young (average age, 40 years) and primarily male (74%). About half of the population had a college education (48%), and 56% were office workers. Many respondents (40%) indicated that back pain had an impact on their daily life. Additionally, 48% of respondents reported experiencing depression, and 14% reported experiencing emotional abuse in the past year.

Results from the full models with covariates are presented below. The perceived safety climate and HWB climate variables were associated with a limited number of the considered worker health behaviors (Table 2). After controlling for age, gender, level of education, and job type, a stronger perceived workplace safety climate was associated with optimal sleep (OR=1.82, 95% CI=1.35, 2.45) and physical activity (OR=1.56, 95% CI=1.09, 2.22). A stronger perceived HWB climate was associated with optimal sleep, although not at the 0.05 significance threshold (OR=1.32, 95% CI=0.99, 1.76, $p$=0.058).

Perceived workplace safety climate was found to be associated with most of the considered worker outcomes (Table 2). Workplaces with stronger perceived safety climates were associated with less back pain (OR=0.63, 95% CI=0.47, 0.84) and fewer reports of the impact of back pain on daily life (OR=0.67, 95% CI=0.50, 0.89). Strong perceived safety climates were associated with higher job satisfaction (OR=3.28, 95% CI=2.27, 4.73) and life satisfaction (OR=3.57, 95% CI=2.53, 5.03). Additionally, a stronger perceived safety climate was associated with less depression (OR=0.70, 95% CI=0.52, 0.92) and higher self-perceived general health (OR=1.92, 95% CI=1.43, 2.59). Similar effects were found using the measure of perceived workplace HWB climate.

Both perceived safety and HWB climate variables were found to relate to overall productivity loss using the WPAI. Workplaces with stronger climates of safety and HWB were associated with less productivity loss (Table 2). Stated another way, the odds that an employee will experience productivity loss are lower for those who report a strong climate of workplace safety (OR=0.54, 95% CI=0.39, 0.75) and climate of HWB (OR=0.49, 95% CI=0.36, 0.68). The short form WLQ was not associated with either climate variable.

**Table 1.** Descriptive Characteristics of the Study Population

| Variable/category | % (n) (N=904[a]) |
|---|---|
| Perceived climate of HWB (0–10 scale; 0=workplace doesn't promote HWB and 10=workplace promotes HWB extremely well) | |
| Weaker perceived climate (<8) | 44.4 (401) |
| Stronger perceived climate (8–10) | 55.6 (503) |
| Perceived climate of safety (0–10 scale; 0=extremely unsafe and 10=extremely safe) | |
| Weaker perceived climate (<8) | 32.3 (292) |
| Stronger perceived climate (8–10) | 67.7 (612) |
| Physical activity (HHS guideline: at least 150 minutes of moderate to vigorous physical activity per week) | |
| Does not meet guideline | 18.1 (164) |
| Meets guideline | 81.9 (740) |
| Nutrition (U.S. dietary guidelines of at least 5 fruits/vegetables per day) | |
| Does not meet guideline | 78.7 (711) |
| Meets guideline | 21.3 (193) |
| Tobacco use (any tobacco including cigarettes, cigars, pipe, snuff, or chew) | |
| Not tobacco user | 90.5 (818) |
| Tobacco user | 9.5 (86) |
| Sleep (optimal sleep defined as 7–8 hours per night) | |
| Not optimal sleep | 29.6 (268) |
| Optimal sleep | 70.4 (636) |
| Alcohol (*n*=896; low risk defined as one or fewer drinks per day for women and 2 or fewer drinks per day for men) | |
| Low risk alcohol | 94.2 (844) |
| High risk alcohol | 5.8 (52) |
| Emotional abuse (*n*=854; past year self-report of any emotional abuse in or outside of the work site [e.g., being threatened, intimidated, insulted, or controlled]) | |
| Reported abuse in past year | 14.5 (124) |
| No abuse reported in past year | 85.5 (730) |
| Physical abuse (*n*=872; past year self-report of any physical abuse in or outside of the work site [e.g., being hit, kicked, or choked]) | |
| Reported abuse in past year | 4.5 (39) |
| No abuse reported in past year | 95.5 (833) |
| Depression (self-reported depression; that is, reported feeling depressed) | |
| No reported depression | 54.6 (494) |
| Self-reported depression sometimes or most of the time | 45.4 (410) |
| Job satisfaction (0–10 scale with 0=not at all satisfied and 10=extremely satisfied) | |
| Lower job satisfaction (<9) | 70.2 (635) |
| High job satisfaction (9 or 10) | 29.8 (269) |
| Life satisfaction (0–10 scale with 0=not at all satisfied and 10=extremely satisfied) | |
| Lower life satisfaction (<9) | 64.5 (853) |
| High life satisfaction (9 or 10) | 35.5 (321) |
| Back pain | |
| Frequency of back pain | |
| Pain rarely or never | 61.8 (559) |
| Pain always or sometimes | 38.2 (345) |
| Impact of back pain on daily activities of life (0–10 scale with 0=no interference with daily activities and 10=unable to carry on daily activities) | |
| Doesn't interfere with daily activities (0) | 60.0 (542) |
| Interferes with daily activities (1–10) | 40.0 (362) |
| Self-perceived general health | |
| Poor, fair, or good health | 31.1 (281) |

