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Workplace Psychosocial Factors, Work Organization, and Physical Exertion as Risk Factors for Low Back Pain Among US Workers:

Data From the 2015 National Health Interview Survey

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Abstract

Objective: To evaluate the association between workplace psychosocial, organization, and physical risk factors with low back pain (LBP) among US workers.

Methods: 2015 National Health Interview Survey data were analyzed to calculate the prevalence rates and prevalence ratios for LBP across levels of workplace psychosocial and organizational risk factors among 17,464 US adult workers who worked ≥20 hours per week. Results were also stratified by workplace physical exertion.

Results: The adjusted prevalence rates of LBP were significantly elevated for workers reporting high job demand, low job control, work-family imbalance, bullying, job insecurity, working alternate shifts, and physical exertion. Job control and nonstandard shifts were significantly associated with LBP only among those who reported low/no physical exertion.

Conclusions: LBP prevalence was associated with select workplace psychosocial and organization risk factors. Stratification by physical exertion modified multiple associations.

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Keywords

low back pain; job demand; job insecurity; work-family imbalance; workplace physical exertion; occupational risk factors; psychosocial factors

Globally, approximately 1.71 billion people (95% uncertainty interval 1.63–1.80) have musculoskeletal conditions, with low back pain (LBP) being the main contributor to the overall burden based on 2019 data.[1] The number of people with disability from LBP is increasing as the population increases and ages.[2] Musculoskeletal disorders (MSDs) account for the largest segment of work-related injuries and illnesses, with approximately one out of every four work-related injuries and illnesses in the United States attributable to MSDs.[3] The US Bureau of Labor Statistics consistently shows that MSDs contribute to approximately one-third of injury cases, resulting in days away from work.[3]

LBP is considered an MSD, with a reported prevalence of 25.7% in US workers based on 2010 data.[4] LBP accounts for about 40% of work-related MSD cases.[4] An earlier study reported that, globally, 37% of LBP was deemed attributable to occupational risk factors.[5] Using data from the British Whitehall II Study of civil servants, Lallukka (2018) found that recurrent back pain was associated with higher odds of exiting from paid work for health-associated reasons.[6] The effects were stronger among clerical/support employees and professionals/executives than among administrative personnel, but working conditions (eg, high job demand, low job control) did not act as effect modifiers.[6]

The etiology of LBP is viewed as multifactorial, involving personal, physical, and workplace psychosocial characteristics; relationships among these characteristics may also affect the outcome (LBP).[7–10] Personal factors associated with LBP include biological characteristics, such as sex, age, body mass index (BMI),[11–13] psychological states (depression and negative mood),[14] health behaviors such as smoking, and a history of musculoskeletal injury.[15,16] In addition to biological characteristics, genetic influences may impact LBP, with heritability estimates ranging from 30% to 45%.[17–19]

It has been shown that one LBP injury mechanism is related to the load tolerance of physical risk factors (eg, force, poor posture, and repetition of load).[20] When the external physical stressors or combinations of these factors exceed the tissue tolerance, tissue damage can occur, leading to MSDs.[20] Studies examining job physical demands reveal dose-response relationships between external mechanical loading and spinal tissue damage.[21,22] A dose-response relationship with several other LBP outcomes was also found in many epidemiological studies using the National Institute for Occupational Safety and Health lifting index as the objective measure for physical demands.[23–28]

The causal pathways from psychosocial stressors to the development of MSDs have not been fully elucidated. Previous research suggests their role in modifying the relationship between the physical risk factors and LBP.[7] The modification role is exhibited by changes in muscle tonality and musculoskeletal loading while performing tasks in response to psychosocial stress.[20,29,30] Several frameworks have been proposed to explain the role of psychosocial stressors in the development of MSDs. In the landmark review, “Musculoskeletal Disorders and the Workplace" by the National Research Council of the National Academies (2001),[7] the proposed conceptual MSD model described the roles of biomechanical, psychosocial, and cognitive factors in the development of upper extremity MSDs. Proposed pathways for psychosocial stressors include an increased biomechanical load in the tissues in response to a psychosocial stressor and an increase in the somatic interpretation of musculoskeletal symptoms during stress.[31] Under this model, psychological stressors play moderating roles and may interact with physical risk factors to increase muscular or psychological strain.[32–34] Tang (2020) describes an intricate connection between psychosocial and biomechanical aspects compounded by organizational, individual, and environmental factors.[35] The moderating effects of psychosocial stressors on increased tissue loading in upper extremity disorders may similarly result in increased spinal loads for manual materials handling (MMH) tasks.[36,37] Increased spinal loads for MMH tasks are a strong risk indicator for LBP.[36] Increased spinal loads under stressful working conditions have been identified as risk factors for LBP in previous experimental studies.[29,38–40]

