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Journal

Archives of Environmental & Occupational Health, 75(7)

ISSN

1933-8244

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Publication Date

2020-10-02

DOI

10.1080/19338244.2020.1743960

Peer reviewed

HHS Public Access

Author manuscript

Arch Environ Occup Health. Author manuscript; available in PMC 2022 July 21.

Published in final edited form as:

Arch Environ Occup Health. 2020 ; 75(7): 422–430. doi:10.1080/19338244.2020.1743960.

Assessing the Prevalence of Meeting Physical Activity Recommendations among U.S. Healthcare Workers: Data from the 2015 National Health Interview Survey

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Abstract

We examined the prevalence of U.S. healthcare workers who met the *2008 Physical Activity Guidelines for Americans* (2008 Guidelines), and the relationships among meeting the 2008 Guidelines and health behaviors, musculoskeletal symptoms, and occupational- and workplace-factors. We estimated prevalence of meeting the 2008 Guidelines for aerobic and muscle-strengthening activity using data from the 2015 National Health Interview Survey. Among 1,502 U.S. healthcare workers, 56.2 % met the recommended guideline for aerobic activity; 30.1% met the recommended guideline for muscle-strengthening activity; and 25.3% met both recommended guidelines. Adjusting for covariates, meeting the 2008 Guidelines was associated with no history of smoking, current alcohol consumption, type of occupation, occupational activities, and availability of a health promotion program at work. Our findings suggest multi-level approaches (combining individual and organizational level efforts) are needed.

Keywords

Prevalence; occupational health; health risk behaviors; healthcare workers; physical activity

Introduction

The healthcare industry is the fastest-growing workplaces sector with the largest employment growth.[1] Over 17 million Americans are employed in healthcare, accounting for 11.3% of the U.S. workforce.[2] Healthcare workers are positioned to promote health behaviors in others, but some evidence shows that healthcare workers do not participate in adequate levels of physical activity. One study using data from the 2010 National Health Interview Survey (NHIS) reported that over 70% of U.S. healthcare workers did not meet

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Disclosure: The authors declared no conflict of interest with respect to the research, authorship, and/or publication of this article. This study was supported by K23NR014661 (PI: S Nam).

the *2008 Physical Activity Guidelines for Americans (2008 Guidelines)*.[3] Given the size and role of healthcare workers, this low prevalence is a significant public health issue.

Some individual and work-related factors that can contribute to low levels of physical activity among U.S. healthcare workers. Studies have reported that the irregular work schedules and long work hours,[4,5] typical of healthcare work, along with under-staffing and a litigious environmental characteristic of many healthcare workplaces,[6] may contribute to lowering levels of physical activity. There is also evidence showing that healthcare workers have high rates of musculoskeletal injuries and symptoms,[7,8] which might interfere with their ability to meet recommended levels of physical activity.

A comprehensive examination of the factors that impact healthcare workers' participation in physical activity could help inform policies to increase their physical activity levels and promote associated health benefits. Such an investigation would help us to understand factors associated with higher (or lower) risk for low levels of physical activity among healthcare workers. Therefore, the aims of this study were to determine estimates on the prevalence of U.S. healthcare workers who met the *2008 Guidelines*, and to examine associations among healthcare workers' health behaviors, musculoskeletal symptoms, and occupational and workplace factors, using the 2015 NHIS data of a national representative sample of U.S. healthcare workers. We also examined whether the inclusion of healthcare workplace wellness programs is associated higher levels of meeting the *2008 Guidelines*.

Materials and Methods

Data sample

NHIS is a cross-sectional, in-person interview survey of U.S. households conducted annually. The survey sample is selected by multi-stage area probability sampling from the civilian non-institutionalized population and consists of approximately 35,000 households containing about 87,500 persons.[9] The survey over-sampled non-Hispanic Black, Hispanic, and Asian persons to allow for more accurate national estimates of health for these minorities. The total household response rate for the 2015 NHIS was 70.1% and the response rate for the sample adult component was 79.7%.[1]

The 2015 NHIS sample consisted of 33,672 adults aged ≥ 18 years and 2,466 healthcare workers were identified based on the occupation information. NHIS classifies occupation using the Standard Occupation Classification System by the US Census Bureau[1] and healthcare worker occupations are categorized into two major groups of healthcare practitioners and technical occupations and healthcare support occupations. Among those, 1,544 participants answered "working for pay at a job or business" to the type of current employment question (The remaining 922 participants did not work for pay last week [e.g., looking for work, working, but not for pay, at a family-owned job or business] thus we did not include them in our further analysis). After excluding participants with missing data on physical activity (n=16) and those who reported being currently pregnant (n=26), our analysis included 1,502 healthcare workers.

