

Employee Sleep Enhancement and Fatigue Reduction Programs: Analysis of the 2017 CDC Workplace Health in America Poll

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Abstract

Background: Poor sleep health, including sleep deficiency and sleep disturbance, is common among employed adults in the U.S. and is associated with undesirable workplace outcomes. Adoption of workplace health promotion programs (WHPPs) is increasing, yet few programs aim to reduce fatigue or improve sleep among employees.

Objective: We analyzed data from the nationally representative 2017 Centers for Disease Control Workplace Health in America poll to identify the prevalence of sleep enhancement or fatigue reduction WHPPs and the characteristics of employers that offer these programs.

Method: A stratified random sample of nationally-representative worksites with ≥ 10 employees was generated. It comprised 2,843 worksites. Worksite representatives reported workplace characteristics, health promotion activities, and the likelihood of offering WHPPs relating to sleep enhancement or fatigue reduction. Logistic regression analyses were utilized to identify characteristics associated with offering a sleep enhancement or fatigue reduction WHPP, controlling for WHPP budget and size of the company, and contingent on worksites having a comprehensive workplace health plan.

Results: Less than 1 in 10 worksites (10%) reported offering a sleep enhancement or fatigue reduction WHPP. Worksites most likely to offer a sleep-focused WHPP were those in retail, wholesale, or technology industries (OR = 2.71, 95%CI: 1.08-6.8) vs. those in the finance, information, technology industries; those with a large WHPP budget ($> \$500,000$, OR = 6.85, 95%CI: 2.1-22.35) vs. those with no budget; and those that had visible support of WHPP initiatives from senior leadership (OR = 4.74, 95%CI: 1.91-11.75) vs. those without such support.

Conclusions: Our results highlight how few worksites reported offering sleep-focused programs for their employees. Those worksites that did feature such programs, were commonly well-resourced and had senior leadership support for WHPP initiatives in general. Future research should consider working directly with leaders to expand the implementation of employee sleep enhancement and fatigue reduction WHPPs.

Keywords

Employee Assistance Programs, interventions, population health, education/communications, awareness, strategies, sleep health, worksite wellness, health communications

Introduction

Poor sleep health, manifesting as sleep deficiency (i.e., sleep duration less than the recommended 7 hours nightly), sleep difficulties (e.g., difficulty falling asleep or nighttime awakenings), untreated sleep disorders as well as daytime consequences (e.g., fatigue), is common among employed adults in the United States (U.S.). According to the Centers for Disease Control (CDC), 25% of working age adults report sleep deficiency¹ and 30% report routinely experiencing sleep difficulties.² Poor sleep health among employees is concerning, for it

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is associated with greater risk for hypertension,^{3,4} obesity,^{3,5} Type II diabetes,⁶ and cancer, among other chronic diseases.⁷ Furthermore, sleep disorders are common, including insomnia (approximately 10% of adults are estimated to have this disorder)^{2,8,9} and sleep apnea (30% or more of working aged adults are estimated to have this disorder),¹⁰ yet are widely undiagnosed, thereby exerting a pervasive impact on sleep, health, mood, and workplace performance.

In addition to its detrimental effects on individual employee health, poor sleep health has implications for workplace safety, productivity, and absenteeism. Employees who experience frequent sleep difficulty (“sometimes,” “most nights” or “every night” in the past 4 weeks) are 6 times more likely to be absent from work compared to employees who never experience sleep difficulty.¹¹ Research also suggests that sleep deficient employees may show up to work, yet underperform (a phenomenon termed “presenteeism”), resulting in an average of 7.8 lost work days per sleep deficient employee per year.¹² The annual cost of sleep deprivation in the US among working age adults is estimated to be approximately \$411 billion dollars due to illness and mortality, absenteeism, reduced productivity, decreased work skill development, and reduced alertness, as well as errors, and accidents.¹³

Workplace health promotion programs (WHPPs) are an increasingly common approach to improving employee health in the US. According to the CDC Workplace Health in America Poll, 46% of US worksites reported offering WHPPs for their employees.¹⁴ Among other benefits, worksites stand to benefit from WHPPs in terms of improved employee health, lower healthcare costs, and increased productivity among their employees. In a critical meta-analysis of the literature, each \$1 invested in WHPP is associated with average reductions of \$3.27 in medical costs and \$2.73 in absenteeism-related costs.¹⁵ According to a 2012 report, the most common health behaviors targeted by WHPPs are physical activity and nutrition, with far less attention paid to employee sleep.¹⁶

