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Occupational factors associated with obesity and leisure-time physical activity among nurses: A cross sectional study

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Abstract

Background and objective—Adverse working conditions contribute to obesity and physical inactivity. The purpose of this study was to examine the associations of occupational factors with obesity and leisure-time physical activity among nurses.

Methods—This study used cross-sectional data of 394 nurses (mean age 48 years, 91% females, 61% white) randomly selected from the California Board of Registered Nursing list. Data on demographic and employment characteristics, musculoskeletal symptom comorbidity, physical and psychosocial occupational factors, body mass index (BMI), and physical activity were collected using postal and on-line surveys from January to July in 2013.

Results—Of the participants, 31% were overweight and 18% were obese; 41% engaged in regular aerobic physical activity (≥150 min/week) and 57% performed regular muscle-strengthening activity (≥2 days/week). In multivariable logistic regression models, overweight/obesity (BMI ≥ 25 kg/m^2) was significantly more common among nurse managers/supervisors (OR = 2.54, 95% CI: 1.16–5.59) and nurses who worked full-time (OR = 2.18, 95% CI: 1.29–3.70) or worked ≥40 h per week (OR = 2.53, 95% CI: 1.58–4.05). Regular aerobic physical activity was significantly associated with high job demand (OR = 1.63, 95% CI: 1.06–2.51). Nurses with passive jobs (low job demand combined with low job control) were significantly less likely to perform aerobic physical activity (OR = 0.49, 95% CI: 0.26–0.93). Regular muscle-strengthening physical activity was significantly less common among nurses working on non-day shifts (OR = 0.55, 95% CI: 0.34–0.89). Physical workload was not associated with obesity and physical activity.

Conclusions—Our study findings suggest that occupational factors significantly contribute to obesity and physical inactivity among nurses. Occupational characteristics in the work environment should be considered in designing effective workplace health promotion programs targeting physical activity and obesity among nurses.

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Keywords

Body mass index; Nurses; Obesity; Occupational characteristics; Physical activity

1. Introduction

The increasing prevalence of obesity is a major public health problem in the United States (U.S.) and worldwide (Flegal et al., 2012; Ogden and Carroll, 2010; World Health Organization, 2004). According to a recent study using 2011–2012 National Health and Nutrition Examination Survey data, two out of three adults in the U.S. are overweight or obese (Ogden et al., 2014). Obesity is linked to type 2 diabetes, mental health, and cardiovascular disease morbidity and mortality, which result in substantial health care costs (National Heart Lung and Blood Institute, 2003; U.S. Department of Health and Human Services (USDHHS), 2001; Wang et al., 2008). The cause of obesity is multifactorial, including unhealthy eating, sleep deprivation, psychological, genetic, environmental, and behavioral factors (Institute of Medicine, 2006; USDHHS, 2001). Physical activity is one of the major factors targeted in obesity prevention and management and also produces various health benefits. Engaging in physical activity offsets the adverse health effects of overweight or obesity, reducing the risk of cardiovascular disease (Centers for Disease Control and Prevention [CDC], 2011; Li et al., 2006; Sofi et al., 2008; Thompson et al., 2003), and the protective effects of physical activity hold true even after controlling for body mass index (BMI) (Kriska et al., 1993; Wareham et al., 2000). However, the vast majority of U.S. adults do not engage in regular physical activity, and only 21% meet recommended levels for both aerobic and muscle-strengthening physical activity (CDC, 2013a).

Research suggests that occupational factors contribute to obesity and physical inactivity. Adverse working conditions such as long work hours, high job demands, and exposure to hostile work environments are significantly associated with obesity (Han et al., 2011; Jaaskelainen et al., 2015; Luckhaupt et al., 2014). Individuals with highly stressful jobs require more recovery time and are less likely to engage in physical activity (Fransson et al., 2012; Lallukka et al., 2008a,b; McVicar, 2003; Sveinsdottir and Gunnarsdottir, 2008). Furthermore, studies demonstrated that obesity is associated with high absenteeism and low workplace productivity, which lead to rising costs to businesses and society (Goetzel et al., 2010; Thompson, 2007; Zapka et al., 2009).

In a recent study, health care employment was significantly associated with increased prevalence of obesity (Luckhaupt et al., 2014). Nurses are the largest health care occupation group, and the prevalence of overweight/obesity among U.S. nurses ranges from 30% to 55% depending on geographical area, race and ethnicity, and work settings (Han et al., 2011; Miller et al., 2008; Tucker et al., 2010; Zapka et al., 2009). Nursing jobs involve shift work and long work hours and are often reported as highly stressful from physically and psychologically demanding patient care (McVicar, 2003; Sveinsdottir and Gunnarsdottir, 2008). Also, work-related musculoskeletal injuries and pain are common among nurses due to patient handling (Lee et al., 2013). Such factors may be associated with reduced leisure-

time physical activity, which, in turn, contributes to overweight/obesity among nurses (Atkinson et al., 2008; Keller, 2009; Lallukka et al., 2008a,b; Zhao et al., 2012).

