

Original Article

Weight Change and Workplace Absenteeism in the HealthWorks Study

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Key Words

Absenteeism • Body weight • Workplace • Environment

Abstract

Objective: Little is known about the relationship between weight change and workplace absenteeism. The purpose of this study was to examine the degree to which weight change predicted 2-year absenteeism. **Methods:** A longitudinal analysis of 1,228 employees enrolled in a worksite-randomized controlled trial was performed. Participants were all working adults in the Minneapolis, MN, area (USA). **Results:** The final model indicated a significant interaction between weight change and baseline BMI. The difference in absenteeism ranged from (mean \pm SE) 3.2 ± 1.2 days among healthy weight employees who maintained their weight to 6.6 ± 1.1 days among obese employees who gained weight (and slightly higher among healthy weight employees who lost weight). The adjusted model also indicated that participants who were male, not depressed, nonsmokers, and had lower baseline absenteeism had significantly less workplace absenteeism relative to participants who were female, depressed, smokers, and had higher baseline absenteeism. **Conclusion:** Absenteeism was generally low in this sample, but healthy weight employees who maintained their body weight over 2 years had the fewest number of sick days. More research is needed in this area, but future workforce attendance interventions may be improved by focusing on the primary prevention of weight gain in healthy weight employees.

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Introduction

Excess body weight is among the top public health concerns in the USA and other nations, primarily due to its increasing prevalence and association with cardiometabolic diseases and medical care costs [1, 2]. Meta-analytic evidence indicates that weight loss programs do not have a strong population level impact [3]; thus some researchers have recommended focusing on weight gain prevention instead of weight loss [4]. Some evidence suggests that weight gain prevention interventions are useful in this regard [5], but the effects of weight gain prevention on obesity-related economic indicators remains understudied.

Obese employees are generally prone to greater workplace absenteeism as illustrated by a recent large study where employees with a BMI ≥ 30 kg/m² had 25% higher odds of calling in sick ≥ 1 day per year relative to employees with a BMI < 25 kg/m² [6]. Prospective studies in this area are scarce and limited to main effect analyses from intervention packages. Relative to a standard behavioral program, 14% fewer sick days were observed among participants in year 3 following bariatric surgery [7]. Similarly, a worksite program combining weight loss and smoking cessation interventions found nearly 4% fewer net sick days per month after 2 years in the intervention group as compared to the no-treatment control group [8].

There is some evidence to indicate that health improvement programs with a weight management component can improve workplace absenteeism, but there are no direct studies of the relationship between absenteeism and actual weight gain or weight maintenance over time. This is an important unfilled gap in the literature given the call for more/better weight gain prevention programs and employers' increasing economic interest in learning how health-related productivity can be improved. The purpose of this study was to investigate the association between weight change and workplace absenteeism over 2 years.

Participants and Methods

Design

This was a secondary analysis of data from the HealthWorks study, a worksite-randomized trial that evaluated an environmental weight gain prevention intervention (described in more detail elsewhere) [9]. Six worksites in the Minneapolis, MN, metropolitan area were included, with three receiving the intervention and three others serving as no-treatment controls. Measures were taken at baseline and 24-month follow-up. All procedures were approved by the University of Minnesota Institutional Review Board, and participants signed informed consent forms.

Sample

Participating worksites had to have ≥ 250 employees. Individual eligibility requirements for study participation were: $\geq 50\%$ full time equivalent position, primarily day shift, and present onsite for at least half of all work hours. The analytical sample was restricted to participants with complete baseline and 24-month follow-up data, not pregnant, and not having given birth during the trial or within 1 year prior to enrollment.

Measures

The primary predictor was body weight change. Body weight was measured at baseline and 24-month follow-up using a calibrated digital scale by trained study staff. Participants were weighed without shoes and in light street clothing. For purposes of analysis, weight change was modeled categorically as: i) weight gain: gained > 1 kg between baseline and 24 months, ii) weight maintenance: 24-month follow-up weight within ± 1 kg of baseline weight, and iii) weight loss: lost > 1 kg between baseline and 24-month follow-up. The 1 kg threshold reflects the expected mean annualized weight gain in American adults [1]. The outcome was workplace absenteeism and was assessed at baseline and follow-up using a single item that asked

participants to report how many days they missed work in the last 2 years due to illness or injury. The response was numerically open-ended. Based on previous studies [6], covariates examined were baseline age, sex, race/ethnicity, randomized condition, current smoking, personal history of depression, personal history of diabetes, personal history of hypertension, absenteeism, and BMI category. To calculate BMI, height was measured using a wall-mounted ruler, and weight in kg was divided by height in meters squared. Participants were assigned to one of three BMI categories based on standard US definitions [10] as follows: obese ≥ 30.0 kg/m², overweight 25.0–29.9 kg/m², and healthy weight <25.0 kg/m².