Measures

Physical activity.—The 2015 NHIS included questions on two components of leisure-time physical activity: Aerobic activity and muscle-strengthening activity. For measuring aerobic activity, NHIS contained the following four questions: (1) "How often do you do LIGHT OR MODERATE LEISURE-TIME physical activities for AT LEAST 10 MINUTES that cause ONLY LIGHT sweating or a SLIGHT to MODERATE increase in breathing or heart rate?"; (2) "About how long do you do these light or moderate leisure-time physical activities each time?"; (3) "How often do you do VIGOROUS leisure-time physical activities for AT LEAST 10 MINUTES that cause HEAVY sweating or LARGE increases in breathing or heart rate?"; and (4) "About how long do you do these vigorous leisure-time physical activities each time?"

In comparison, the *2008 Guidelines* provide recommendations for aerobic "moderate-intensity" (not for "light or moderate") and "vigorous-intensity" activities. To address this discrepancy, we considered the NHIS data on participating in "light or moderate" activity as applicable to the "moderate-intensity" *2008 Guideline* recommendation. Following the standard methods when referencing the *2008 Guidelines*, we reclassified one minute of vigorous activity as equivalent to two minutes of light/moderate-intensity activity.[4] Thus, "weekly minutes of moderate-intensity equivalent activity" were calculated by summing (1) minutes of light/moderate aerobic activity with (2) vigorous aerobic activity minutes, doubled. Participants who reported engaging in ≥ 150 minutes of moderate-intensity equivalent activity per week were defined as "meeting the recommendation for aerobic activity".

For measuring muscle-strengthening activity, NHIS contained the following question: "How often do you do LEISURE-TIME physical activities specifically designed to STRENGTHEN your muscles such as lifting weights or doing calisthenics?"

Engaging muscle-strengthening activity two or more times per week was defined as "meeting the recommendation for muscle-strengthening activity." Participants who reported engaging in ≥ 150 minutes of moderate-intensity equivalent activity and muscle-strengthening activity two or more times per week were defined as "meeting both guidelines".

Socio-demographic characteristics and body mass index (BMI).—Socio-demographic characteristics used for our study included: sex, age, race/ethnicity, marital status, and geographical region. BMI was calculated using self-reported weight and height and was categorized into underweight/normal-weight (16.6 to <25 kg/m^2), overweight (25 to <30 kg/m^2), and obesity (≥30 kg/m^2).[5]

Health behaviors.—The NHIS included a series of questions about smoking status: "Have you smoked at least 100 cigarettes in your entire life?" Respondents answering "yes" were then asked, "Do you now smoke cigarettes every day, some days, or not at all?"[10] NHIS generated a variable on smoking status in 6 categories (from never smoker to current every day smoker). Similarly, a series of questions asked about alcohol consumption: "In any one year, have you had at least 12 drinks of any type of alcoholic beverage?"; "In your

entire life, have you had at least 12 drinks of any type of alcoholic beverage?"; and "In the past year, how often did you drink any type of alcoholic beverage?" Based on the responses to these questions, NHIS generated an aggregate variable on alcohol drinking status in 10 categories (from lifetime abstainer to current heavier drinker).[11] For instance, a lifetime abstainer had fewer than 12 drinks in his or her lifetime. The variables of "smoking" and "alcohol consumption" were re-categorized as 'never smoked/drank alcohol,' 'current,' or 'former in order to maintain adequate frequency in each category for data analyses and to make these two variables compatible to each other.' Sleep duration was measured by the question "On average, how many hours of sleep do you get in a 24-hour period?" The responses were categorized as <7 h, 7 to 9 h, and >9 h.

Musculoskeletal symptoms.—Joint symptoms were measured by asking participants "During the past 30 days, have you had any symptoms of pain, aching, or stiffness in or around a joint?" and (if yes) "Which joints are affected?" Symptoms in shoulders, elbows, wrists, or fingers/thumb joints were defined as upper extremity joint symptoms. Symptoms in hips, knees, ankles, or toes were defined as lower extremity joint symptoms. Chronic joint symptoms were measured by the question "Did your joint symptoms FIRST begin more than 3 months ago?" Responses of having chronic symptoms (either in upper or lower extremity joints) were categorized as "yes" or "no". Low back pain was assessed by the questions, "During the past 3 months, did you have low back pain that lasted a whole day or more?", "During the past 3 months, how often did you have low back pain?", and "Thinking about the last time you had pain, how much pain did you have?" Responses were categorized for presence (yes/no), frequency (every day/most days, some days, or no low back pain) and severity (severe, moderate, mild, or no low back pain).