Although far less common, sleep-focused WHPPs offer promising results. In a study evaluating a sleep-focused WHPP that delivered sleep education and sleep disorders screening, researchers found that employees who participated in the program reported improved productivity and lower absenteeism and injuries.¹⁷ Also, according to a systematic review, Redeker and colleagues identified 60 studies that evaluated sleep-focused WHPPs.¹⁸ In another review conducted by Robbins and colleagues, more than 50% of the 20 studies that were included in the review reported a favorable increase in employee sleep duration as a result of participation in a WHPP.¹⁹ Despite this promising signal, both Robbins and Redeker documented significant heterogeneity between the sleep-related WHPPs in several areas, including study design (e.g., pilot study versus randomized cohort study), program focus area (e.g., sleep hygiene versus fatigue management), and evaluation efforts (e.g., self-reported questionnaire versus objective sleep measures), which precluded pooling evidence in these reviews for meta-analysis. Despite this evidence to suggest that programs that aim to improve employee sleep (e.g., delivering education

on healthy sleep, symptoms of sleep disorders, or fatigue reduction) may be a promising target for WHPPs, their prevalence and characteristics have not been fully explored.^{18,19} We examine the prevalence of sleep-related WHPPs as compared to other more common WHPP targets (i.e., physical activity and nutrition) at worksites. According to the CDC Workplace Health Model, worksite characteristics, such as support from senior management, talented WHPP program designers and practitioners, and regular employee health assessments to benchmark progress.²⁰ Thus, we explore the characteristics of workplaces that offer sleep-focused WHPPs for their employees. To do so, we analyzed data from the nationally representative Workplace Health in America survey collected in 2017 by the CDC.

Methods

Study Design and Sample

Data from the CDC 2017 Workplace Health in America survey were analyzed. The study contacted 35,584 worksites and successfully screened 10,350 worksites. A total of 6,209 worksites agreed to participate and 2,843 worksites met completion criteria and were successfully included in this study (the 46% cooperation rate).¹⁴ This survey gathered information from a cross-sectional, nationally representative sample of worksites in the US. The methods have been described in detail previously.¹⁴ The sample was drawn from the Dun and Bradstreet database of 2.5 million private and public employers in the US who employed 10 employees or more. A stratified simple random sample design was employed, whereby the primary strata were 10 multistate regions. Within each stratum region, worksite size was further stratified by number of employees and industry group according to the 7 combined industry sectors according to the North American Industry Classification System, consistent with previous research.²¹

As reported elsewhere, trained interviewers contacted each worksite by telephone and asked to speak to the individual “most knowledgeable about employee health and safety” at the worksite. The representative at the worksite responded to the survey items on behalf of the worksite. As the data are de-identified and publicly available, the study was exempt from IRB review. Interviewers confirmed with each interviewee that their worksite met the study criteria (employing at least 10 employees) during the past 12 months. RTI International conducted this study. According to the RTI International institutional review board, this study met the criteria for an IRB-exempted survey (IRB #0214531) because data collection was done at the worksite, rather than the human subject level.

Measures

We examined worksite characteristics, workforce characteristics, worksite health promotion characteristics, and specific WHPP characteristics (e.g., physical activity, nutrition, and sleep enhancement or fatigue reduction).

Worksite characteristics. Worksite characteristics collected included industry sector defined using standard classification codes to distinguish between agriculture/mining, wholesale/retail, arts/hospitality, management/finance, education/health services, public administration, and other workplaces not captured by the above. Also, the age, gender, and proportion of hourly workers, offsite workers, and unionized workers was measured. Finally, the rate of turnover was reported as the number of employees who leave the organization in a given year.

Characteristics of WHPPs. Worksite health promotion was characterized by the availability/existence of the following health policies and infrastructure: employee health insurance, periodic health risk assessments (i.e., advising employees on areas that pose a high risk to their health), employee health education efforts, a supportive environment for employee health (e.g., employees feel that their employer and peers support their healthy behavioral changes), health screenings (e.g., blood pressure screening or skin cancer screening), and the number of years the health promotion program has been available. In addition, the survey asked, if the company's mission statement mentioned employee health, and whether there was support from the company's leadership for the health promotion program.

Additionally, the survey assessed whether health was integrated into the workplace culture, such as offering healthy snacks for employees during meetings, employees discussing health during breaks or supporting one another in reaching their health goals. The survey further inquired if the worksite offered a comprehensive workplace health promotion plan, defined as policies and interventions to address multiple risk factors and health conditions with a number of individual and organization-level components to influence employee health. It also was determined whether the worksite used data to design their workplace health promotion programs, and the size of the health promotion budget. Finally, the survey ascertained whether there was an onsite health coach, physical activity trainer and a workplace health champion.

WHPP offerings. We calculated the proportion of worksites in the sample that reported a sleep enhancement or fatigue reduction program for their employees (1 = offer a sleep enhancement or fatigue reduction program; 0 = do not offer a sleep enhancement or fatigue reduction program). To understand the relative prevalence of sleep enhancement or fatigue reduction programs in comparison to more common WHPP focal areas, we also tabulated the proportion of worksites reporting a physical activity (1 = offer a physical activity program; 0 = do not offer a physical activity program) or nutrition program (1 = offer a nutrition program; 0 = do not offer a nutrition program). For each type of WHPP (physical activity, nutrition, and sleep enhancement or fatigue reduction) that was offered, additional information was elicited describing the type of program and whether the program focused on "increasing awareness or providing information," such as classroom sessions or workshops on health-related topics (1), "skill-building," such

as hands-on demonstrations or seminars(2), or "both" increasing awareness or providing information and skill-building (3).