Previous studies of obesity among nurses have often focused on the relationship between shift work and irregular meal or disrupted sleep patterns (Field et al., 2007; Geiger-Brown et al., 2011). There is limited research on the effect of occupational factors other than shift work on obesity among nurses. Also, little is known about leisure-time physical activity among nurses and associated occupational risk factors. The purpose of this study was to describe the prevalence of overweight/obesity and leisure-time physical activity among nurses and to examine the relationships of occupational factors with obesity and physical activity.

2. Methods

2.1. Study design and participants

This study analyzed cross-sectional survey data of 394 California registered nurses. The survey data were collected through mail and internet from January to July in 2013. The study initially invited 2000 nurses randomly selected from a list of actively licensed nurses by the California Board of Registered Nursing by sending mail surveys. Respondents were given an alternative response option of on-line completion following log-on information provided in the study information letter. A total of 526 nurses responded, and 394 nurses were eligible for the analysis in the present study. Excluded were 102 retired or not working, 14 currently on disability leave, and 11 employed less than one year. Additionally, three subjects with more than 50% missing data, and two subjects with missing data on both BMI and physical activity were excluded.

2.2. Measures

2.2.1. Outcomes

2.2.1.1. Overweight/obesity: Overweight and obesity were determined by using BMI, which is calculated by weight in kilograms divided by height in meters squared (kg/m^2). BMI was categorized as underweight ($<18.5\ kg/m^2$), normal ($18.5–24.9\ kg/m^2$), overweight ($25–29.9\ kg/m^2$), and obese ($\geq 30\ kg/m^2$) (CDC, 2012). We divided the categories into two groups as follows: underweight/ normal ($<25\ kg/m^2$) and overweight/obese ($\geq 25\ kg/m^2$).

2.2.1.2. Leisure-time physical activity: Leisure-time aerobic physical activity and muscle-strengthening physical activity were measured by questions from the Behavioral Risk Factor Surveillance System (CDC, 2013b).

Aerobic physical activity was measured by the following two questions: “During the past month, other than your regular job, how many times per week did you take part in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?” Those who reported at least one time were then asked “When you took part in this activity, for how many minutes did you usually keep at it?” Using the two questions, the total number of minutes per week of aerobic physical activity was calculated by multiplying the frequency of physical activity per week by the number of minutes spent on physical

activity. Based on the 2008 Physical Activity Guidelines for Americans (USDHHS, 2008), regular aerobic physical activity was defined as engaging in at least 150 min per week of aerobic physical activity.

Muscle-strengthening physical activity was measured by asking, "During the past month, other than your regular job, how many times per week or per month did you do physical activities or exercises to strengthen your muscles?" Regular activity was defined as performing muscle-strengthening physical activity 2 or more days a week (USDHHS, 2008).

2.2.2. Sociodemographics—Sociodemographics included age, gender, race/ethnicity, and education.

2.2.3. Musculoskeletal pain—Musculoskeletal pain was assessed by asking whether they had pain, aching, stiffness, burning, numbness, or tingling in the low back, neck, shoulders, and hands/wrists in the past 12 months (Lee et al., 2013). Pictograms were provided for each body region on the questionnaire.

2.2.4. Occupational factors—*Workplace and employment factors* included type of workplace (e.g., hospital), work setting (e.g., rural), job title (e.g., staff nurse), work status (e.g., full-time), work shift (e.g., day), hours worked per shift, and hours worked per week.

Physical workload was assessed by the Physical Workload Index Questionnaire (PWIQ) (Hollmann et al., 1999), which includes 19 items assessing the average frequency of specific body postures (trunk, arms, and legs) and handling weights (lifting, pushing, pulling, or carrying of loads) during ordinary daily work. All responses were constructed using a 5-point Likert-type scale ranging from 1 (*never*) to 5 (*very often*). The physical workload index was calculated by summing weighted item scores (Hollmann et al., 1999).

Psychosocial work factors were assessed using the Job Content Questionnaire (Karasek et al., 1998). Job stress questions included five items assessing job demand (e.g., conflicting job demands, excessive amount of work); three items assessing decision authority (e.g., little freedom to decide); and six items assessing skill discretion (e.g., a high level of skill, opportunity to develop special abilities). All responses were constructed using a 4-point Likert scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). Job control was created as the sum of decision authority and skill discretion subscales. Job demand and job control were dichotomized at the median. The two variables were combined and classified into four categories: (a) high-strain jobs (high job demand and low job control); (b) active jobs (high job demand and high job control); (c) low-strain jobs (low job demand and high job control); and (d) passive jobs (low job demand and low job control). Job satisfaction was measured by a single question, "How satisfied are you with your job?" on a 4-point Likert-type scale (1 = not at all satisfied to 4 = very satisfied).