Occupational and workplace factors.—Type of occupation included healthcare practitioners and technical occupations (e.g., diagnosing and treating practitioners, nurses, technicians) and healthcare support occupations (e.g., medical/nursing/dental/therapist assistants, health aides, massage therapists, phlebotomists). Work arrangement was categorized as regular/permanent employee versus other. Work schedule was categorized as regular day shift, regular evening shift, regular night shift, and rotating shift. Job demand, job control, and work-family imbalance were measured using the 4-point Likert Scale (from strongly agree to strongly disagree). Job demand was assessed using the question of "I have enough time to get the job done" and was defined as "high" for "disagree/strongly disagree" responses. Job control was assessed using the question of "My job allows me to make a lot of decisions on my own" and was defined as "high" for "agree/strongly agree" responses. Work-family imbalance was assessed using the question of "The demands of my job interfere with my personal or family life," and was defined as "high" for "agree/strongly agree" responses. Occupational physical activities were measured by the following questions, "How often does your job involve repeated lifting, pushing, pulling, or bending" and "How often does your job involve standing or walking around?" Responses were categorized into never/seldom, sometimes, and often/always. Whether a health promotion program was available at work in the past year was categorized as yes versus no.

Statistical analyses

All analyses were conducted in 2017–2018 using the SAS-callable SUDAAN, version 9.0.1, software was used to account for the complex survey design. To produce nationally representative estimates, sample weights were used to account for differential probabilities of selection, non-response, and non-coverage. First, the weighted prevalence and 95% Confidence Intervals (CI) for physical activity were estimated separately for meeting the aerobic guideline, meeting the muscle-strengthening guideline, and meeting both guidelines. We also assessed meeting each guideline by socio-demographics, BMI, health behaviors, musculoskeletal symptoms, and occupational and workplace factors. Second, using logistic regression, the associations between meeting the guidelines and the independent variables in unadjusted and adjusted models were examined. In the adjusted models, we included the following variables based on the 95% statistical significance from each of the unadjusted models: gender, race/ethnicity, BMI, marital status, region, health behaviors (smoking and alcohol consumption), severity of low back pain, type of occupation, work arrangement, work schedule, physical work activities, and the availability of health promotion programs at work. Overall, significance of adjusted models was determined at $p < 0.05$.

Results

The estimates of U.S. healthcare workers meeting the *2008 Guidelines* were based on a sample of 1,502 participants. Table 1 presented weighted prevalence estimates by the sample characteristics with unadjusted odds of meeting aerobic and muscle-strengthening guidelines (either or both). Based on *2008 Guidelines* criteria, 56.2% of U.S. healthcare workers met the aerobic guideline, 30.1% met the muscle-strengthening guideline, and 25.3% met both guidelines. In unadjusted models, odds of meeting the aerobic guideline, the muscle-strengthening guideline, or both guidelines were significantly higher in male, current alcohol consumers, healthcare practitioners and technical occupations, and workers with health promotion programs available at work. Non-Hispanic Black and workers with obesity were less likely to meet the guidelines compared to non-Hispanic White and workers with under-/normal-weight, respectively, in all three analyses.

The adjusted odds of meeting either or both of the guidelines versus meeting none of the guidelines are presented in Table 2. Adjusting for covariates, the odds of meeting the aerobic guideline, the muscle-strengthening guideline, and both guidelines were significantly lower in females (vs. males), Non-Hispanic Asian (vs. Non-Hispanic White), and workers with obesity (vs. workers with under-/normal-weight). The odds of meeting the aerobic guideline and the muscle-strengthening guideline were significantly higher in current alcohol consumers but lower in current smokers. Musculoskeletal symptoms were not significantly associated with meeting any of the guidelines. As for occupational and workplace factors, health care practitioners and technical occupations and workers reporting higher levels of physical work activities were more likely to meet the muscle-strengthening guideline and both guidelines, and the availability of workplace health promotion programs was significantly associated with meeting aerobic guideline and both guidelines.

Discussion

In our study with a nationally representative sample of 1,502 U.S. healthcare workers from the 2015 NHIS, we found that over a half met the aerobic guideline, one third met the muscle-strengthening guideline, and one fourth met both guidelines. Our study demonstrated that healthcare workers' leisure-time physical activity engagement was significantly associated with their health behaviors (smoking and alcohol intake) and occupational factors such as type of occupation and the level of occupational physical activity. Further, this study suggested that providing health promotion programs at work can significantly contribute to meeting the physical activity guidelines among health care workers.

Our study found that the prevalence rates meeting the aerobic and muscle-strengthening guidelines were lower among current smokers and higher among current alcohol consumers. Our finding suggesting the negative effect of smoking behavior was consistent with three systematic reviews.[12–14] However, the systematic reviews cautioned that evidence is insufficient due to the low quality of studies, the variety of definitions used to define a smoker, and the differing terminology used to describe physical activity intensity.[12,14] Our finding of higher physical activity engagement among current alcohol consumers was consistent with a recent systematic review of the literature of the general populations in the U.S.,[15] and an epidemiological study of women health professionals in the U.S.[16] Both studies indicated that higher rates of alcohol use were associated with higher levels of physical activity. On the other hand, our finding was inconsistent with two previous international studies targeting healthcare workers. In the U.K., Blake et al.[17] reported that nurses who were classified as physically active were less likely to report alcohol consumption. In Italy, Montali et al.[18] reported that healthcare workers who were physically inactive were more likely to consume wine/beer but not hard liquors.[18] We speculate that these mixed findings might be due to differences in the measurements (e.g., physical activity and alcohol consumption questions, definitions, classifications) and differences associated with geographical location and culture. Further study might help clarify these discrepancies.