(*continued on next page*)

**Table 1.** Descriptive Characteristics of the Study Population (*continued*)

| Variable/category | % (n) (N=904[a]) |
|---|---|
| Very good or excellent health | 68.9 (623) |
| Work limitations (Work Limitations Questionnaire, *n*=804, 1–5 scale) | |
| Lower work limitations (≤4) | 30.2 (243) |
| Higher work limitations (>4) | 69.8 (561) |
| Productivity loss (Work Productivity and Activity Impairment scale, *n*=924, 0%–100%) | |
| Higher productivity loss (>0) | 23.8 (220) |
| Lower productivity loss (0) | 76.2 (704) |
| Age, years | |
| 18–44 | 68.3 (617) |
| 45 and over | 31.7 (287) |
| Sex | |
| Male | 73.7 (666) |
| Female | 26.3 (238) |
| Job type | |
| Office worker | 56.3(509) |
| Other | 43.7 (395) |
| Education | |
| Less than college degree | 51.9 (470) |
| College degree or more | 48.0 (434) |

[a]Unless otherwise noted.
HWB, health and well-being.

## DISCUSSION

Using a cross-sectional sample of working adults, this study sought to investigate select pathways related to worker and employer outcomes specified in a conceptual model. Specifically, the study demonstrated associations between conditions of work (perceived workplace safety climate and perceived HWB climate) and select worker health behaviors (physical activity, sleep), worker outcomes (back pain, depression, general health, job satisfaction, and life satisfaction), and employer outcomes (productivity loss).

This study is among the first in a new wave of research addressing TWH principles. The sample population included more than 900 working adults across 3 companies implementing an integrated intervention.[1] This study is distinguished by the richness of the HA data set and the unique ability to explore a variety of indicators related to worker health behaviors, worker outcomes, and employer outcomes.

Some findings from this study confirm previous research linking work climate to worker outcomes such as stress and psychological distress,[14,15] as well as job satisfaction and back pain.[16,17] This work adds additional evidence supporting associations linking perceived workplace climate to worker health behaviors such as sleep and physical activity, as well as enterprise productivity outcomes. Though much of the existing scholarship has focused on the impact of workplace safety climate,[18] this study provides additional evidence that a perceived workplace climate of HWB impacts worker outcomes, health behaviors, and enterprise outcomes.