2.3. Data analysis

Data were analyzed using SPSS version 20 (SPSS, Chicago, IL). Descriptive statistics were used to summarize the study variables. Values for continuous variables were presented as means and standard deviations, and categorical variables were summarized by frequencies

and percentages. Prevalence rates of overweight/obesity and aerobic physical activity and muscle-strengthening physical activity were described by sociodemographics, musculoskeletal symptom comorbidity, and occupational factors. Bivariate analysis was conducted to examine differences in overweight/obesity, aerobic physical activity, and muscle-strengthening physical activity by study variables, using chi-square tests. Multivariable logistic regression analysis was conducted to examine the relationships of occupational factors with overweight/obesity, aerobic physical activity, and muscle-strengthening physical activity. Sociodemographics and musculoskeletal pain were adjusted in the multivariable logistic regression analyses. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated. A value of $p < .05$ was considered to be significant.

3. Results

3.1. Participant characteristics

Table 1 summarizes the characteristics of the study participants. Participants were predominantly middle-aged (mean 48.4 years), women (90.6%), non-Hispanic white (61.2%), and 65.5% had bachelor's degrees or higher education. The majority of the participants (81.2%) experienced musculoskeletal pain in the past 12 months, most commonly in the lower back (61.8%). The majority of participants were employed in hospital settings (67.5%) as staff nurses (52.2%), working full-time (73.3%) on day shifts (69.4%). About 43% of the participants worked more than 12 h per shift (mean 10 h), and 46.5% worked more than 40 h per week (mean 37.6 h). About half of the participants (44.9%) were very satisfied with their job.

3.2. Overweight/obesity and regular physical activity: prevalence and bivariate analysis

Of the participants, 31.1% were overweight and 17.6% were obese. For physical activity, 41.3% engaged in regular aerobic physical activity and 56.6% performed muscle-strengthening activity 2 or more days a week (see Table 1). Significant associations were found between BMI and physical activity: the proportion of obese nurses was significantly higher among nurses who did not participate in regular aerobic physical activity (23.7% vs. 9.5%, $p = .004$) and in regular muscle-strengthening activity (23.6% vs. 13.4%, $p = .040$), compared to nurses performing regular physical activity (see Table 2).

Table 3 presents the prevalence of obesity and regular physical activity by sociodemographics, musculoskeletal symptom comorbidity, and occupational factors. Nurses who were older, men, non-Hispanic white, and had a diploma or associate degree were significantly more likely to be overweight or obese ($p < .05$). No sociodemographic factors were significantly associated with regular physical activity, but the proportion of regular muscle-strengthening physical activity tended to decrease with increased age ($p = .084$). Nurses reporting musculoskeletal symptoms tended to have a higher prevalence of overweight/obese and lower prevalence of regular aerobic physical activity compared to those without any musculoskeletal symptoms, but the findings were not statistically significant ($p > .05$).

The prevalence of overweight/obesity was significantly higher among nurses who worked full-time compared to part-time or per-diem nurses (52.1% vs. 37.8%, $p = .015$) and among nurses who worked ≥40 h per week compared to those who worked <40 h per week (58.9% vs. 39.9%, $p < .001$). The prevalence of regular aerobic physical activity was significantly higher among nurses who perceived high job demand (47.4% vs. 36.5%, $p = .003$) while nurses in the passive job category had the lowest prevalence of regular aerobic physical activity (29.3%, $p = .033$). Nurses with low physical workload tended to have a higher prevalence of overweight/obesity and lower prevalence of regular physical activity, but the findings were not statistically significant ($p > .05$).

3.3. Associations of occupational factors with obesity and regular physical activity

Table 4 presents the associations of occupational factors with overweight/obesity and regular physical activity. All significant variables in bivariate analysis maintained significant associations in multivariable analysis, controlling for age, gender, race/ethnicity, education, and musculoskeletal pain. Additionally, job title and work shift showed significant associations with overweight/ obesity or regular muscle-strengthening physical activity in multivariable analysis. Compared to staff nurses, managers/supervisors were significantly more likely to be overweight or obese (OR = 2.54, 95% CI: 1.16–5.59). Working full-time (OR = 2.18, 95% CI: 1.29–3.70) and working ≥40 h per week (OR = 2.53, 95% CI: 1.58–4.05) were associated with 2–3 fold odds of being overweight or obese, compared to working part-time/per-diem and <40 h per week, respectively. The odds of regular aerobic physical activity were 1.6 times greater among nurses reporting high job demand (OR= 1.63, 95% CI: 1.06–2.51) and 51% lower among nurses on passive jobs (OR = 0.49, 95% CI: 0.26–0.93). Compared to day shifts, working on non-day shifts (OR = 0.55, 95% CI: 0.34–0.89) was significantly associated with 45% lower odds of regular muscle-strengthening physical activity. In particular, nurses who worked on night shifts were significantly less likely to perform regular muscle-strengthening physical activity (OR = 0.44, 95% CI: 0.25–0.77) and tended to be less likely to perform aerobic physical activity (OR = 0.59, 95% CI = 0.33–1.05; data not shown in Table 4).