Our study findings also showed a significant relationship between regular physical activity engagement and type of occupation. Our analysis was limited to comparison between the major two groups because of the distribution of data in NHIS 2015 dataset. Compared to healthcare support occupations (e.g., assistants and aids), health care practitioners and technical occupations (e.g., doctors, nurses, therapists) were more likely to meet the *2008 Guidelines*, and socioeconomic gradients between the two groups may explain the difference as low socioeconomic status is often known as barriers to physical activity engagement. This finding was consistent with a report from a Taiwanese study targeting full-time staff members working in 100 hospitals across Taiwan.[19] More detailed analysis by healthcare occupation was conducted by Tsiga et al:[20] They found that among nurses, doctors, ambulance workers, police officers, and office workers, nurses exercised the least and ambulance workers exercised the most. It should be noted that both our study and Chiou et al.[19] provide limited information on differences in prevalence by occupation, as neither breaks down occupations in fine detail: For example, neither study differentiates between

nurses vs. physicians vs. nurse practitioners. Further study would help to reconcile these discrepancies.[3,20]

Our finding that those who engage in higher levels of occupational physical activity were more likely to meet both of the recommended *2008 Guidelines* was supported by some previous literature. The finding is consistent with a 'generalization hypothesis' in that 'occupational physical activity spills over into other life domains (e.g., people with physically demanding jobs will also be active outside of their working hours).[21] For instance, Tsiga et al[20] reported that ambulance workers who often engage in heavy manual activities at work engage in more exercise than other healthcare workers (e.g., nurses).[20] Similarly, a recent study of California nurses reported a positive, but not statistically significant, relationship between occupational physical activity and leisure-time physical activity engagement.[22] However, it should be noted that overall there are mixed findings (i.e., positive, negative, or no clear/direct relationship) between occupational physical activity and leisure-time physical activity[21] and further investigation should be warranted to clarify these discrepancies.

Finally, the availability of health promotion programs at work was found to be significantly associated with meeting the *2008 Guidelines*. This finding is consistent with the findings of previous interventional studies.[23–27] Workplace health promotion interventions have succeeded in enhancing workers' physical activity or muscle strength/flexibility, improving cardiorespiratory fitness, and reducing obesity.[23–27] Our study supports the idea that the workplace can be an effective arena to promote physical activity, which can help prevent obesity and cardiovascular diseases among healthcare workers. Further research is needed to identify effective approaches in providing workplace health promotion programs that can result in the ideal level of engagement in physical activity among healthcare workers. For instance, it would be important to know when a program should be offered (i.e., during or outside of working hours) and which healthcare worker groups would benefit the most from such interventions.

Limitations

The present study has several limitations. First, there is a potential selection bias in our analysis since the sample comes from the NHIS which only draws from a civilian population. Second, this study relied on self-report data, which may be influenced by recall bias or social-desirability bias and resulting in over-/under- estimates of health behaviors and BMI. A potential source of overestimation could be the physical activity questions used in the NHIS: The NHIS uses a single question to measure both "light-intensity" and "moderate-intensity" activity, and thus we could not differentiate these two intensity levels of activity whereas the *2008 Guidelines* include only "moderate-intensity" activity as for a recommended activity. Third, the muscle-strengthening questions in the NHIS might not be the most accurate and comprehensive question to capture activities of all major muscle groups (e.g., legs, hips, and back). Four, we focused on overall healthcare worker groups but levels of physical activity may vary across different types of healthcare workers (e.g., physicians versus nurses). Fifth, we do not control for confounding variables, for example how stress level might influence both smoking status and levels of physical activity.

Lastly, this study was a cross-sectional analysis; thus we could not determine any causal relationships.

Conclusion

Our study showed that regular physcial activity engagement is far from optimal among U.S. healthcare workers with only one out of four meeting both aerobic and muscle-strengthening activity guidelines. We also found that individual health behaviors, and occupational and workplace factors are important determinants of levels of physical activity among healthcare workers. Multi-level approaches (combining individual and organizational level efforts) are needed to enhance physical activity in this population.

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Table 1.