Statistical analyses. Descriptive statistics are reported for the worksite, WHPP offerings, and WHPP characteristics. A logistic regression was used to predict the characteristics of worksites that reported a sleep enhancement or fatigue reduction WHPP. All models followed the recommended procedures to produce nationally representative estimates.¹⁴

Logistic regression models were created without covariates (Model 1, "Unadjusted") and with the following covariates: company size, type, and budget over \$50,000 (Model 2, "Adjusted"). Another model was created using the Model 2 covariates, but the sample restricted to only those worksites that also reported a comprehensive WHPP plan (Model 3, "Adjusted and Restricted"). In Model 2, it is conceivable that factors associated with a sleep program could overlap those associated with any health promotion program (including those without another program). Model 3, on the other hand, adds the presence of a WHPP plan as a covariate. Covariates were selected a priori based on relevance to the research question and potential confounders. For instance, it was hypothesized that the presence of a WHPP plan might increase the likelihood of thorough health promotion programs, such as sleep-related programs. Therefore, by restricting the sample to those with the presence of a WHPP plan, it was possible to examine the specific characteristics of companies likely to focus on sleep improvement or fatigue reduction among their workforce. Similarly, worksite size, type, and WHPP budget were also hypothesized factors that may increase the likelihood of a sleep-related WHPP and were included as covariates.

In the regression models, the reference category selected depended on the type of question. For questions with a yes/no response (e.g., health screening, senior leadership support) the response "no" was used as the reference category. In the case of the question asking for worksite industry, size, type, and age, reference categories for the predictors in the logistic regression analyses were selected by tabulating the category which had the lowest rate of sleep enhancement or fatigue reduction programs. For instance, the worksites in the art/hospitality industry had the lowest proportion of sleep enhancement or fatigue reduction WHPP and were thus selected as the reference category in analyses examining which type of industry was more likely to have a sleep enhancement or fatigue reduction program. Similarly, private for-profit companies had the lowest rate of sleep enhancement or fatigue reduction programs and were selected as the reference category for analyses examining company type and likelihood of a sleep enhancement or fatigue reduction program. All tests were 2-sided with alpha set at 0.05. Analyses were performed in STATA (Version 16, College Station, TX).

Results

Among the worksites represented in this study, education/health services worksites were most common (19.4%),

Table 1. Descriptive Statistics Summarizing the Total Sample of Worksites, and the Worksites Reporting a Sleep Enhancement or Fatigue Reduction Program (N = 2,843).

		Total worksite Sample	Sleep or Fatigue Program	p-value
Worksite Characteristics				
Industry	Agriculture/Mining /Construction	15.1%	15.9%	<.0001
	Wholesale/Retail/Transportation	20.1%	18.6%	
	Arts/Hospitality/Entertainment	20.0%	20.6%	
	Finance/Information/Technology	20.5%	22.5%	
	Education/Health Services	17.0%	16.5%	
	Public Administrations	6.7%	5.5%	
	Hospital/Healthcare	0.6%	0.5%	
Size	<100 people	90.8%	92.2%	<.001
	100-500 people	8.3%	7.2%	
	>500 people	0.9%	0.6%	
Type	For-Profit, Private	54.5%	60.7%	<.0001
	For-Profit, Public	14.7%	11.5%	
	Non-Profit	15.7%	15.9%	
	Government	12.8%	10.0%	
	Other	2.3%	1.8%	
WHPP Characteristics				
Health Insurance Plans	No Coverage	15.2%	17.4%	<.0001
	Partial Coverage	46.2%	48.7%	
	Full Coverage	38.7%	33.9%	
Offers an HRA	Yes	26.2%	16.8%	<.0001
Provides Health Education	Yes	34.3%	22.5%	<.0001
Supportive Environment	Yes	48.0%	37.9%	<.0001
Health Integrated into Culture	Yes	28.7%	18.5%	<.0001
Provides Screening	Yes	26.6%	17.5%	<.0001
Program in Existence	1-2 years	12.5%	11.7%	<.0001
	3-5 years	13.5%	10.2%	
	6 or more years	15.0%	8.7%	
	No Program	58.9%	69.4%	
Program Provider	Company	26.5%	19.3%	<.0001
	Insurance Company	7.0%	5.2%	
	Vendor	9.3%	7.4%	
	No Program	57.3%	68.1%	
Has WHPP Champion	Yes	30.9%	22.0%	<.0001
Health Mission	Yes	45.7%	33.3%	<.0001
Leadership Support	Yes	84.1%	78.9%	.007
Middle Manager Support	Yes	83.4%	80.4%	.092
WHPP Employee on Staff	Yes	62.2%	51.1%	<.0001
Has Health WHPP Plan	Yes	59.0%	47.7%	<.0001
Use Data	Yes	52.7%	39.0%	<.0001
Budget	None	35.6%	43.8%	<.0001
	<\$1k	11.1%	11.4%	
	\$1-5k	11.5%	12.8%	
	\$5-10k	5.9%	6.6%	
	\$10-15k	3.6%	4.0%	
	\$15-20k	4.0%	3.6%	
	\$20-50k	4.4%	5.3%	
	\$50-100k	5.9%	4.3%	
	\$100-500k	17.3%	8.0%	
	>\$500k	0.9%	0.3%	
Workforce Characteristics				
% Age > 30		28.0 ± 25.0	27.4 ± 25.4	0.084
% Age > 60		12.1 ± 14.8	12.2 ± 15.4	0.614
% Female		46.7 ± 30.9	47.6 ± 30.7	<.001
% Hourly Workers		61.4 ± 33.8	60.8 ± 34.4	0.097
% Offsite Workers		13.3 ± 26.5	13.6 ± 26.7	0.702
% Unionized Workers		7.27 ± 22.16	5.37 ± 19.74	<.0001
% Annual Turnover		17.2 ± 22.2	16.3 ± 22.2	<.0001