In addition to supporting associations documented in the conceptual model, the present work points to select differences in the behavior of specific indicators within the model. Although both measures of perceived climate performed similarly in relation to Aims 2 (worker outcomes) and 3 (employer outcomes) of this study, it was observed that the perceived HWB climate does not have similar associations to worker health behaviors (Aim 1) as does workplace safety climate. This may be due to differences in the policies guiding workplace safety and HWB, respectively. For instance, in the U.S., there are clear requirements for workplaces mandated by the Occupational Safety and Health Administration that affect employee safety behaviors (e.g., standards guiding eye, face, and fall protection). No comparable requirements currently exist pertaining to worker health behaviors. Finally, this study showed that the WPAI and WLQ appear to operate differently with respect to workplace climate; in this work, only the WPAI was associated with the studied climate variables, potentially indicating a difference in what aspects of productivity each of these tools actually measure. As previous research has noted, the benefits of these 2 productivity instruments differ.

**Table 2.** Associations Between Perceived Workplace Safety and Well-Being Climates With Worker Health Behaviors, Worker Outcomes, and Employer Outcomes

| | Worker perception of safety climate | | | | Worker perception of HWB climate | | | |
|---|---|---|---|---|---|---|---|---|
| | Bivariate models | | Full models | | Bivariate models | | Full models | |
| Variable | Or (95% CI) | *p*-value | Or (95% CI) | *p*-value | Or (95% CI) | *p*-value | Or (95% CI) | *p*-value |
| Worker health behaviors | | | | | | | | |
| Alcohol | 0.69 (0.39, 1.22) | 0.205 | N/A | N/A | 0.72 (0.41, 1.26) | 0.249 | N/A | N/A |
| Nutrition | 1.11 (0.78, 1.56) | 0.562 | N/A | N/A | 1.37 (0.99, 1.90) | 0.058 | N/A | N/A |
| Physical activity | **1.47 (1.05, 2.11)** | **0.027** | **1.56 (1.09, 2.22)** | **0.015** | 1.01 (0.72, 1.42) | 0.965 | N/A | N/A |
| Sleep | **1.86 (1.38, 2.51)** | **0.000** | **1.82 (1.35, 2.45)** | **0.000** | 1.35 (1.02, 1.80) | 0.039 | 1.32 (0.99, 1.76) | 0.058 |
| Tobacco | 0.93 (0.58, 1.49) | 0.767 | N/A | N/A | 1.31 (0.83, 2.07) | 0.241 | N/A | N/A |
| Worker outcomes | | | | | | | | |
| Abuse, emotional | 0.94 (0.63, 1.41) | 0.777 | N/A | N/A | 0.86 (0.59, 1.26) | 0.452 | N/A | N/A |
| Abuse, physical | 1.21 (0.59, 2.46) | 0.604 | N/A | N/A | 1.27 (0.66, 2.46) | 0.474 | N/A | N/A |
| Back pain, frequency | **0.63 (0.48, 0.84)** | **0.002** | **0.63 (0.47, 0.84)** | **0.002** | **0.60 (0.46, 0.79)** | **0.000** | **0.58 (0.44, 0.76)** | **0.000** |
| Back pain, impact on life | **0.66 (0.50, 0.87)** | **0.004** | **0.67 (0.50, 0.89)** | **0.005** | **0.58 (0.44, 0.76)** | **0.000** | **0.58 (0.44, 0.76)** | **0.000** |
| Depression | **0.68 (0.52, 0.91)** | **0.008** | **0.70 (0.52, 0.92)** | **0.012** | **0.68 (0.52, 0.89)** | **0.005** | **0.68 (0.52, 0.89)** | **0.005** |
| Job satisfaction | **3.28 (2.29, 4.70)** | **0.000** | **3.28 (2.27, 4.73)** | **0.000** | **4.04 (2.91, 5.60)** | **0.000** | **3.92 (2.82, 5.47)** | **0.000** |
| Life satisfaction | **3.62 (2.58, 5.08)** | **0.000** | **3.57 (2.53, 5.03)** | **0.000** | **3.14 (2.34, 4.22)** | **0.000** | **3.05 (2.27, 4.11)** | **0.000** |
| Self-perceived general health | **1.95 (1.46, 2.62)** | **0.000** | **1.92 (1.43, 2.59)** | **0.000** | **1.56 (1.18, 2.07)** | **0.002** | **1.59 (1.19, 2.12)** | **0.002** |
| Employer outcomes | | | | | | | | |
| Work limitations | 1.19 (0.86, 1.63) | 0.29 | N/A | N/A | 1.31 (0.97, 1.77) | 0.080 | N/A | N/A |
| Productivity loss | **0.55 (0.40, 0.76)** | **0.000** | **0.54 (0.39, 0.75)** | **0.000** | **0.50 (0.36, 0.69)** | **0.000** | **0.49 (0.36, 0.68)** | **0.000** |