Meeting the Physical Activity Guideline[a] among U.S. healthcare workers: Prevalence and bivariate associations

	Health Care Workers in 2015 NHIS		Prevalence of Meeting the Physical Activity Guideline					
			Meeting Aerobic guideline		Meeting Muscle-strengthening guideline		Meeting Both guidelines	
	N	Weighted % (95% CI)	%	Unadjusted OR (95% CI)	%	Unadjusted OR (95% CI)	%	Unadjusted OR (95% CI)
Total	1,502		56.2	(52.7, 59.6)	30.1	(26.9, 33.6)	25.3	(22.3, 28.5)
Demographics								
Gender								
Male	290	21.1 (18.3, 24.2)	65.1	**1.6 (1.1, 2.3)**	44.9	**2.3 (1.6, 3.3)**	36.6	**2.0 (1.4, 3.0)**
Female	1,212	78.9 (75.8, 81.7)	53.7	1.0	26.2	1.0	22.2	1.0
Age (years)								
18–29	285	20.1 (17.3, 23.1)	53.8	1.0	35.2	1.0	28.2	1.0
30–44	531	34.8 (31.5, 38.3)	60.5	1.3 (0.9, 2.0)	30.9	0.8 (0.5, 1.3)	26.8	0.9 (0.6, 1.5)
45–64	593	40.9 (37.6, 44.2)	55.0	1.1 (0.7, 1.6)	27.9	0.7 (0.4, 1.2)	23.2	0.8 (0.5, 1.3)
65+	93	4.2 (3.2, 5.6)	41.6	0.6 (0.3, 1.3)	20.9	0.5 (0.2, 1.1)	18.4	0.6 (0.2, 1.5)
Race/Ethnicity								
Hispanic	173	10.9 (9.1, 13.0)	51.1	**0.7 (0.5, 0.99)**	28.1	0.8 (0.5, 1.3)	23.3	0.8 (0.5, 1.2)
Non-Hispanic, Black	256	15.7 (13.6, 18.0)	46.2	**0.6 (0.4, 0.8)**	21.6	**0.6 (0.3, 0.9)**	15.4	**0.5 (0.3, 0.8)**
Non-Hispanic, Asian	94	6.5 (5.1, 8.3)	49.3	0.6 (0.4, 1.04)	24.0	0.6 (0.3, 1.3)	20.2	0.6 (0.3, 1.4)
Non-Hispanic, Other	35	2.6 (1.5, 4.4)	38.3	**0.4 (0.2, 0.9)**	28.9	0.8 (0.3, 2.1)	28.9	1.0 (0.4, 2.6)
Non-Hispanic, White	944	64.4 (61.2, 67.4)	60.8	1.0	33.2	1.0	28.4	1.0
Body mass index [b]								
Under-/normal- weight	550	37.3 (34.1, 40.6)	65.8	1.0	36.2	1.0	31.1	1.0
Overweight	465	31.3 (28.3, 34.5)	57.8	**0.7 (0.5, 1.0)**	31.5	0.8 (0.6, 1.1)	26.5	0.8 (0.6, 1.1)
Obese	487	31.4 (28.4, 34.5)	43.0	**0.4 (0.3, 0.6)**	21.6	**0.5 (0.3, 0.7)**	17.0	**0.5 (0.3, 0.7)**
Marital status								
Married/living with partner	828	66.0 (62.8, 68.9)	58.8	1.3 (0.9, 1.8)	30.3	0.7 (0.5, 1.0)	26.1	0.9 (0.6, 1.3)
Widowed/divorced/separated	344	16.4 (14.2, 18.8)	49.5	0.9 (0.6, 1.4)	21.4	**0.5 (0.3, 0.7)**	18.4	**0.6 (0.4, 0.9)**
Never married	328	17.7 (15.1, 20.6)	52.6	1.0	37.9	1.0	28.5	1.0
Geographical region								

Arch Environ Occup Health. Author manuscript; available in PMC 2022 July 21.