Associations between work-related physical and selected psychosocial characteristics with LBP have been examined extensively in several systematic review studies.[9,41–43] These studies focused on traditional psychosocial stressors, such as job strain (high demand/low control), social support, and job satisfaction. A recent study examined psychosocial risk factors for LBP among a sample of US workers in eight occupation groups (professional, management, office and administration, sales, production, services, construction, and transportation) using multiple years of the Quality of Worklife Survey (QWL) and found significant associations between LBP and psychosocial factors such as job strain, work-family imbalance, harassment, and discrimination that were not typically studied in the area of work-related LBP research.[44]

Stress resulting from workplace psychosocial factors has been linked to symptoms in the neck and low back.[37,41,45,46] Poor supervisory support and coworker support, high job demands, low job control, and low job satisfaction have also been shown to be work-related psychosocial risk factors for LBP.[41,42,47] Job control and social support were the two main psychosocial stressors for chronic LBP lasting 3 months or more in a recent systematic review.[48] In addition, evidence for an association with LBP has been found for work-family imbalance[49] and bullying.[50] An analysis of the 2010 National Health Interview Survey Occupational Health Supplement (NHIS-OHS) showed significant associations between LBP and work-family imbalance, bullying, and job insecurity.[4] These additional psychosocial stressors for LBP present different sources of stress from the traditional job strain model.[51] Rapidly changing trends in work organization and nonstandard work arrangements warrant an analysis of additional psychosocial factors to understand their associations with LBP. A recent systematic review examining social determinants of health and chronic LBP found independent associations between poor LBP outcomes with factors that included education and low income, race/ethnicity, unemployment, female gender, occupation/job characteristics, financial instability, and social status.[52]

The present study aims to explore whether relations between psychosocial stressors and LBP are modified by physical exertion level. A review study suggests the importance of assessing the interaction between physical and psychosocial risk factors for the prevention of LBP.[53] To our knowledge, only two studies have demonstrated a significant interaction effect of job control (a workplace psychosocial factor) and physical exertion on the reporting of musculoskeletal symptoms.[54,55] The previous studies used a convenience sample and assessed general musculoskeletal complaints or pain in the upper extremities.[54,55] None of the studies addressed the interaction of job control and physical exertion on the reporting of LBP. To address the research gap in assessing the interaction effect of job control and the complex interactions between physical and other psychosocial stressors, the present study examines associations between an expanded group of workplace psychosocial factors and LBP, stratified by physical exertion using a nationally representative study population.

METHODS

Data

The NHIS is an annual, cross-sectional health survey of the civilian, noninstitutionalized US population sponsored by the National Center for Health Statistics (NCHS) and conducted by the US Census Bureau. It is administered through voluntary, in-person household interviews lasting approximately 1 hour and utilizes a stratified multistage sample design that oversamples Black, Hispanic, and Asian persons.[56]

The NHIS contains a core questionnaire consisting of a set of health and sociodemographic questions. In addition to the core questionnaire, the NHIS includes supplements sponsored by other centers and agencies. In 2015, NIOSH again sponsored a set of work-related questions, and the NIOSH-OHS was administered to one randomly selected adult aged 18 years or over in each household.[56] The 2015 NHIS-OHS included questions on workplace psychosocial factors (job demand, job control, work-family imbalance, bullying, and job insecurity) and work organization factors (nonstandard work arrangements and shift work). The 2015 NHIS-OHS also included a question on physical exertion at work. The 2015 NHIS Person and Sample Adult files were used for study analyses and are publicly available. The final response rate for the 2015 NHIS Sample Adult component was 55.2%.[57]

Sample

Among the 33,672 US adult 2015 NHIS respondents, 19,456 were currently employed and considered for inclusion in the study sample. Current (“as of last week” during participant interview) employment status in the analyses was defined by responses of “working for pay at a job or business” (n = 18,465), “with a job or business, but not at work” (n = 685), and “working, but not for pay, at a family-owned job or business” (n = 306). The military specific occupation group (n = 190) and armed forces industry group (n = 187) were removed from the sample because certain active-duty armed forces personnel are excluded from the NHIS, so those included in the sample are likely not representative of the population.[57] Employed respondents working fewer than 20 hours per week (n = 1363) were removed from the sample as literature suggested that the occupational risk factors being examined would be less salient among part-time workers. The final analytic sample included 17,464 currently employed US adults who worked 20 or more hours per week.

STUDY DEFINITIONS

LBP and Occupational Risk Factors

LBP was measured by the question: “During the past 3 months, did you have low back pain?” Responses of “yes” were categorized as having LBP. This definition is similar to the chronic LBP definition by the Research Task Force on Chronic LBP, but does not include chronicity, intensity, or interference with normal activities.[58]

Questions on workplace psychosocial factors included job demand, job control (decision authority), work-family imbalance, bullying, and job insecurity. Work organization questions included work arrangements and work schedules (shift work).