followed by agriculture (18.5%) and arts/hospitality (15.3%). The majority of worksites reported employing fewer than 100 employees (90.8%) and were described as private for-profit companies (54.5%). The full details summarizing worksite and WHPP characteristics are presented in Table 1.

WHPP Offerings

As shown in Figure 1, among the worksites represented in this study, 29% of worksites offered a physical activity program, 23% offered a nutrition program, and 10% offered a sleep enhancement or fatigue reduction WHPP for employees.

As shown in Figure 2, among worksites offering physical activity WHPPs, 30% reported offering only informational/educational programs, 13% offered only skill-building programs, and 55% offered both types of programs. Among those offering nutrition WHPPs, 44% offered informational/educational than skill-building programs, 5% offered skill-building programs, and 49% offered both. Among those offering sleep enhancement or fatigue reduction programs, 52% offered informational/educational programs, 6% offered skill-building, and 41% offered.

Worksite Characteristics Associated With the Presence of a Sleep Enhancement or Fatigue Reduction Program

Table 2 illustrates the association between health promotion characteristics of worksites and offering of a sleep enhancement or fatigue reduction WHPP. In adjusted analyses, when compared to companies in financial, management, or technology sectors, companies in wholesale or retail sectors were more likely to report offering a sleep-focused health promotion program to employees (OR = 2.71, 95%CI:1.08-6.8). With respect to company type, for profit private were more likely than for profit public companies to offer a sleep enhancement or fatigue reduction program (OR = 2.71,95%CI: 1.08-6.8).

Worksite Health Promotion Program Characteristics Associated With Presence of a Sleep or Fatigue Reduction Program

Worksites with other positive characteristics associated with presence of a sleep enhancement or fatigue reduction program included companies that offered health risk assessments (OR = 2.98, 95%CI: 1.8-4.92; reference = not offering such assessments); those that offered health education (OR = 4.01, 95%CI: 1.91-8.4; reference = no health education); had a supportive environment (OR = 3.28, 95%CI: 1.45-7.43; reference = no supportive environment); those that had health integrated into their workplace culture (OR = 3.19, 95%CI: 1.69-6.04; reference = health not integrated); and those companies that offered health screenings for employees (OR = 2.58, 95%CI: 1.53-4.32; reference = no health screenings). Programs that had been in place for 3-5 years were more likely to have a sleep program (OR = 2.42, 95%CI: 1.22-4.77; reference = program in place for <3 years), as were those that had been in place 6

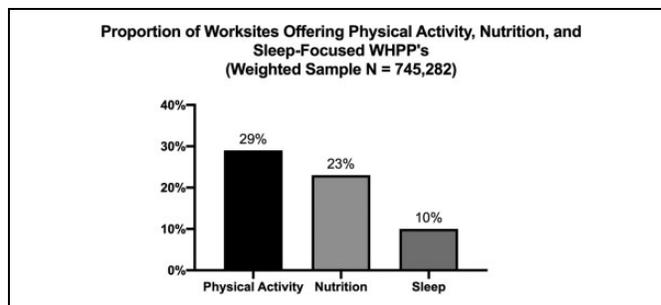


Figure 1. Proportion of worksites offering physical activity nutrition and sleep-focused WHPP's (Weighted Sample N = 745,282).

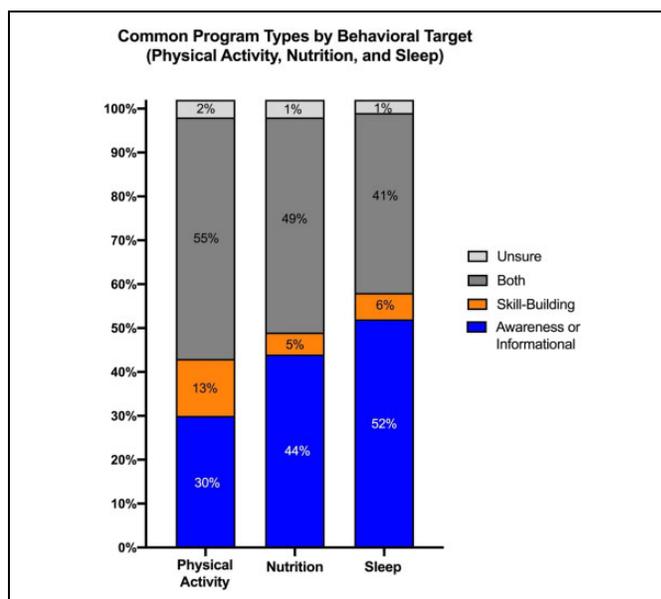


Figure 2. Common program types by behavioral target (Physical Activity Nutrition, and Sleep).