	Health Care Workers in 2015 NHIS		Prevalence of Meeting the Physical Activity Guideline					
			Meeting Aerobic guideline		Meeting Muscle-strengthening guideline		Meeting Both guidelines	
	N	Weighted % (95% CI)	%	Unadjusted OR (95% CI)	%	Unadjusted OR (95% CI)	%	Unadjusted OR (95% CI)
Northeast	276	17.6 (15.1, 20.3)	55.8	0.9 (0.6, 1.4)	30.1	0.9 (0.5, 1.5)	26.1	0.8 (0.5, 1.4)
North Central/Midwest	349	25.5 (22.7, 28.6)	60.2	1.0 (0.7, 1.6)	29.7	0.9 (0.6, 1.4)	25.4	0.8 (0.5, 1.2)
South	498	36.2 (32.9, 39.7)	51.7	0.7 (0.5, 1.1)	28.9	0.8 (0.6, 1.3)	22.0	**0.7 (0.4, 1.00)**
West	379	20.7 (18.2, 23.4)	59.2	1.0	32.8	1.0	30.2	1.0
Health Behaviors								
Smoking status								
Current	163	10.8 (8.9, 13.1)	42.3	**0.5 (0.3, 0.8)**	19.4	**0.5 (0.3, 0.9)**	18.5	0.6 (0.3, 1.1)
Former	262	17.8 (15.3, 20.7)	55.3	0.9 (0.6, 1.3)	27.4	0.8 (0.5, 1.2)	21.5	0.7 (0.5, 1.1)
Never	1,075	71.3 (68.2, 74.3)	58.5	1.0	32.5	1.0	27.3	1.0
Alcohol consumption								
Current	1,072	75.4 (72.6, 78.1)	61.9	**2.5 (1.8, 3.6)**	33.1	**1.9 (1.2, 2.9)**	28.4	**2.0 (1.2, 3.1)**
Former	139	8.1 (6.5, 10.1)	40.5	1.1 (0.6, 1.9)	24.8	1.3 (0.6, 2.6)	16.4	1.0 (0.4, 2.1)
Never	277	16.5 (14.3, 18.8)	39.2	1.0	20.8	1.0	16.9	1.0
Sleep duration								
< 7 hour	554	36.8 (33.5, 40.2)	54.3	0.9 (0.7, 1.2)	30.2	1.0 (0.7, 1.4)	24.6	1.0 (0.7, 1.3)
7 to 9 hours	882	59.1 (55.6, 62.5)	57.1	1.0	30.3	1.0	25.5	1.0
> 9 hour	66	4.1 (3.1, 5.5)	59.1	1.1 (0.6, 2.1)	27.0	0.9 (0.4, 1.9)	27.0	1.1 (0.5, 2.4)
Musculoskeletal symptoms								
U/E symptoms								
No	1,276	85.9 (83.4, 88.1)	55.7	1.0	29.9	1.0	24.8	1.0
Yes	225	14.1 (11.9, 16.6)	59.3	1.2 (0.8, 1.7)	31.6	1.1 (0.7, 1.6)	28.5	1.2 (0.8, 1.9)
L/E symptoms								
No	1,135	77.4 (74.5, 80.1)	55.9	1.0	30.5	1.0	25.6	1.0
Yes	366	22.6 (19.9, 25.5)	57.3	1.1 (0.8, 1.4)	28.9	0.9 (0.6, 1.4)	24.0	0.9 (0.6, 1.4)
Chronic symptoms in shoulder, U/E, or L/E								
No	1,092	74.3 (71.1, 77.3)	55.6	1.0	30.8	1.0	25.4	1.0
Yes	408	25.7 (22.7, 28.9)	57.6	1.1 (0.8, 1.5)	28.6	0.9 (0.6, 1.3)	25.0	1.0 (0.7, 1.4)
Low back pain – Severity								

Arch Environ Occup Health. Author manuscript; available in PMC 2022 July 21.

	Health Care Workers in 2015 NHIS		Prevalence of Meeting the Physical Activity Guideline					
			Meeting Aerobic guideline		Meeting Muscle-strengthening guideline		Meeting Both guidelines	
	N	Weighted % (95% CI)	%	Unadjusted OR (95% CI)	%	Unadjusted OR (95% CI)	%	Unadjusted OR (95% CI)
No	1,051	70.9 (68.0, 73.7)	56.6	1.0	30.4	1.0	25.0	1.0
Mild	155	9.1 (7.4, 11.1)	59.8	1.1 (0.7, 1.8)	32.6	1.1 (0.7, 1.8)	30.7	1.3 (0.8, 2.2)
Moderate	212	14.4 (12.1, 16.9)	57.7	1.1 (0.7, 1.6)	30.7	1.0 (0.7, 1.6)	26.1	1.1 (0.7, 1.7)
Severe	83	5.7 (4.3, 7.4)	42.0	**0.6 (0.3, 0.97)**	21.8	0.6 (0.3, 1.3)	18.6	0.7 (0.3, 1.5)
Low back pain – Frequency								
None	1,051	70.9 (68.0, 73.7)	56.6	1.0	30.4	1.0	25.0	1.0
Some days	279	18.8 (16.3, 21.5)	57.7	1.1 (0.7, 1.5)	30.5	1.0 (0.7, 1.5)	27.7	1.2 (0.7, 1.8)
Every day or most days	171	10.3 (8.5, 12.6)	51.0	0.8 (0.5, 1.2)	27.8	0.9 (0.5, 1.4)	23.1	0.9 (0.5, 1.5)
Occupational/Workplace factors								
Type of occupation								
Healthcare practitioners and technical occupations	1,040	71.6 (68.3, 74.7)	60.8	**1.9 (1.4, 2.6)**	33.4	**1.8 (1.3, 2.5)**	28.8	**2.1 (1.4, 2.9)**
Healthcare support	462	28.4 (25.4, 31.7)	44.5	1.0	22.0	1.0	16.4	1.0
Work arrangement								
Regular, permanent employee	1,349	90.1 (88.0, 91.9)	56.5	1.0	29.1	1.0	25.1	1.0
Other	150	9.9 (8.1, 12.0)	53.1	0.9 (0.5, 1.4)	40.0	1.6 (1.0, 2.6)	27.0	1.1 (0.6, 2.0)
Work schedule								
Day shift	981	65.1 (61.8, 68.2)	57.7	1.0	31.1	1.0	25.6	1.0
Evening shift	89	6.9 (5.3, 8.8)	46.6	0.6 (0.4, 1.0)	18.6	**0.5 (0.3, 0.97)**	18.6	0.7 (0.4, 1.3)
Night shift	146	9.4 (7.6, 11.5)	54.2	0.9 (0.5, 1.4)	26.5	0.8 (0.5, 1.4)	19.6	0.7 (0.4, 1.2)
Rotating shift	285	18.7 (16.1, 21.6)	55.3	0.9 (0.6, 1.4)	32.8	1.1 (0.7, 1.6)	29.6	1.2 (0.8, 1.9)
Job demand								
High	231	14.9 (12.4, 17.7)	60.9	1.3 (0.9, 1.8)	30.0	1.0 (0.7, 1.5)	25.7	1.0 (0.7, 1.6)
Low	1,267	85.2 (82.3, 87.6)	55.2	1.0	29.9	1.0	25.1	1.0
Job control								
High	1,309	88.0 (85.6, 90.0)	57.3	1.6 (0.99, 2.5)	30.8	1.4 (0.8, 2.3)	25.9	1.5 (0.8, 2.5)
Low	186	12.0 (10.0, 14.4)	46.3	1.0	24.5	1.0	19.5	1.0
Physical work activities – Repeated lifting, pulling, etc								