The physical exertion variable examined in this study was obtained from the questionnaire item: “How often does your job involve repeated lifting, pushing, pulling or bending?” The response was coded by a five-point scale from never, seldom, sometimes, often, or always. Using this question, a binary variable, physical exertion, was created a priori to separate respondents having physical exertion (responses of sometimes, often, or always) from those having low/no physical exertion (responses of never and seldom). The physical exertion categorization was also consistent with previous literature.[59] Table 1 provides all of the NHIS questions and variables used in analyses.

Sociodemographic Characteristics

Sociodemographic variables included sex, age, race/ethnicity, and education. Age was coded as (1) 18–24 years, (2) 25–34 years, (3) 35–44 years, (4) 45–54 years, (5) 55–64 years, and (6) 65 years and above. Race and ethnicity were coded as (1) Hispanic, (2) non-Hispanic White, (3) non-Hispanic Black, and (4) non-Hispanic other races. Education was coded as (1) less than high school, (2) high school diploma/general equivalency degree (GED), (3) some college, and (4) college degree or higher education. Analyses by education level were restricted to respondents aged 25 years and older. Annual family income is included in the Supplemental Digital Content Table 1 (http://links.lww.com/JOM/B577) and was defined as (1) $0–$49,999, (2) $50,000–$99,999, and (3) $100,000 or more. The family income variable was created by NCHS using a multiple-imputation methodology.[57]

Selected Health Conditions

Health conditions included in the analyses were obesity and serious psychological distress. BMI was computed using self-reported weight and height by a formula [weight (kg)/height (m^2)], and obesity was defined as a BMI of 30 kg/m^2 or higher. Serious psychological distress was assessed by the Kessler-6 (K6), a six-item scale of nonspecific psychological distress in the past 30 days. K6 is assessed with the following question: “During the past 30 days, how often did you feel...”: (1) so sad that nothing could cheer you up; (2) nervous; (3) restless or fidgety; (4) hopeless; (5) that everything was an effort; and (6) worthless. The answer options included: all of the time (4 point score for k6 scale); most of the time (3 point score for k6 scale); some of the time (2 point score for k6 scale); a little of the time (1 point score for K6 scale); and none of the time (0 point score for K6 scale). Serious psychological distress was coded by summing the scores with total scores ranging from 0 to 24, with a score of 13 or above indicating serious psychological distress.[60,61]

Statistical Analysis

To account for the complex sampling design, all analyses were weighted and conducted using SAS-callable SUDAAN (version 11.0.1). PROC SURVEYFREQ was used to compute weighted descriptive statistics and measures of associations. PROC RLOGIST was used to estimate risk of LBP via multivariable logistic regression with adjusted prevalence ratios (aPRs) and 95% confidence intervals (CIs). Adjusted prevalence ratios with CIs excluding 1.0 were considered statistically significant. Respondents who were missing information on LBP or workplace psychosocial, organization, or physical risk factors were set to missing in the analyses. The definition of LBP in this article is specific to the past 3 months (from the time of the survey), so the calculated prevalence rates are 3-month period prevalence rates referred to simply as "prevalence" in this article for brevity.

First, the weighted prevalence and prevalence ratios of LBP by individual sociodemographic characteristics and health conditions were calculated. Based on the LBP literature, an a priori determination was made to retain age, sex, race/ethnicity, education level, and BMI in the models of associations between workplace psychosocial, organization, and physical risk factors. Second, backward stepwise regression was used to reach the final model. The initial, full model (Supplemental Table 1, http://links.lww.com/JOM/B577) included sex, race/ethnicity, education level, age, BMI, psychological distress, and family income. The sociodemographic and health condition variables were individually removed from the model, and estimates were evaluated to determine if they had changed by 10% or greater once the variable had been removed. If an estimate did not change by 10% or more, the variable was not considered significant and was subsequently removed from the model. Based on these criteria and the a priori list, the variables age, sex, race/ethnicity, education level, and BMI were retained in the final model. Lastly, the final model was stratified by workplace physical exertion. An additional exploratory analysis to examine prevalence ratios and prevalence stratified by both physical exertion and race/ethnicity was conducted.

Interactions terms were created for physical exertion at work and each of the workplace psychosocial factors (job control, job demand, work-family imbalance, bullying, and job insecurity) and included in the final logistic regression model. None of the interaction terms were statistically significant ($P \leq 0.05$) based on the Wald F test results produced by PROC RLOGIST. Because they were not significant, they were removed from the model, and only the main effects were retained for the final analyses.