4. Discussion

Nurses are at high risk of both overweight/obesity and leisure-time physical inactivity, which may be associated with occupational and work environment factors. To the best of our knowledge, this study is the first study that comprehensively investigated the relationships among occupational factors, obesity and leisure-time physical activity among nurses. This study found that increased risk of overweight/obesity was associated with being nurse managers/supervisors, working full-time, and working more than 40 h per week and that physical activity was associated with working on day shifts and experiencing high job demand.

4.1. Overweight/obesity

In our study sample of California registered nurses, about half (48.7%) were overweight or obese; this prevalence is similar to or lower than the reports of previous studies of nurses (Han et al., 2011; Miller et al., 2008; Tucker et al., 2010; Zapka et al., 2009). This finding

may be explained from the fact that our study was based in California, which presents a lower obesity prevalence in the U.S. (CDC, 2013c). Therefore, the obesity prevalence reported in the study is likely an underestimate of the prevalence among U.S. nurses.

This study found a significant association between job title and overweight/obesity. Nurse managers/supervisors presented a significantly higher prevalence of overweight/obesity than staff nurses. A possible explanation would be that nurse managers/supervisors tend to be more sedentary at work during their shift, while staff nurses, in general, perform more physically active and demanding tasks by delivering direct patient care (Trinkoff et al., 2001, 2003). Indeed, we found that nurse managers/supervisors had a significantly lower physical workload (PWIQ score: 30.1 vs. 38.5 score, $p<.001$). Previous research suggested that more sedentary work and low physical job demand were associated with increased risk of total and central obesity in workers (Choi et al., 2010b). A multinational study of nurses and midwives in Australia, New Zealand and the United Kingdom reported that those employed in administration and management positions were at increased risk of overweight or obesity due to sedentary work practices (Bogossian et al., 2012). In that respect, this high-risk group of nurses should be targeted specifically for health promotion interventions, enabling positive lifestyle changes.

Another important finding of our study is the impact of work status and work hours as risk factors of obesity. Working full-time and working ≥40 h per week were associated with increased risk of obesity. Similarly, previous research showed that full-time workers had a significantly higher prevalence of overweight and obesity than workers with part-time or casual working status among nurses and midwives (Bogossian et al., 2012; Nelson et al., 2014). Also, several cross-sectional and longitudinal studies found significant associations between long work hours and weight gain, overweight or obesity (Han et al., 2011; Lallukka et al., 2008a,b; Luckhaupt et al., 2014; Solovieva et al., 2013). In the same vein, we expected that a 12-h shift might be a risk factor for obesity, but found no supporting evidence. Conversely, we observed the opposite pattern with lower prevalence of overweight/obesity among nurses working more than 12 h per day. Although our study results on work hours were inconsistent, it appears that full-time nurses working long hours may encounter more barriers in engaging in healthy behaviors such as regular physical activity. Further investigation is warranted to elucidate this relationship.

In regard to musculoskeletal symptoms, we did not find a significant association with overweight/obesity, but there was a tendency of higher prevalence of overweight/obesity as well as lower physical activity among nurses with musculoskeletal symptoms. Having musculoskeletal symptoms may reduce physical activity engagement and contribute to obesity. Therefore, it is warranted to emphasize workplace prevention of musculoskeletal injuries or disorders.

4.2. Physical activity

For physical activity, despite its substantial health benefits (CDC, 2011), most of the nurses in this study did not perform recommended amounts of physical activities. Only 41.3% met the recommended level for aerobic physical activity, which is lower than the prevalence of 51.6% among U.S. adults (CDC, 2013a). For muscle-strengthening physical activity, 56.6%

met the recommended level and 32.8% did not meet both aerobic and muscle-strengthening physical activity recommendations. We also found that the low levels of both aerobic and muscle-strengthening physical activities were strongly associated with obesity, consistent with a recent national analysis (CDC, 2013a). The findings clearly indicate a need to help nurses to achieve regular physical activity during their leisure time. This need has a significant public health implication because nurses are in a good position to educate and motivate patients about healthy lifestyle behaviors.

We found slightly different sets of risk factors among occupational factors. Regular muscle-strengthening physical activity was associated with only shift work. Our findings indicate that nurses on non-day shifts, especially night shifts, are less likely to engage in regular muscle-strengthening physical activity. Studies show that night-shift work is associated with insufficient sleep quality and quantity and chronic fatigue (Geiger-Brown et al., 2011; Han et al., 2014; Huth et al., 2013). Also, shift workers generally have fewer resources or opportunities for leisure-time physical activity (Atkinson and Davenne, 2007; van Amelsvoort et al., 2004). All of these factors may negatively influence nurses working night or other shifts in performing regular physical activity (Atkinson et al., 2008; Lallukka et al., 2004; Persson and Martensson, 2006).