years or longer (OR = 3.02, 95%CI: 1.57-5.80; reference = program in place for <3 years). Other characteristics of worksites offering a sleep enhancement or fatigue reduction program are shown in Table 3. Some of the more important are the following: presence of a health champion at the worksite (OR = 3.86, 95%CI: 2.07-7.2; reference = no health champion at the worksite), presence of a health-related mission (OR = 3.12, 95%CI: 1.99-4.9; reference = no health-related mission), and leadership buy-in for workplace wellness (OR = 4.74, 95%CI: 1.91-11.75; reference = no leadership buy-in).

Worksite Health Promotion Budget and the Presence of a Sleep or Fatigue Reduction Program

In adjusted analyses, companies with larger budgets were more likely to offer a sleep enhancement or fatigue reduction program (\$50-100 k: OR = 4.08, 95%CI: 1.5-11.13; \$100-500 k: OR = 6.59, 95%CI: 3.09-14.07; >\$500 k: OR = 6.85, 95%CI: 2.10-22.35; reference = no budget) (Table 4)

Table 2. Logistic Regression Examining the Worksite Characteristics Associated With Presence of a Sleep Enhancement or Fatigue Reduction Program for Employees (N = 2,843).

	Unadjusted				Adjusted				Adjusted + restricted			
	OR	Lower	Upper	p	OR	Lower	Upper	p	OR	Lower	Upper	p
Industry	Reference											
Finance/Information/Technology												
Agriculture / Mining	1.1	(0.63	2.05)	0.677	1.10	(0.6	2.02)	0.760	0.92	(0.38	2.2)	0.845
Wholesale / Retail	2.4	(1.36	4.33)	0.003	2.52	(1.36	4.66)	0.003	2.71	(1.08	6.8)	0.033
Arts / Hospitality	0.7	(0.35	1.4)	0.307	0.73	(0.36	1.47)	0.381	0.56	(0.2	1.53)	0.257
Education / Health / Services	1.1	(0.63	2.05)	0.673	0.80	(0.43	1.5)	0.492	0.62	(0.25	1.52)	0.291
Public Administration	3.7	(2.09	6.62)	<.0001	1.82	(0.92	3.6)	0.085	1.13	(0.44	2.89)	0.795
Hospital	3.9	(2.27	6.59)	<.0001	1.90	(1.02	3.54)	0.044	0.89	(0.39	2.06)	0.791
Size	Reference											
<100 people												
100-500 people	1.7	(1.17	2.52)	0.338	1.48	(0.98	2.22)	0.061	0.71	(0.43	1.17)	0.177
>500 people	4.4	(3.01	6.3)	0.819	4.18	(2.82	6.2)	<.0001	1.29	(0.8	2.07)	0.296
Type	Reference											
For-Profit, Private												
For-Profit, Public	0.2	(0.13	.33)	0.338	0.23	(0.14	.37)	<.0001	0.37	(0.2	.71)	0.003
Non-Profit	0.8	(0.54	1.28)	0.819	0.65	(0.42	1.01)	0.057	0.58	(0.32	1.06)	0.078
Government	1.3	(0.82	2.01)	0.338	1.14	(0.71	1.85)	0.590	0.96	(0.52	1.77)	0.898
Other	0.6	(0.22	1.57)	0.819	0.61	(0.22	1.63)	0.321	0.79	(0.21	3.04)	0.733

Legend

Model 1: Unadjusted.

Model 2: Adjusted for worksite size, company type, and budget >\$50,000.

Model 3: Adjusted for worksite size, company type, budget >\$50,000, and WHPP plan.

Workforce Characteristics and Presence of a Sleep or Fatigue Reduction Program

In adjusted analyses, workforce characteristics, such as having a young workforce, hourly workers, remote employees, unionized workers, or high levels of turnover, were not associated with the presence of a sleep or fatigue reduction program (Table 5)

Discussion

Our analysis of the CDC Workplace Health in American Poll showed that while physical activity and nutrition WHPPs were reported by one-third and one-quarter of worksites, respectively, sleep enhancement or fatigue reduction WHPPs were reported by only 10% of the worksites in this nationally representative study. Contrary to previous research suggesting that larger worksites have more comprehensive WHPPs,^{21,22} after controlling for relevant covariates, our results did not show an association between the size of the worksite and presence of a sleep enhancement or fatigue reduction WHPP. We found worksites in wholesale, retail, or transportation sectors were most likely of all industries (including health services and hospitals) to offer a sleep enhancement or fatigue reduction program.