RESULTS

Among currently employed US adults who worked 20 or more hours per week, 26.5% reported LBP. Table 2 shows the prevalence of LBP by sociodemographic characteristics and select health conditions. LBP varied with age; the prevalence ranged from 8.0% in the youngest workers (aged 18–24) to 30.5% in older workers (aged 55–64). The prevalence of LBP was similar for women (26.9%) and men (26.1%). The highest prevalence rates of LBP were reported by non-Hispanic White workers and those with some college education.

The prevalence for LBP ranged from approximately 25% among Hispanic and non-Hispanic Black workers to 28.0% in non-Hispanic White workers. Compared with those with a college degree or higher, workers with lower educational attainment had a higher prevalence of LBP. Workers reporting serious psychological distress had more than a two-fold higher prevalence of LBP compared with workers who did not report serious psychological distress. Obese workers had a 30.6% prevalence of LBP, whereas workers who were not obese had a 24.8% prevalence of LBP.

Jobs characterized as requiring physical exertion are shown in Supplemental Table 2 (http://links.lww.com/JOM/B577). The highest prevalence rates (≥70%) of physical exertion (repeated lifting, pushing, pulling, or bending) were found in construction and extraction, farming, fishing and forestry, installation, maintenance and repair, building and grounds cleaning and maintenance, food preparation and serving related, production, healthcare support, transportation and material moving, personal care and service, and healthcare practitioners and technical workers.

With the exception of nonstandard work arrangements (eg, temporary, contract-based, or freelance employee), each of the occupational risk factors (high demand, low control, work-family imbalance, bullying, job insecurity, nonstandard shift, and workplace physical exertion) was associated with a higher prevalence of LBP compared with their respective counterparts (low demand, high control, no work-family imbalance, no bullying, job security, regular daytime shift, and low/no physical exertion). The unadjusted prevalence of LBP ranged from 12% higher among those with low control or nonstandard shifts to 51% higher for job insecurity and 63% higher for bullying (Table 3). Workers who reported physical exertion at work had a 35% higher prevalence of LBP compared with those reporting low/no physical exertion.

After adjustment for sex, race/ethnicity, education level, age, and BMI (Table 4), the prevalence rates and prevalence ratios for workplace psychosocial, work organization, and physical exertion were similar to the unadjusted estimates shown in Table 3. With the exception of nonstandard work arrangements, each of the risk factors had an elevated aPR that attained statistical significance.

Stratification by workplace physical exertion revealed differences in LBP by workplace psychosocial and organization risk factors. High demand, work-family imbalance, bullying, and job insecurity all had significantly higher adjusted prevalence rates and aPRs for LBP for both physical exertion and low/no physical exertion at work compared with the low demand, no work-family imbalance, not bullied, and job security reference groups (Table 5). Compared with workers reporting low/no physical exertion at work, the adjusted prevalence of LBP was significantly higher for those workers reporting physical exertion at work who also reported high job demand (38.5%), work-family imbalance (35.7%), or job insecurity (41.8%) (Table 5).

For those working jobs requiring physical exertion at work, the aPR for low job control was not significant (CI included 0), nor were the aPRs for the two work organization characteristics (nonstandard shifts and nonstandard work arrangements). However, for those reporting low/no physical exertion at work, the aPRs for low job control and working nonstandard shifts had statistically significant elevations.

Supplemental Tables 3 and 4 (http://links.lww.com/JOM/B577) show differences in the aPR and prevalence rates of LBP among the race/ethnicity groups for the workplace psychosocial and organization factors stratified by physical exertion status. As shown in Supplemental Table 3 and Table 4 (http://links.lww.com/JOM/B577), associations between workplace psychosocial, organization, and physical factors, and LBP vary by demographic group. The authors of the study adhered to the STROBE Guidelines and the STROBE Checklist is included as Supplemental Digital Content (http://links.lww.com/JOM/B541).

DISCUSSION

This study highlighted the importance of high demand, work-family imbalance, bullying, and job insecurity as psychosocial risk factors for LBP and also provided evidence to support previous studies in the US working populations and other populations elsewhere. After stratification by physical exertion, these same workplace psychosocial exposures remained significant; however, exposure to bullying presented higher risks for LBP among workers with low to no physical exertion at work than among their counterparts with physical exertion. These findings highlight the complexity in the relationship between workplace physical exertion, psychosocial stressors, and LBP.