We also found significant associations between job demand and aerobic physical activity. Interestingly, high job demand was associated with increased regular aerobic physical activity, whereas passive job, defined as low job demand combined with low job control, was significantly associated with less engagement in regular aerobic physical activity. Previous studies have found relatively consistent inverse associations between leisure-time physical activity and passive jobs, but not with job demands, and the relationship slightly varied by gender and education level (Choi et al., 2010a; Fransson et al., 2012; Gimeno et al., 2009; Kouvonen et al., 2005). For example, in a prospective cohort study of British civil servants (Gimeno et al., 2009), men who worked on passive jobs over 5 years performed less leisure-time physical activity than those who had never worked on passive jobs, but the difference was not significant in women. According to pooled data from 14 European prospective cohort studies (n = 170,162) (Fransson et al., 2012), employees working on high-strain and passive jobs were less likely to be physically active during their leisure time, compared with those on low-strain jobs. Also, in a study of middle-aged U.S. workers, higher educated men with passive jobs performed less leisure-time physical activity, while less educated women with passive jobs were less likely to be physically active during leisure time (Choi et al., 2010a). More research is needed to confirm the independent associations between job strain components and physical activity among nurses.

4.3. Limitations

The study has several limitations. First, due to the cross-sectional design, causal directions among occupational factors, obesity, and physical activity cannot be determined. Second, this study relied upon self-reported data for BMI and physical activity; thus, there may have been recall or reporting bias, which may result in either the underestimation or overestimation of the true prevalence. Social desirability may lead to overreporting of physical activity and underreporting of body weight. Third, although this study used a

random sample, a relatively small sample size and low response rate (26.3%) may have introduced selection bias. Along with this, a study sample selected from one state in the U.S. limits the generalizability of the study findings. Finally, some potential confounders were not collected in this study, such as dietary habits, sleep patterns, other lifestyle factors (e.g., smoking and alcohol use), and social support. These unmeasured or unknown factors may raise the possibility of residual confounding effect.

5. Conclusion

Nurses are a major health care workforce and are well positioned to promote healthy lifestyle behaviors for the health of the population. However, our study shows that nurses are also faced with the high prevalence of overweight/obesity and their leisure-time physical activities are far from optimal. Our findings suggest that occupational factors, such as job title, work status, work hours, shift work, and job demand, may affect physical activity or BMI. Accordingly, the findings indicate the need to consider the influence of working conditions in developing effective workplace health promotion programs targeting obesity prevention and physical activity in combination with individual-focused intervention strategies. Future research is needed to validate the findings and determine causal relationships in a large prospective cohort of U.S. nurses and to further explore the longitudinal effect of occupational factors in work environment on obesity and physical activity.

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What is already known about the topic?

- The increasing prevalence of obesity is a major public health problem in the U.S. and worldwide.
- The vast majority of U.S. adults does not engage in regular physical activity.
- Research shows adverse working conditions contribute to obesity and physical inactivity.

What this paper adds

- Nurses are faced with the high prevalence of overweight/obesity and their leisure-time physical activities are far from optimal.
- Overweight/obesity and leisure-time physical inactivity among nurses were associated with occupational factors, such as job title, full-time work, long work hours, shift work, and high job demand.

Table 1

Characteristics of the study participants ($N = 394$).[a]

Characteristics	Mean ± SD (range) or *n* (%)
Age (years)	48.4 ± 12.1 (23–81)
Gender	
Men	37 (9.4)
Women	356 (90.6)
Race/ethnicity	
Hispanic	28 (7.1)
White, Non-Hispanic	241 (61.2)
Asian or Pacific Islander	89 (22.6)
Other[b]	36 (9.1)
Education	
Diploma or associate	135 (34.4)
Bachelor	180 (45.9)
Master or doctoral	77 (19.6)
Comorbidity: musculoskeletal symptoms	
Low back pain	241 (61.8)
Neck pain	191 (49.0)
Shoulder pain	164 (42.2)
Hand/wrist pain	163 (42.1)
Musculoskeletal pain (any region)	319 (81.2)
Body mass index (kg/m^2)	25.7 ±4.8 (16.0–41.6)
Underweight (<18.5)	5 (1.3)
Normal (18.5–24.9)	193 (50.0)
Overweight (25–29.9)	120 (31.1)
Obese (>30)	68 (17.6)
Aerobic physical activity (minutes a week)	148.9 ± 128.2 (0–900)
No activity	37 (9.5)
<150 min a week	192 (49.2)
150–300 min a week	109 (28.0)
≥300 min a week	52 (13.3)
Muscle strengthening physical activity	
None	126 (32.7)
1 day a week	41 (10.6)
≥2 days a week	218 (56.6)
Type of workplace	
Hospital	266 (67.5)
Ambulatory /outpatient clinic	52 (13.2)
Long term care/home health agency/hospice	29 (7.4)
Other	47 (11.9)