According to the CDC Workplace Health Model, effective WHPPs must include support from senior management, effective implementation from program designers and practitioners, and regular assessment efforts to benchmark progress.²⁰ Consistent with this model, our results show that worksites with visible support and buy-in for employee health from senior management were more likely to offer a sleep enhancement

or fatigue reducing program. We also found that worksites with bigger budgets were significantly more likely to offer a sleep enhancement or fatigue reduction program. Our results thus support other research to show that senior leadership and environmental supports are critical to affect change in employee health and safety.²³⁻²⁵

Our results suggest that worksites in the wholesale, retail, and transportation sectors were significantly more likely to report offering a sleep enhancement or fatigue reduction program as compared with those in the arts or hospitality sector. The higher likelihood of sleep enhancement or fatigue reduction programs could be a consequence of the regulations imposed upon transportation sector worksites in the US, requiring them to field programs and interventions to improve sleep and vigilance of employees operating machinery, such as public transportation operators, long haul truck drivers, and other occupations.²⁶ It could also be that work tasks in these sectors (e.g., transportation) are more likely to impair sleep, as they may involve rotating shift work. Therefore, organizations reporting sleep enhancement or fatigue reduction programs in this study may have done so in order to comply with state or federal regulations as opposed to, at their own volition, improve health and well-being of their workers.

As compared with private for-profit companies, public for-profit companies were the most likely to report a sleep or fatigue reduction program. It may be that public for-profit companies are increasingly responsive to calls for adopting socially responsible practices such as those advancing environmental sustainability or programs such as sleep enhancement or fatigue management that have the potential to improve the health of workers. These worksites also may have larger

Table 3. Logistic Regression Examining the WHPP Characteristics Associated With Presence of a Sleep Enhancement or Fatigue Reduction Program (N = 2,843).

		Unadjusted				Adjusted				Adjusted + restricted			
		OR	Lower	Upper	p	OR	Lower	Upper	p	OR	Lower	Upper	p
Insurance Premiums	No Coverage					Reference							
	Partial Coverage	7.1	(2.35	21.42)	0.001	4.61	(1.51	14.07)	0.007	2.35	(0.31	17.55)	0.405
	Full Coverage	11.9	(3.96	35.64)	<.0001	7.46	(2.45	22.75)	<.0001	4.08	(0.55	30.17)	0.169
HRA	No					Reference							
	Yes	11.7	(8.28	16.67)	<.0001	9.79	(6.41	14.93)	<.0001	2.98	(1.8	4.92)	<.0001
Health Education	No					Reference							
	Yes	26.4	(16.03	43.4)	<.0001	23.40	(13.43	40.78)	<.0001	4.01	(1.91	8.4)	<.0001
Supportive Environment	No					Reference							
	Yes	15.1	(9.14	24.83)	<.0001	13.44	(7.63	23.68)	<.0001	3.28	(1.45	7.43)	0.004
Health Integrated into Company Culture	No					Reference							
	Yes	17.7	(11.85	26.43)	<.0001	16.72	(10.44	26.78)	<.0001	3.19	(1.69	6.04)	<.0001
Health Screening	No					Reference							
	Yes	12.0	(8.45	16.99)	<.0001	10.40	(6.94	15.56)	<.0001	2.58	(1.53	4.32)	<.0001
Program in Existence	1-2 years					Reference							
	3-5 years	4.0	(2.44	6.59)	<.0001	2.85	(1.68	4.84)	<.0001	2.42	(1.22	4.77)	0.011
	6 or more years	5.1	(3.16	8.25)	<.0001	3.87	(2.32	6.47)	<.0001	3.02	(1.57	5.8)	0.001
Program Provider	Company Insurance					Reference							
	Company Vendor	0.8	(0.49	1.27)	<.0001	0.85	(0.5	1.44)	0.542	1.03	(0.54	1.98)	0.922
	Health Champion	0.6	(0.42	.96)	<.0001	0.62	(0.39	.97)	0.036	0.42	(0.24	.73)	0.002
Health Mission	No					Reference							
	Yes	5.2	(1.16	7.4)	<.0001	5.01	(3.1	8.09)	<.0001	3.86	(2.07	7.2)	<.0001
Leadership Buy-In	No					Reference							
	Yes	4.0	(0.72	7.82)	<.0001	3.53	(2.45	5.09)	<.0001	3.12	(1.99	4.9)	<.0001
Middle Manager Buy-In	No					Reference							
	Yes	4.5	(1.41	4.74)	<.0001	4.41	(2.3	8.44)	<.0001	4.74	(1.91	11.75)	0.001
WHPP Designated Staff	No					Reference							
	Yes	3.1	(0.94	3.82)	<.0001	2.80	(1.52	5.15)	0.001	2.58	(1.17	5.71)	0.019
WHPP Plan	No					Reference							
	Yes	3.0	(0.69	4.88)	<.0001	2.88	(1.76	4.71)	<.0001	2.18	(1.05	4.51)	0.036
Use Data for WHPP Plan	No					Reference							
	Yes	6.1	(1.37	8.12)	<.0001	5.72	(3.6	9.08)	<.0001	3.42	(1.77	6.6)	<.0001
	No					Reference							
	Yes	5.7	(1.2	8.23)	<.0001	5.37	(3.43	8.41)	<.0001	5.06	(2.77	9.24)	<.0001

Legend

Model 1: Unadjusted.