Although low job control was associated with significantly elevated prevalence ratios for LBP in univariate and multivariate analyses, this finding was not evident in stratified analyses for workers reporting physical exertion. These were likely blue-collar workers (eg, construction and extraction; production; farming, fishing, and forestry; installation, maintenance, and repair). Low job control and working a nonstandard shift were significantly associated with LBP only among workers reporting low/no physical exertion, likely office-based workers. The relationship between nonstandard shift and LBP is complex. Two previous studies using large samples of workers showed mixed findings regarding the relationship between job control and workplace LBP.[41,62] Single-item job control over task order, pace, and break in relation to three LBP outcomes (self-reported, seeking care, and lost time due to LBP) were evaluated, respectively, in a study by Thiese et al. (2020), whereas the robust 10-item job control construct was used for assessing its relationship with sickness absence due to LBP in a study by Yu et al. (2015).[41,62] In the study by Thiese et al., the three low job control variables were significantly associated with the self-reported LBP.[41] Neither study found a significant relationship between low job control and sickness absence due to LBP.[41,62] Although mixed findings regarding associations between low job control and LBP outcomes in the literature may reflect inclusion of different LBP outcomes and psychosocial variables, our study suggests that physical exertion may explain some of the inconsistency. Our study also suggests the need to differentiate between different types of workers (by occupation and industry) and work shift when studying associations between LBP and psychosocial and work organization risk factors. Type of job (occupation and industry) is likely to dictate physical exertion level.

Our findings of different effects of psychosocial stressors on LBP by physical exertion level could be related to several factors. For example, positive workplace psychosocial experiences (eg, low demand, high control, etc.) may be protective when a worker has a job requiring physical exertion. Alternatively, workers who report physical exertion at work may already experience LBP, so addition of negative psychosocial stressors does not increase LBP prevalence or prevalence ratio. Our results are similar to findings concerning risk for upper extremity disorders in a study of 713 workers from 12 manufacturing and healthcare facilities.[55] Kwon et al. found that the protective effect of job control was attenuated by high physical demands.[55] An earlier study by Hollmann et al. also found that job control's buffering effect against MSDs was observed only when physical workload was low.[54] Our finding about the relationship between job control and LBP is consistent with this finding and may be useful for explaining the mixed results of the association between job control and LBP in white- and blue-collar workers seen by Hollman et al.[54]

Regarding psychosocial factors, our findings are similar to, and build upon, the analysis by Yang et al. of the 2010 NHIS.[4] In that study, odds of reporting LBP were increased among respondents who reported work-life imbalance (27%), exposure to bullying (39%), and job insecurity (44%).[4] In addition, a recent study looked at workplace psychosocial and physical risk factors for LBP using multiple years of the QWL.[44] Although the definition of back pain in the QWL and the measurement of psychosocial workplace exposures differed somewhat in the two studies, our findings that job demands, work-family imbalance, harassment, and physical activity are associated with LBP are consistent with results from the QWL.[44] A nonstandard shift was also associated with increased prevalence of LBP in those who reported low/no physical exertion, but not for those who reported working in occupations requiring physical exertion at work. This may be due to healthy worker effects (selection and survivor) among workers whose jobs required physical exertion or may reflect findings from other studies that longer sitting time is associated with chronic LBP.[63]

Patel et al. (2022), when applying a health disparities research framework, emphasize the need to examine racial and ethnic disparities inchronic musculoskeletal pain.[64] Given the sample size, we were able to compare the prevalence of LBP by work organization and workplace psychosocial factors stratified by physical exertion among non-Hispanic Black, non-Hispanic White, Hispanic, and non-Hispanic other race workers. Supplemental Tables 3 and 4 (http://links.lww.com/JOM/B577) show that there is variability in the prevalence and prevalence ratios of LBP between the different race/ethnic groups for many of the work organization and workplace psychosocial factors.

LIMITATIONS

The study had several limitations. First, the data are cross-sectional, so changes over time and causality cannot be determined. Second, the study outcome and occupational risk factors were self-reported and may be subject to recall or social desirability bias. Self-report may also lead to uncontrolled confounding due to imprecision of exposure and outcome variables resulting from measurement limitations and subjectivity in respondents' answers. Third, the intermediate exposure answer categories for physical exertion at work (eg, often, sometimes, seldom) rely on subjective assessment of frequency. Fourth, workplace physical exertion is a singular variable and does not allow for more specification of the work task or exertion level (eg, lifting task versus being in an awkward posture or exact weight being handled, etc.). Fifth, the psychosocial occupational risk factors are complex constructs that were assessed by single questions. Sixth, there is no standard definition of LBP, and the question asked in the NHIS did not include information about chronicity or interference with activities. Seventh, sitting and standing at work were not assessed in this study, which may have an effect on the physical exertion. Finally, the LBP variable analyzed was not specific to work-related LBP, and LBP may be caused by factors not included in this occupationally focused study.

STRENGTHS

To our knowledge, this study is the first to investigate the role of physical exertion on associations observed between multiple workplace psychosocial factors and LBP using a nationally representative sample of the US working population. The sample size (N = 17,464) allowed us to examine these associations while also adjusting for demographic characteristics, select health conditions, and physical exertion characteristics.