Characteristics	Mean ± SD (range) or *n* (%)
Type of work setting	
Rural	50 (14.0)
Suburban	125 (34.9)
Urban	183 (51.1)
Job title	
Staff nurse	205 (52.2)
Charge nurse	40 (10.2)
Nurse manager/supervisor	40 (10.2)
Other	108 (27.5)
Work status	
Full-time	272 (73.3)
Part-time/per-diem	99 (26.7)
Work hours per shift	10.0 ±2.2 (0–15)
<8 h	17 (4.7)
8–11 h	191 (52.5)
≥12 h	156 (42.9)
Work hours per week	37.6 ± 11.7 (0–85)
<40 h	197 (53.5)
≥40 h	171 (46.5)
Shift	
Day	258 (69.4)
Evening	23 (6.2)
Night	76 (20.4)
Rotating	15 (4.0)
Physical workload index	35.0 ±13.3 (14.0–70.2)
Job demand	34.1 ±6.4 (18–48)
Job control	70.0 ± 10.0 (42–94)
Job strain[c]	
Low strain (low demand and high control)	113 (29.0)
Passive job (low demand and low control)	101(25.9)
Active job (high demand and high control)	90 (23.1)
High strain (high demand and low control)	86 (22.1)
Job satisfaction	
Not at all or not too satisfied	36 (9.2)
Somewhat satisfied	179 (45.9)
Very satisfied	175 (44.9)

[a] Sample sizes for variables may not add up the total due to missing data.

[b] Other: African-American, American Indian or Alaskan Native, and Other.

[c] Low vs. high of psychological demand and job control were dichotomized at median.

Table 2

Aerobic and muscle strengthening physical activity by body mass index among California nurses.

	Aerobic physical activity			Muscle strengthening physical activity		
	<150 min/week (*n*=229)	≥150 min/week (*n*=161)		<2 days/week (*n*= 167)	≥2 days/week (*n* = 218)	
	***n* (%)**	***n* (%)**	***p***	***n* (%)**	***n* (%)**	***p***
Body mass index (kg/m^2)			.004			.040
Underweight (<18.5)	2 (0.9)	3 (1.9)		3 (1.9)	2 (0.9)	
Normal (18.5–24.9)	105 (46.9)	87 (55.1)		70 (43.5)	118 (54.6)	
Overweight (25–29.9)	64 (28.6)	53 (33.5)		50 (31.1)	67 (31.0)	
Obese (≥30)	53 (23.7)	15 (9.5)		38 (23.6)	29 (13.4)	

Sample sizes for variables may not add up the total due to missing data.

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Table 3

Prevalence (%) of overweight/obesity and regular physical activity by sociodemographics and occupational factors among California nurses ($N = 394$).[a]

	Overweight/obesity (BMI ≥25 kg/m)		Regular aerobic physical activity (≥150 min/week)		Regular muscle strengthening physical activity (≥2 days/week)	
	n (%)*	*p*	*n* (%)*	*p*	*n* (%)*	*p*
Total	188 (48.7)		161 (41.3)		218 (56.6)	
Age (years)		.014		.818		.084
<30	9 (31.0)		12 (41.4)		19 (65.5)	
30–39	31 (40.8)		28 (36.4)		50 (64.9)	
40–49	34 (48.6)		29 (42.6)		43 (62.3)	
50–59	66 (47.8)		62 (44.6)		74 (54.0)	
≥60	44 (64.7)		28 (39.4)		30 (44.8)	
Gender		.006		.945		.365
Men	26 (70.3)		15 (41.7)		23 (63.9)	
Women	162 (46.4)		145 (41.1)		195 (56.0)	
Race/ethnicity		.001		.223		.865
Hispanic	15 (53.6)		11 (39.3)		17 (60.7)	
White, Non-Hispanic	127 (53.8)		105 (43.8)		135 (57.2)	
Asian or Pacific Islander	26 (29.9)		28 (32.2)		45 (52.9)	
Other[b]	20 (57.1)		17 (48.6)		21 (58.3)	
Education		.006		.388		.923
Diploma or associate	77 (58.8)		51 (37.8)		75 (56.8)	
Bachelor	72 (40.4)		80 (45.2)		101 (57.4)	
Master or doctoral	37 (49.3)		30 (39.5)		41 (54.7)	
Musculoskeletal symptoms [c]		.299		.090		.471
Yes	156 (49.8)		124 (39.1)		173 (55.6)	
No	31 (43.1)		36 (50.0)		44 (60.3)	
Type of workplace		.880		.438		.669
Hospital	126 (48.1)		101 (38.5)		145 (55.8)	
Ambulatory/outpatient clinic	27 (54.0)		23 (44.2)		30 (57.7)	
Long term care/home	13 (46.4)		14 (48.3)		13 (50.0)	