Model 2: Adjusted for worksite size, company type, and budget >\$50,000.

Model 3: Adjusted for worksite size, company type, budget >\$50,000, and WHPP plan.

budgets than smaller, private companies. Future research is warranted to examine the nature and effectiveness of sleep enhancement and fatigue reduction programs in larger worksites.

Poor sleep health, including insufficient sleep, sleep difficulties, and associated daytime fatigue is associated with lower daytime function, and productivity losses among employees.¹² Therefore, enhancing sleep by jointly promoting healthy sleep duration and quality are viable targets for improving productivity, health, safety, and well-being among workers. There are a variety of sleep or fatigue-related domains that could be addressed by workplace health programs, such as programs that promote awareness of healthy sleep duration, which is 7 to

9 hours, according to the National Sleep Foundation.²⁷ Programs could also emphasize healthy sleep behaviors, such as establishing a consistent sleep schedule or relaxing bedtime routine. Another promising avenue for sleep-related employee health programs is sleep disorder education and screening. Addressing sleep disorders may be important, for insomnia affects between 8 and 15% of adults in the US² and obstructive sleep apnea (OSA) affects between 34% of male and 17% of female adults in the US.²⁸ It is also possible that the nature of the work may disrupt employee sleep, such as long work hours or rotating work shifts. These may require tailored worksite policies that maximize the potential for consistent sleep duration and maintenance of sleep health.

Table 4. Logistic Regression Examining Worksite Health Promotion Budget and Presence of a Sleep Enhancement or Fatigue Reduction Program (N = 2,843).

		Unadjusted				Adjusted				Adjusted + Restricted			
		OR	Lower	Upper	p	OR	Lower	Upper	p	OR	Lower	Upper	p
Budget	None	Reference											
	<\$1k	2.1	(0.94	4.74)	0.071	2.06	(0.89	4.78)	0.091	1.78	(0.61	5.21)	0.292
	\$1-5k	2.2	(1.04	4.54)	0.039	2.14	(1.00	4.58)	0.049	1.58	(0.6	4.17)	0.354
	\$5-10k	2.4	(1.04	5.72)	0.040	2.13	(0.87	5.21)	0.097	1.33	(0.45	3.9)	0.602
	\$10-15k	1.7	(0.50	5.6)	0.406	1.84	(0.56	6.)	0.313	1.43	(0.38	5.43)	0.601
	\$15-20k	3.0	(1.07	8.53)	0.036	3.15	(1.12	8.85)	0.029	2.32	(0.72	7.51)	0.159
	\$20-50k	2.8	(1.28	6.13)	0.010	2.47	(1.09	5.59)	0.030	1.58	(0.58	4.3)	0.371
	\$50-100k	5.3	(2.54	11.04)	<.0001	5.77	(2.70	12.32)	<.0001	4.08	(1.50	11.13)	0.006
	\$100-500k	12.7	(6.93	23.28)	<.0001	13.70	(7.55	24.85)	<.0001	6.59	(3.09	14.07)	<.0001
>\$500k	10.5	(4.04	27.47)	<.0001	13.54	(4.80	38.19)	<.0001	6.85	(2.10	22.35)	0.001	

Legend

Model 1: Unadjusted.

Model 2: Adjusted for worksite size, company type, and budget >\$50,000.

Model 3: Adjusted for worksite size, company type, budget >\$50,000, and WHPP plan.

Table 5. Logistic Regression Examining Workforce Characteristics and Presence of a Sleep Enhancement or Fatigue Reduction Program (N = 2,843).

		Unadjusted				Adjusted				Adjusted + restricted			
		OR	Lower	Upper	p	OR	Lower	Upper	p	OR	Lower	Upper	p
Age < 30	<25%	Reference											
	>25%	1.4	(1.02	1.8)	0.037	1.21	(0.89	1.65)	<.0001	0.80	(0.54	1.19)	0.277
Age > 60	<25%	Reference											
	>25%	1.9	(0.27	4.32)	<.0001	1.52	(1.11	2.07)	0.009	0.91	(0.61	1.37)	0.649
Hourly Workers	<25%	Reference											
	>25%	1.8	(1.22	2.75)	0.003	1.67	(1.09	2.57)	0.018	1.11	(0.62	1.96)	0.729
Offsite Workers	<25%	Reference											
	>25%	1.9	(1.46	2.58)	<.0001	1.84	(1.36	2.48)	<.0001	1.05	(0.71	1.57)	0.795
Unionized	<25%	Reference											
	>25%	2.6	(1.95	3.47)	<.0001	2.02	(1.48	2.76)	<.0001	1.38	(0.91	2.11)	0.130
Turnover	<25%	Reference											
	>25%	1.6	(1.18	2.11)	0.002	1.36	(1.00	1.85)	0.049	1.06	(0.71	1.59)	0.761

Legend

Model 1: Unadjusted.

Model 2: Adjusted for worksite size and company type.

Model 3: Adjusted for worksite size, company type, and a physical activity WHPP.