The data are nationally representative, allowing for generalizability of the findings to the US adult working population. Additionally, the 2015 NHIS provided a large set of questions on occupational risk factors that are not commonly asked in other national or state-based surveys. The sample size allowed us to study an expanded group of psychosocial and work organization factors stratified by work-related physical exertion. The findings about the effect of physical exertion level on the association between LBP and psychosocial and organization factors contribute to the literature by highlighting the need to assess the complex relations among psychosocial factors, physical demands at work, and LBP.

CONCLUSION

Despite differences in measurement and definitions of LBP, this study supports previous research showing that multiple workplace psychosocial factors are associated with LBP but highlights the need to further investigate the role of physical exertion in these associations. Demographic variables, such as race and ethnicity, also may warrant consideration when examining workplace factors and LBP.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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LEARNING OUTCOMES

After reviewing this article, readers should be able to

- describe the associations between workplace psychosocial, physical, and organization risk factors (including high job demand, low job control, work-family imbalance, bullying, job insecurity, nonstandard shiftwork, and physical exertion) with low back pain among adults working at least 20 hours per week in the United States.
- recognize the potential effect of workplace physical exertion on the associations between workplace psychosocial and organizational risk factors with low back pain among these workers.

TABLE 1.

Study Definitions for Workplace Psychosocial, Work Organization, and Physical Risk Factor Characteristics (NHIS, 2015)

Study Variables	Exact Wording of Questions	NHIS Responses Choices *	Coding of Responses for Analyses
Low back pain	During the past 3 months, did you have low back pain?	1. Yes 2. No	Having low back pain—yes
Work-family imbalance	The demands of my job interfere with my personal or family life.	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree	Work-family imbalance—yes (1 and 2 combined); no (3 and 4 combined)
High demand	I have enough time to get the job done.	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree	High demand—yes (3 and 4 combined); no (1 and 2 combined)
Low control	My job allows me to make a lot of decisions on my own.	1. Strongly Agree 2. Agree 3. Disagree 4. Strongly disagree	Low control—yes (3 and 4 combined); no (1 and 2 combined)
Bullying	During the past 12 months, were you threatened, bullied, or harassed by anyone while you were on the job?	1. Yes 2. No	Bullying—yes
Insecure job	Are you worried about losing your current, main job?	1. Yes 2. No	Insecure job—yes
Work arrangement	Which of the following best describes your work arrangement?	1. You work as an independent contractor, independent consultant, or freelance worker 2. You are paid by a temporary agency 3. You work for a contractor who provides workers and services to others under contract 4. You are a regular permanent employee 5. Some other work arrangement	Standard work arrangement—you are a regular permanent employee. All other responses were classified as nonstandard work arrangements.
Work schedule	Which of the following best describes the hours you usually work?	1. A regular daytime schedule 2. A regular evening shift 3. A regular night shift 4. A rotating shift	Regular daytime shift—a regular daytime schedule All other responses were classified as nonstandard shifts.
Workplace physical exertion	How often does your job involve repeated lifting, pushing, pulling, or bending? Would you say...	0. Never 1. Seldom 2. Sometimes 3. Often 4. Always	Physical exertion—sometimes, often, always responses were combined

* All questions had response choices of “refused” and “don’t know.” These responses were removed from analyses.

TABLE 2.

Weighted Prevalence Rates and Prevalence Ratios of Low Back Pain for Sociodemographic Characteristics and Select Health Conditions (NHIS, 2015)