	Health Care Workers in 2015 NHIS		Prevalence of Meeting the Physical Activity Guideline					
			Meeting Aerobic guideline		Meeting Muscle-strengthening guideline		Meeting Both guidelines	
	N	Weighted % (95% CI)	%	Unadjusted OR (95% CI)	%	Unadjusted OR (95% CI)	%	Unadjusted OR (95% CI)
Often or always	831	56.4 (53.2, 59.7)	57.8	1.2 (0.9, 1.6)	32.6	**1.3 (1.00, 1.8)**	27.4	**1.3 (1.0, 1.7)**
Never or seldom or sometimes	670	43.6 (40.3, 46.8)	53.9	1.0	26.7	1.0	22.3	1.0
Physical work activities – standing or walking								
Often or always	1,274	86.4 (84.3, 88.3)	56.3	1.1 (0.7, 1.5)	30.5	1.2 (0.8, 1.8)	25.8	1.3 (0.9, 2.0)
Never or seldom or sometimes	227	13.6 (11.8, 15.7)	55.0	1.0	26.9	1.0	20.9	1.0
Work-family imbalance								
High	433	28.7 (25.9, 31.6)	59.2	1.2 (0.9, 1.6)	33.8	1.3 (0.9, 1.8)	29.0	1.3 (0.9, 1.9)
Low	1,066	71.4 (68.4, 74.1)	54.9	1.0	28.5	1.0	23.6	1.0
Health promotion program available at work (past year)								
Yes	865	62.1 (58.7, 65.3)	62.3	**1.9 (1.4, 2.5)**	32.2	**1.4 (1.0, 1.9)**	28.5	**1.6 (1.2, 2.2)**
No	547	37.9 (34.7, 41.3)	46.7	1.0	25.7	1.0	19.7	1.0

[a](1) met aerobic guideline: Defined as performing at least 150 minutes of moderate-intensity equivalent physical activity/week; (2) met muscle-strengthening guideline: Defined as performing MS activities ≥2 times per week; (3) met both guidelines: Defined as performing at least 150 minutes of moderate-intensity equivalent physical activity/week and performing MS activities ≥2 times per week; (4) reference group – not meeting either or both of the guidelines.

[b]Body mass index estimates were calculated from measured weight and height (weight [kg]/ height [m^2])

NHIS, National Health Interview Survey; OR, odds ratio; U/E, upper extremity; L/E, lower extremity

Boldface indicates statistical significance (p<0.05).

Arch Environ Occup Health. Author manuscript; available in PMC 2022 July 21.

Table 2.