Employee sleep is directly related to mental and emotional health among workers,²⁹ as well as weight management.⁵ Research has also shown that sleep problems are associated with more sedentary behavior and lower physical activity,^{30,31} positioning sleep enhancement and fatigue reduction WHPPs as vital to the success of programs in other domains (e.g., exercise, nutrition). Despite the strong relationship between employee sleep and both individual employee-level outcomes (e.g., improved health) and organizational outcomes (e.g., productivity), findings from this study show that sleep enhancement and fatigue reduction programs are underutilized among worksites in the US. This, despite the call of the National Institute for Occupational Health and Safety and the CDC for worksites, particularly in safety critical sectors, to address employee sleep health. Thus, our study further should

appeal to researchers and practitioners in the field of occupational health and safety.³²⁻³⁵

Limitations

This study used nationally representative data from the Workplace Health in America poll. While the sample of worksites is representative, the majority of worksites included in this sample were relatively small (<100 employees). In addition, the survey data used in this study assessed the prevalence of a sleep enhancement or fatigue reduction program. It could be that an employee health program that was offered, such as meditation, may have elicited sleep-related benefits, but missed this narrow definition of a sleep enhancement or fatigue reduction program as defined in this survey. This study documented a lower

proportion of worksites reporting sleep-focused health programs than physical activity or nutrition programs, yet it could be that worksites with sleep-focused programs had a lower response rate. Therefore, it is a limitation that this study did not examine type of program by survey response rate. Furthermore, the current study did not capture information on worksite health programming that addressed multiple health behaviors, such as exercise and sleep concurrently. There are several limitations in the data available that are worth mentioning. First, the survey did not capture the proportion of employees reporting sleep deficiency, disturbance, or disorders at the worksite. It is also a limitation that specific data were not available on the nature of work at each worksite, such as length of a typical shift or occupational task. Further, the survey did not ask participants to disclose data on the success of their programs, such as changes in employee health behaviors. Finally, the survey did not ask worksites to disclose their motivation or rationale for choosing the focal areas for each program; future research should consider exploring this topic.

Future Research

Results from this study highlight several opportunities for future research to design, implement, and evaluate sleep enhancement and fatigue reduction programs. First, the worksites sampled for this study were predominantly small worksites (<100 employees). Future research should sleep enhancement and fatigue reduction programs in larger worksites. Second, to garner support for sleep enhancement or fatigue reduction programs, future research may expand the already compelling evidence in favor of sleep enhancement WHPPs highlighting the benefits in terms of improved productivity and lower absenteeism and injuries.¹⁷ Third, future research may promote awareness among worksite personnel responsible for health programs concerning the benefits of addressing employee sleep difficulties in terms of workplace performance, productivity, and healthcare costs. Fourth, as our study found that worksites offering health-oriented interventions such as regular employee health screenings or those favoring workplace cultures supportive of health, are more likely to offer sleep enhancement or fatigue reduction programs, another avenue for future research is to assess the impact of worksites that feature programs targeting multiple behaviors. This could include the assessment of programs that *simultaneously* address sleep, physical activity, as well as other health behaviors in the same working population. Future research should elucidate causal pathways linking these acts. This would likely entail longitudinal tracking of the short- and long-term effects of health behavior change. For instance, it may be that sleep-oriented interventions contribute to the health-orientation or health cultural robustness of a worksite, or that healthy employees are attracted to worksites with comprehensive offerings, such as sleep enhancement and fatigue reduction programs. Therefore, it would be useful to assess the impact of sleep enhancing and fatigue-reducing initiatives on the health program utilization of these workers over time.

So What?

What is already known on this topic?

Workplace health promotion programs have become a fixture in American worksites. However, many of these programs focus on 2 pillars of health, physical activity and nutrition, while few focus on another important area of employee health: sleep health.

What does this article add?

Using nationally representative data from the CDC Workplace Health in America Poll our study documents the paucity of programs focused on employee sleep health. Our study shows that worksites in the retail, wholesale, or transportation sectors are more likely to have a sleep enhancement or fatigue reduction program than other industries. We also illustrate that worksites with large budgets and support from senior leadership for employee health are more likely to have a sleep enhancement or feature reduction program for employees.

What are the implications for health promotion practice or research?

Workplace health researchers and practitioners may consider adding sleep enhancement or fatigue reduction components to their workplace wellness programs. Cultivating a robust overall workplace health culture by company leadership may facilitate the adoption and implementation of sleep enhancing and fatigue reducing WHPPs.

Conclusions

This nationally representative workplace study highlights the low prevalence of WHPPs specifically designed to enhance worker sleep and prevent daytime fatigue. Workplaces offering such programs are more likely to be highly committed to worker health, in terms of their overall work culture and policies and in terms of the size of their health promotion budgets. Future research should longitudinally analyze these associations to help determine key causal factors which may then be tested in interventional studies to better establish the means to promote more alert, productive, and safer workers.

Authors' Note

Study conceptualization—all authors; draft of the manuscript—RR; statistical analysis—RR and MG; approval of the final manuscript—all authors. This study reviewed by the RTI International Institutional Review Board and deemed exempt from review (IRB #0214531) because the subject of data collection was the worksite, not a human subject.

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