Characteristics	Unweighted Sample	Est. Population	% in Study Population (95% CI)	% Has Low Back Pain (95% CI)	Unadjusted Prevalence Ratio (95% CI)
Age group					
18–24	1521	15,313,263	11.4 (10.6–12.2)	8.0 (6.7–9.2)	Ref
25–34	4106	29,699,186	22.2 (21.3–23.0)	20.5 (19.0–26.3)	1.33 (1.13–1.57)
35–44	3878	29,922,631	22.4 (21.5–23.2)	25.9 (24.1–27.6)	1.41 (1.20–1.64)
45–54	3868	30,940,652	23.1 (22.2–24.0)	29.8 (28.0–31.7)	1.62 (1.38–1.91)
55–64	3091	22,643,764	16.9 (16.1–17.7)	30.5 (28.2–32.9)	1.66 (1.40–1.97)
65 and over	1000	5,347,233	4.0 (3.7–4.3)	27.4 (23.8–31.0)	1.49 (1.22–1.82)
Gender					
Female	8624	61,484,757	45.9 (45.0–46.9)	26.9 (25.6–28.3)	Ref
Male	8840	72,381,972	54.1 (53.1–55.0)	26.1 (24.9–27.3)	0.97 (0.91–1.04)
Race/ethnicity					
Non-Hispanic White	10,885	86,983,336	65.0 (63.9–66.1)	28.0 (26.8–29.1)	Ref
Non-Hispanic Black	2191	15,561,866	11.6 (10.9–12.3)	24.9 (22.6–27.2)	0.89 (0.80–0.98)
Hispanic	3085	22,077,772	16.5 (15.6–17.4)	24.8 (22.7–27.0)	0.89 (0.81–0.98)
Non-Hispanic, other races	1303	9,243,755	6.9 (6.4–7.4)	19.0 (15.9–22.2)	0.68 (0.57–0.80)
Education					
Less than high school	1531	10,803,621	8.1 (7.5–8.7)	27.2 (24.2–30.3)	1.19 (1.05–1.35)
High school/GED	3840	29,534,940	22.1 (21.3–23.0)	28.6 (26.7–30.5)	1.25 (1.14–1.37)
Some college	5589	42,133,110	31.6 (30.6–32.6)	29.3 (27.7–30.9)	1.28 (1.17–1.40)
College degree or more	6466	51,000,759	38.2 (37.1–39.4)	22.9 (21.4–24.4)	Ref
Health Conditions					
Without serious psychological distress (K6 = 0–12)	16,461	126,071,677	98.2 (97.9–98.5)	25.7 (24.8–26.7)	Ref
Serious psychological distress (K6 = 13–24)	322	2,335,437	1.8 (1.5–2.1)	63.8 (56.6–71.0)	2.48 (2.20–2.80)
Not obese (BMI <30 kg/m^2)	11,766	90,827,358	70.1 (69.2–71.1)	24.8 (23.8–25.9)	Ref
Obese (BMI ≥30 kg/m^2)	5177	38,708,675	29.9 (28.9–30.8)	30.6 (29.0–32.2)	1.23 (1.15–1.31)

BMI, body mass index; CI, confidence interval; Est., estimated; GED, General Educational Development; K6, Kessler six-item scale; Ref, reference level.

TABLE 3.

Weighted Prevalence Rates of Low Back Pain by Workplace Psychosocial, Work Organization, and Physical Risk Factor Characteristics (NHIS, 2015)

Work Characteristics	Unweighted Sample	Estimated Population	% in Study Population (95% CI)	% Has Low Back Pain (95% CI)	Unadjusted Prevalence Ratio (95% CI)
Workplace psychosocial factors					
High demand	2564	19,918,585	14.9 (14.1–15.7)	34.0 (31.6–36.5)	1.36 (1.25–1.47)
Low demand	14,859	113,580,051	85.1 (84.3–85.9)	25.1 (24.2–26.0)	Ref
Low control	2251	17,806,237	13.4 (12.6–14.1)	29.1 (26.5–31.6)	1.12 (1.02–1.23)
High control	15,159	115,521,465	86.6 (85.9–87.4)	26.0 (25.0–27.0)	Ref
Work-family imbalance	4611	35,542,838	26.6 (25.8–27.5)	32.1 (30.3–33.9)	1.32 (1.23–1.41)
Not experiencing work-family imbalance	12,801	97,874,471	73.4 (72.5–74.2)	24.4 (23.3–25.4)	Ref
Bullied in past 12 mo	1304	93,26,374	7.0 (6.4–7.5)	41.3 (37.5–45.1)	1.63 (1.48–1.79)
Not bullied in the past 12 mo	16,137	124,364,929	93.0 (92.5–93.6)	25.3 (24.4–26.3)	Ref
Insecure job	1955	14,966,148	11.2 (10.5–11.9)	37.7 (34.8–40.7)	1.51 (1.38–1.64)
Secure job	15,458	118,464,307	88.8 (88.1–89.5)	25.0 (24.1–26.0)	Ref
Work organization characteristics					
Nonstandard shift	4.404	33,815,691	25.3 (24.3–26.2)	28.7 (26.8–30.7)	1.12 (1.04–1.20)
Regular, daytime shift	13,036	133,707,008	74.7 (73.8–75.7)	25.7 (24.8–26.7)	Ref
Nonstandard work arrangement	2764	20,688,423	15.6 (14.7–16.2)	26.3 (24.2–28.4)	0.99 (0.91–1.08)
Standard work arrangement	14,676	113,049,426	84.5 (83.8–85.3)	26.5 (25.5–27.5)	Ref
Workplace physical risk factor					
Physical exertion	10,073	76,587,631	57.3 (56.3–58.3)	29.8 (28.5–31.0)	1.35 (1.25–1.45)
Low/no physical exertion	7377	57,124,820	42.7 (41.7–43.7)	24.6 (23.0–26.1)	Ref

CI, confidence interval; Est., estimated; Ref, reference level.

TABLE 4.

Weighted, Adjusted[a] Prevalence Rates and Prevalence Ratios (PRs) of Low Back Pain by Workplace Psychosocial, Work Organization, and Physical risk Factors (NHIS, 2015).