Individual and occupational factors associated with Meeting the Physical Activity Guideline[a] among U.S. healthcare workers

Unit: OR (95% CI)	Meeting Aerobic guideline	Meeting Muscle-strengthening guideline	Meeting Both guidelines
Demographics			
Gender			
Male	**1.6 (1.0, 2.5)**	**2.2 (1.4, 3.4)**	**1.9 (1.2, 3.0)**
Female	1.0	1.0	1.0
Race/ethnicity			
Hispanic	0.8 (0.5, 1.2)	0.9 (0.5, 1.6)	0.9 (0.5, 1.5)
Non-Hispanic, Black	0.8 (0.5, 1.3)	0.7 (0.4, 1.1)	0.6 (0.3, 1.0)
Non-Hispanic, Asian	**0.5 (0.3, 0.9)**	**0.5 (0.2, 0.97)**	**0.4 (0.2, 0.96)**
Non-Hispanic, Other	0.5 (0.2, 1.1)	1.1 (0.4, 2.8)	1.3 (0.5, 3.1)
Non-Hispanic, White	1.0	1.0	1.0
Body mass index			
Under-/normal- weight	1.0	1.0	1.0
Overweight	0.7 (0.5, 1.1)	0.8 (0.5, 1.1)	0.8 (0.5, 1.1)
Obese	**0.4 (0.3, 0.6)**	**0.5 (0.3, 0.7)**	**0.5 (0.3, 0.7)**
Marital status			
Married/living with partner	1.2 (0.8, 1.7)	**0.6 (0.4, 0.9)**	0.8 (0.5, 1.2)
Widowed/divorced/separated	1.0 (0.7, 1.7)	**0.6 (0.4, 0.9)**	0.7 (0.4, 1.2)
Never married	1.0	1.0	1.0
Geographical region			
Northeast	1.0 (0.6, 1.5)	1.0 (0.6, 1.7)	0.9 (0.6, 1.5)
North Central/Midwest	1.0 (0.6, 1.5)	0.8 (0.5, 1.3)	0.8 (0.5, 1.2)
South	0.8 (0.6, 1.3)	0.9 (0.6, 1.4)	0.8 (0.5, 1.2)
West	1.0	1.0	1.0
Health Behaviors			
Smoking status			
Current	**0.5 (0.3, 0.9)**	**0.5 (0.3, 0.97)**	0.7 (0.4, 1.3)
Former	0.9 (0.6, 1.3)	0.8 (0.5, 1.2)	0.8 (0.5, 1.3)
Never	1.0	1.0	1.0

Unit: OR (95% CI)	Meeting Aerobic guideline	Meeting Muscle-strengthening guideline	Meeting Both guidelines
Alcohol consumption			
Current	**2.4 (1.6, 3.6)**	**1.7 (1.0, 2.7)**	1.7 (0.98, 2.8)
Former	1.1 (0.6, 2.0)	1.7 (0.8, 3.5)	1.1 (0.5, 2.5)
Never	1.0	1.0	1.0
Musculoskeletal symptoms			
Low back pain – Severity			
No	1.0	1.0	1.0
Mild	0.9 (0.5, 1.5)	0.8 (0.5, 1.3)	1.0 (0.6, 1.7)
Moderate	1.3 (0.8, 2.0)	1.1 (0.7, 1.8)	1.2 (0.7, 1.9)
Severe	0.6 (0.3, 1.2)	0.8 (0.3, 1.7)	0.8 (0.3, 1.8)
Occupational/Workplace factors			
Type of occupation			
Healthcare practitioners and technical occupations	1.3 (0.9, 1.8)	**1.5 (1.0, 2.2)**	**1.5 (1.0, 2.3)**
Healthcare support	1.0	1.0	1.0
Work arrangement			
Regular, permanent employee	1.0	1.0	1.0
Other	1.2 (0.6, 2.2)	**2.6 (1.4, 5.0)**	1.4 (0.7, 3.0)
Work schedule			
Day Shift	1.0	1.0	1.0
Evening Shift	0.9 (0.5, 1.6)	0.7 (0.3, 1.3)	0.9 (0.4, 1.7)
Night Shift	0.8 (0.5, 1.3)	0.7 (0.4, 1.1)	0.6 (0.3, 1.0)
Rotating Shift	0.9 (0.5, 1.3)	0.8 (0.5, 1.2)	0.9 (0.6, 1.4)
Physical work activities – Repeated lifting, pulling, etc			
Often or always	1.3 (0.96, 1.8)	**1.6 (1.1, 2.3)**	**1.6 (1.1, 2.2)**
Never or seldom or sometimes	1.0	1.0	1.0
Health promotion program available at work (past year)			
Yes	**1.8 (1.3, 2.5)**	1.3 (0.9, 1.7)	**1.5 (1.0, 2.0)**
No	1.0	1.0	1.0

[a](1) met aerobic guideline: Defined as performing at least 150 minutes of moderate-intensity equivalent physical activity/week; (2) met muscle-strengthening guideline: Defined as performing MS activities ≥2 times per week; (3) met both guidelines: Defined as performing at least 150 minutes of moderate-intensity equivalent physical activity/week and performing MS activities ≥2 times per week; (4) reference group – not meeting either or both of the guidelines

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[b]Body mass index estimates were calculated from measured weight and height (weight [kg]/ height [m^2])

OR, odds ratio

Boldface indicates statistical significance (p<0.05).