*Note:* Boldface indicates statistical significance ($p<0.05$). Models were adjusted for age, gender, level of education, and job type. N/A indicates that full models were not analyzed because of the nonsignificant results of the bivariate analysis.
HWB, health and well-being.

Prasad et al.[19] observed that both instruments have benefits in certain research settings, but the psychometric properties of the WPAI have been assessed most extensively. In another review article, Lofland and colleagues[20] noted that the WPAI, unlike the WLQ, allows for direct translation into a monetary figure and is distinguished from the WLQ in its ability to capture both presenteeism and absenteeism. The WLQ, by contrast, has been recognized for is its ability to provide estimates of productivity limitations in different work domains (e.g., demands on time, physical ability, interpersonal processes).[19]

Among the strengths of this study is the availability of multiple indicators representing various aspects of the conceptual model put forth by Sorensen et al.[3] Moreover, the use of self-report data depicts the perception of the employee, a perspective of particular importance when considering workplace policies and practices.[21] Relationships were observed among some—but not all—of the considered variables, suggesting that workplace climate may not be similarly related to all health behaviors and worker outcomes.

### Limitations

This study is limited in the generalizability of findings beyond the size and sector of the 3 small to medium-sized manufacturing companies participating in the pilot intervention. Given the cross-sectional nature of the data, the study is also limited in its ability to draw inferences about the direction of the relationships between variables. The overall HA response rate across the 3 companies was 53%, a response rate that may introduce bias regarding how well the employee population is represented in the sample. Neither race/ethnicity nor nonstandard work schedules were included as covariates, limiting the generalizability of the results. Additionally, the abuse variables included in the model did not specify the setting of the abuse, limiting the ability to isolate workplace abuse from domestic abuse. Compared with previous research looking at all employees served by HealthPartners who took a HA,[22] the population of HA respondents in the present study contained a higher proportion of office workers. Moreover, the population of HA respondents in the present study reported healthier behaviors compared with the general population of HA respondents served by HealthPartners,[22] suggesting potential selection bias and further limiting the generalizability of the results.

## CONCLUSIONS

This study successfully demonstrates that conditions of work are associated with improved worker behaviors (physical activity and sleep), worker outcomes (depression, job and life satisfaction, back pain, and general health), and employer (productivity) outcomes. Although this study has supported the overall application of the CWHW's conceptual model,[3] longitudinal studies are needed to observe whether workplace climate leads to improved employee outcomes. Future work should continue to explore differences related to how work conditions (safety and HWB climates) are differentially associated with worker health behaviors and the various measures used to measure workplace climates. The climate measures used in this study differ from those used in national surveys. Although the measures used in the 2015 National Health Interview Survey Occupational Health Supplement differ from those used in the present study, the adjusted national prevalence for poor safety climate within manufacturing companies was 6%,[23] compared with 32% in the present study (measures of health climate were unavailable in the national survey). Next steps for future research may include efforts to determine which of the perceived climate variables better predicts the considered outcomes and whether variation exists among company size, industry, and job type. Owing to the nested nature of the data, multilevel modeling may be considered as an analytic approach. Additionally, future research should continue to explore the use of different validated tools for productivity measurement and the different domains contained under the conceptual umbrella of worker productivity.

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