	Adjusted[a] Prevalence (%) (95% CI)	Adjusted* PR (95% CI)	*P*
Workplace psychosocial factors			
High demand	33.4 (31.0–35.9)	1.32 (1.22–1.43)	<0.001
Low demand	25.3 (24.3–26.2)	Ref	
Low control	29.8 (27.3–32.4)	1.15 (1.04–1.26)	0.006
High control	26.0 (25.0–27.0)	Ref	
Work-family imbalance	31.9 (30.2–33.7)	1.30 (1.10–1.40)	<0.001
No work-family imbalance	24.5 (23.5–25.6)	Ref	
Bullied in the past 12 mo	41.5 (37.7–45.5)	1.63 (1.48–1.80)	<0.001
Not bullied in the past 12 mo	25.4 (24.5–26.4)	Ref	
Insecure job	36.9 (34.0–39.9)	1.46 (1.34–1.59)	<0.001
Secure job	25.3 (24.3–26.2)	Ref	
Work organization characteristics			
Nonstandard shift	29.5 (27.6–31.5)	1.15 (1.07–1.24)	<0.001
Regular, daytime shift	25.6 (24.6–26.6)	Ref	
Nonstandard work arrangement	26.9 (24.7–29.2)	1.02 (0.93–1.11)	0.74
Standard work arrangement	26.5 (25.5–27.5)	Ref	
Workplace physical factor			
Physical exertion	29.9 (28.6–31.2)	1.36 (1.26–1.46)	<0.001
Low/no physical exertion	22.0 (20.8–23.3)	Ref	

CI, confidence interval; *P*, *P* value; PR, prevalence ratio; Ref, reference level.

*Adjusted for sex, race/ethnicity, education level, age, and body mass index (BMI).

TABLE 5.

Weighted, Adjusted* Prevalence Rates and Prevalence Ratios (PRs) of Low Back Pain by Workplace Psychosocial and Work Organization Factors Stratified by Physical Exertion Level at Work† (NHIS, 2015)

	Has Low Back Pain					
	Physical Exertion at Work			Low/No Physical Exertion at Work		
	Adjusted* Prevalence (%) (95% CI)	Adjusted* PR (95% CI)	*P*	Adjusted* Prevalence (%) (95% CI)	Adjusted* PR (95% CI)	*P*
Workplace psychosocial factors						
High demand	38.5 (35.0–42.0)	1.35 (1.22–1.49)	<0.001	26.0 (22.9–29.4)	1.24 (1.08–1.41)	0.002
Low demand	28.5 (27.2–29.9)	Ref		21.0 (19.7–22.4)	Ref	
Low control	31.5 (28.3–31.1)	1.06 (0.95–1.19)	0.31	27.1 (22.9–31.7)	1.27 (1.06–1.52)	0.011
High control	29.7 (28.3–31.1)	Ref		21.5 (20.2–22.9)	Ref	
Work-family imbalance	35.7 (33.4–38.1)	1.29 (1.18–1.41)	<0.001	25.5 (22.9–28.4)	1.24 (1.09–1.41)	0.001
No work-family imbalance	27.6 (26.1–29.2)	Ref		20.6 (19.2–22.1)	Ref	
Bullied in the past 12 mo	43.7 (39.1–48.5)	1.52 (1.36–1.71)	<0.001	35.9 (29.3–43.0)	1.70 (1.39–2.08)	<0.001
Not bullied in the past 12 mo	28.7 (27.4–30.1)	Ref		21.1 (19.9–22.5)	Ref	
Insecure job	41.8 (38.1–45.6)	1.47 (1.33–1.63)	<0.001	29.4 (24.9–34.2)	1.39 (1.18–1.65)	<0.001
Secure job	28.4 (27.1–29.8)	Ref		21.1 (19.8–22.4)	Ref	
Work organization characteristics						
Nonstandard shift	31.1 (28.8–33.5)	1.05 (0.96–1.15)	0.26	26.3 (22.6–30.5)	1.25 (1.06–1.48)	0.009
Regular, daytime shift	29.6 (28.2–31.0)	Ref		21.0 (19.7–22.4)	Ref	
Nonstandard work arrangement	29.7 (26.8–32.8)	0.99 (0.88–1.11)	0.52	22.8 (19.3–26.8)	1.05 (0.88–1.26)	0.56
Standard work arrangement	30.1 (28.7–31.5)	Ref		21.7 (20.3–23.1)	Ref	

CI, confidence interval; *P*, *P* value; PR, prevalence ratio; Ref, reference level.

*Adjusted for sex, race/ethnicity, education, age, and body mass index (BMI).

†Physical exertion level at work was obtained from the question: How often does your job involve repeated lifting, pushing, pulling, or bending? Physical exertion was defined by answers of sometimes, often, or always, and low/no physical exertion was defined by answers of seldom or never.