	Overweight/obesity (BMI ≥25 kg/m)		Regular aerobic physical activity (≥150 min/week)		Regular muscle strengthening physical activity (≥2 days/week)	
	n (%)*	*p*	*n* (%)*	*p*	*n* (%)*	*p*
health agency/hospice						
Other	22 (47.8)		23 (48.9)		30 (63.8)	
Type of work setting		.811		.930		.530
Rural	25 (50.0)		19 (38.8)		29 (60.4)	
Suburban	63 (50.8)		52 (41.9)		64 (52.0)	
Urban	83 (47.2)		74 (40.9)		103 (57.2)	
Job title		.106		.265		.281
Staff nurse	89 (44.3)		74 (36.6)		115 (56.9)	
Charge nurse	19 (50.0)		18 (45.0)		22 (59.5)	
Nurse Manager/supervisor	25 (65.8)		19 (47.5)		16 (42.1)	
Other	54 (50.0)		50 (46.7)		64 (59.8)	
Work status		.015		.210		.293
Full-time	138 (52.1)		104 (38.7)		147 (55.3)	
Part-time/Per-diem	37 (37.8)		45 (45.9)		59 (61.5)	
Work hours per shift						
<12 h	104 (51.5)	.135	89 (43.2)	.190	115 (56.9)	.934
≥12 h	67 (43.5)		56 (36.4)		87 (56.5)	
Work hours per week		<.001		.895		.160
<40 h	77 (39.9)		78 (39.8)		104 (53.3)	
≥40 h	99 (58.9)		68 (40.5)		100 (60.6)	
Shift						
Day shift	120 (47.6)	.675	108 (42.4)	.274	150 (59.5)	.108
Non-day shift [d]	56 (50.0)		41 (36.3)		56 (50.5)	
Physical workload index		.055		.531		.229
Low	95 (54.6)		70 (39.1)		93 (53.8)	
High	79 (44.4)		75 (42.4)		107 (60.1)	
Job demand		.282		.003		.247
Low	107 (51.2)		77 (36.5)		112 (54.1)	
High	79 (45.7)		83 (47.4)		105 (60.0)	

	Overweight/obesity (BMI ≥25 kg/m)		Regular aerobic physical activity (≥150 min/week)		Regular muscle strengthening physical activity (≥2 days/week)	
	n (%)*	*p*	*n* (%)*	*p*	*n* (%)*	*p*
Job control		.252		.195		.293
Low	84 (45.7)		70 (38.0)		100 (54.1)	
High	102 (51.5)		90 (44.6)		117 (59.4)	
Job strain[e]		.303		.033		.284
Low strain	62 (56.4)		48 (42.9)		64 (59.3)	
Passive job	45 (45.5)		29 (29.3)		48 (48.5)	
Active job	40 (45.5)		42 (46.7)		53 (59.6)	
High strain	39 (45.9)		41 (48.2)		52 (60.5)	
Job satisfaction		.671		.433		.165
Not at all or not too satisfied	15 (41.7)		12 (33.3)		17 (47.2)	
Somewhat satisfied	86 (49.7)		72 (40.7)		96 (54.2)	
Very satisfied	85 (49.1)		77 (44.5)		104 (61.9)	

BMI (body mass index).

*Row percentages by each category.

[a]Due to missing data, the sample size was 386 for BMI, 390 for aerobic physical activity, and 385 for muscle strengthening physical activity.

[b]Other: African-American, American Indian or Alaskan Native, and Other.

[c]Any symptom in the low back, neck, shoulders, hands or wrists in the past 12 months.

[d]Non-day shift: evening, night or rotating shift.

[e]Low strain (low demand and high control); passive job (low demand and low control); active job (high demand and high control); high strain job (high demand and low control).

Table 4

Associations of occupational factors with overweight/obesity and regular physical activity among California nurses (N = 394).

Characteristics	Overweight/obesity (BMI ≥ 25 kg/m^2)		Regular aerobic physical activity (≥150 min/week)		Regular muscle strengthening physical activity (≥2 days/week)	
	Unadjusted OR (95% CI)	Adjusted OR[a] (95% CI)	Unadjusted OR (95% CI)	Adjusted OR[a] (95% CI)	Unadjusted OR (95% CI)	Adjusted OR[a] (95% CI)
Type of workplace						
Hospital	1.00	1.00	1.00	1.00	1.00	1.00
Ambulatory/ outpatient clinic	1.27 (0.69–2.32)	1.26 (0.64–2.47)	1.26 (0.69–2.31)	1.10 (0.58–2.11)	1.08 (0.59–1.97)	1.44 (0.75–2.75)
Long term care/ home health agency /hospice	0.94 (0.43–2.04)	0.88 (0.36–2.16)	1.49 (0.69–3.21)	1.55 (0.68–3.54)	0.79 (0.35–1.78)	0.99 (0.42–2.33)
Other	0.99 (0.53–1.85)	1.00 (0.51–1.96)	1.53 (0.82–2.85)	1.47 (0.77–2.83)	1.40 (0.74–2.66)	1.66 (0.85–3.24)
Type of work setting						
Urban	1.00	1.00	1.00	1.00	1.00	1.00
Rural	1.12 (0.60–2.10)	0.89 (0.45–1.76)	0.92 (0.48–1.75)	0.90 (0.46–1.77)	1.14 (0.60–2.18)	1.02 (0.52–2.00)
Suburban	1.16 (0.73–1.83)	1.10 (0.66–1.83)	1.04 (0.66–1.66)	0.94 (0.57–1.54)	0.81 (0.51–1.29)	0.76 (0.47–1.24)
Job title						
Staff nurse	1.00	1.00	1.00	1.00	1.00	1.00
Charge nurse	1.26 (0.63–2.52)	0.77 (0.35–1.69)	1.42 (0.71–2.81)	1.38 (0.67–2.87)	1.11 (0.54–2.26)	1.37 (0.64–2.93)
Nurse Manager /supervisor	2.42 (1.17–5.00)*	2.54 (1.16–5.59)*	1.56 (0.79–3.10)	1.33 (0.64–2.78)	0.55 (0.27–1.11) †	0.63 (0.30–1.33)
Other	1.26 (0.79–2.01)	1.15 (0.66–1.99)	1.52 (0.94–2.44)†	1.41 (0.83–2.40)	1.13 (0.70–1.81)	1.39 (0.82–2.36)
Work status						
Part-time/per-diem	1.00	1.00	1.00	1.00	1.00	1.00
Full-time	1.79 (1.11–2.88)*	2.18 (1.29–3.70)**	0.74 (0.47–1.18)	0.67 (0.41–1.10)	0.77 (0.48–1.25)	0.64 (0.39–1.06)†
Work hours per shift						
<12 h	1.00	1.00	1.00	1.00	1.00	1.00
≥12 h	0.73 (0.48–1.11)	0.81 (0.50–1.31)	0.75 (0.49–1.15)	0.74 (0.46–1.20)	0.98 (0.64–1.50)	0.78 (0.49–1.25)
Work hours per week						
<40 h	1.00	1.00	1.00	1.00	1.00	1.00

Characteristics	Overweight/obesity (BMI ≥ 25 kg/m^2)		Regular aerobic physical activity (≥150 min/week)		Regular muscle strengthening physical activity (≥2 days/week)	
	Unadjusted OR (95% CI)	Adjusted OR[a] (95% CI)	Unadjusted OR (95% CI)	Adjusted OR[a] (95% CI)	Unadjusted OR (95% CI)	Adjusted OR[a] (95% CI)
≥40 h	2.16 (1.42–3.29) ***	2.53 (1.58–4.05) ***	1.03 (0.68–1.57)	0.98 (0.63–1.54)	1.35 (0.88–2.05)	1.43 (0.92–2.24)
Shift						
Day shift	1.00	1.00	1.00	1.00	1.00	1.00
Non-day shift[b]	1.10 (0.70–1.72)	1.19 (0.73–1.93)	0.78 (0.49–1.22)	0.70 (0.43–1.13)	0.69 (0.44–1.08)	0.55 (0.34–0.89) *
Physical workload index						
Low	1.00	1.00	1.00	1.00	1.00	1.00
High	0.66 (0.44–1.01) †	0.70 (0.43–1.16)	1.14 (0.75–1.75)	1.31 (0.81–2.11)	1.30 (0.85–1.98)	1.10 (0.69–1.75)
Job demand						
Low	1.00	1.00	1.00	1.00	1.00	1.00
High	0.80 (0.53–1.20)	0.83 (0.53–1.29)	1.57 (1.04–2.36) *	1.63 (1.06–2.51) *	1.27 (0.85–1.91)	1.24 (0.81–1.90)
Job control						
Low	1.00	1.00	1.00	1.00	1.00	1.00
High	1.26 (0.85–1.89)	1.24 (0.80–1.93)	1.31 (0.87–1.97)	1.23 (0.81–1.89)	1.24 (0.83–1.86)	1.35 (0.88–2.07)
Job strain[c]						
High strain	1.00	1.00	1.00	1.00	1.00	1.00
Active job	0.98 (0.54–1.79)	1.09 (0.58–2.08)	0.94 (0.52–1.70)	1.01 (0.54–1.86)	0.96 (0.53–1.76)	1.01 (0.54–1.89)
Passive job	0.98 (0.55–1.76)	1.06 (0.56–2.01)	0.44 (0.24–0.82) **	0.49 (0.26–0.93) *	0.62 (0.34–1.10)	0.61 (0.33–1.13)
Low strain	1.52 (0.86–2.69)	1.48 (0.79–2.75)	0.80 (0.46–1.42)	0.74(0.41–1.36)	0.95 (0.53–1.70)	1.06 (0.58–1.96)
Job satisfaction						
Very satisfied	1.00	1.00	1.00	1.00	1.00	1.00
Somewhat satisfied	1.02 (0.67–1.56)	0.98 (0.62–1.54)	0.85 (0.56–1.31)	0.95 (0.61–1.47)	0.73 (0.47–1.12)	0.71 (0.45–1.12)
Not at all or not too satisfied	0.74 (0.36–1.53)	0.81 (0.37–1.78)	0.62 (0.29–1.33)	0.69 (0.31–1.51)	0.55 (0.27–1.14)	0.48 (0.23–1.03) †

BMI (body mass index).

[a]Multivariable logistic regression analyses adjusted for age, gender, race/ethnicity, educational background, and musculoskeletal pain

[b]Non-day shift: evening, night or rotating shift.

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[c] Low strain (low demand and high control); passive job (low demand and low control); active job (high demand and high control); High strain job (high demand and low control).

† $p < .10$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

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