Analysis

The intervention and control arms were statistically indistinguishable in terms of weight change and workplace absenteeism, therefore these groups were combined to improve statistical power. Absenteeism was skewed to the right with approximately one third of the sample reporting a value of 0 days absent, thus negative binomial regression models were used to account for this distribution. Also, a 99% Winsorization technique [11] was applied that set all observed values for workplace absenteeism below the 1st percentile to the 1st percentile score, while all data above the 99th percentile were set to the 99th percentile score. This technique was performed as an alternative to trimming and to temper potential impacts of short-term disability that may have been experienced by a small subset of the sample. Twelve values for workplace absenteeism were truncated so that no value exceeded 80 days. A basic model was first created to examine the crude relationship between the primary predictor and outcome. Then effect modification was examined by creating a two-way interaction term between weight change and each covariate (separately) and entering it into the crude model. Remaining covariates not found to be effect modifiers were then entered separately into the reduced model to check for their utility as independent predictors. Any significant ($p < 0.05$) term was retained in the final model.

Results

Of the 1,747 study enrollees, 1,228 met all eligibility criteria for this analysis. The sample was generally White (87%), middle-aged (mean \pm SD = 44.2 \pm 10.2 years), and female (61%). The prevalence of self-reported smoking (14%) and diabetes (4%) was slightly lower than the general US population. Workplace absenteeism averaged 5.0 \pm 11.1 days during the 2-year study. Baseline BMI was 28.4 \pm 6.2 kg/m², and the breakdown of BMI analytical categories was: obese (33%), overweight (36%), and healthy weight (31%). Over 2 years, weight change was 0.8 \pm 5.0 kg, with 47%, 25% and 28% of the sample falling into the weight gain, weight maintenance and weight loss analytical categories, respectively. A more detailed breakdown of 2-year weight change by baseline BMI categories (based on World Health Organization international classifications [12]) in this sample is outlined in table 1.

The initial crude model indicated that weight maintenance ($\beta \pm$ SE = -0.35 ± 0.11 , $p = 0.002$), but not weight loss ($\beta \pm$ SE = 0.04 ± 0.11 , $p = 0.682$), was significantly associated with workplace absenteeism relative to weight gain. The direction of this relationship indicated that those who maintained their weight over 2 years had a lower rate of workplace absenteeism compared to those who gained weight, but those who lost weight had a similar rate of workplace absenteeism compared to those who gained weight. Further modeling revealed a significant interaction between weight change category and baseline BMI category ($X^2 = 12.34$, $p = 0.015$). Baseline sex, smoking, depression, and absenteeism were also retained as independent predictors of follow-up workplace absenteeism in the final multivariate model. All included final model terms and directions of association are summarized in table 2. To aid in interpretation of these results, a graphical depiction of the (least-squares) adjusted association between weight change and workplace absenteeism, at each level of baseline BMI, is presented in fig. 1.

Table 1. Weight change distribution over 2 years in the HealthWorks study, stratified by baseline BMI categories (n = 1,228)^a

Baseline BMI, kg/m ²	2-year weight change, kg							
	≤-10.0	-9.9 to -5.0	-4.9 to -1.1	-1.0 to 1.0	1.1 to 2.9	3.0 to 4.9	5.0 to 9.9	≥10.0
Underweight (<18.5)	0 (0%)	0 (0%)	2 (0%)	1 (0%)	4 (0%)	1 (0%)	2 (0%)	0 (0%)
Healthy weight I (18.5–22.9)	0 (0%)	3 (0%)	29 (2%)	78 (6%)	47 (4%)	29 (2%)	18 (1%)	3 (0%)
Healthy weight II (23.0–24.9)	0 (0%)	6 (0%)	28 (2%)	43 (4%)	48 (4%)	18 (1%)	13 (1%)	6 (0%)
Overweight I (25.0–27.4)	1 (0%)	8 (1%)	49 (4%)	66 (5%)	46 (4%)	38 (3%)	25 (2%)	5 (0%)
Overweight II (27.5–29.9)	6 (0%)	12 (1%)	47 (4%)	48 (4%)	41 (3%)	24 (2%)	27 (2%)	3 (0%)
Obese I (30.0–34.9)	9 (1%)	21 (2%)	51 (4%)	38 (3%)	45 (4%)	32 (3%)	32 (3%)	8 (1%)
Obese II (35.0–39.9)	9 (1%)	11 (1%)	16 (1%)	21 (2%)	16 (1%)	9 (1%)	12 (1%)	7 (1%)
Obese III (≥40.0)	9 (1%)	12 (1%)	11 (1%)	9 (1%)	4 (0%)	9 (1%)	8 (1%)	4 (0%)

^aCell values are given as frequency count (percent of sample total). BMI categories are based on current definitions from the World Health Organization.

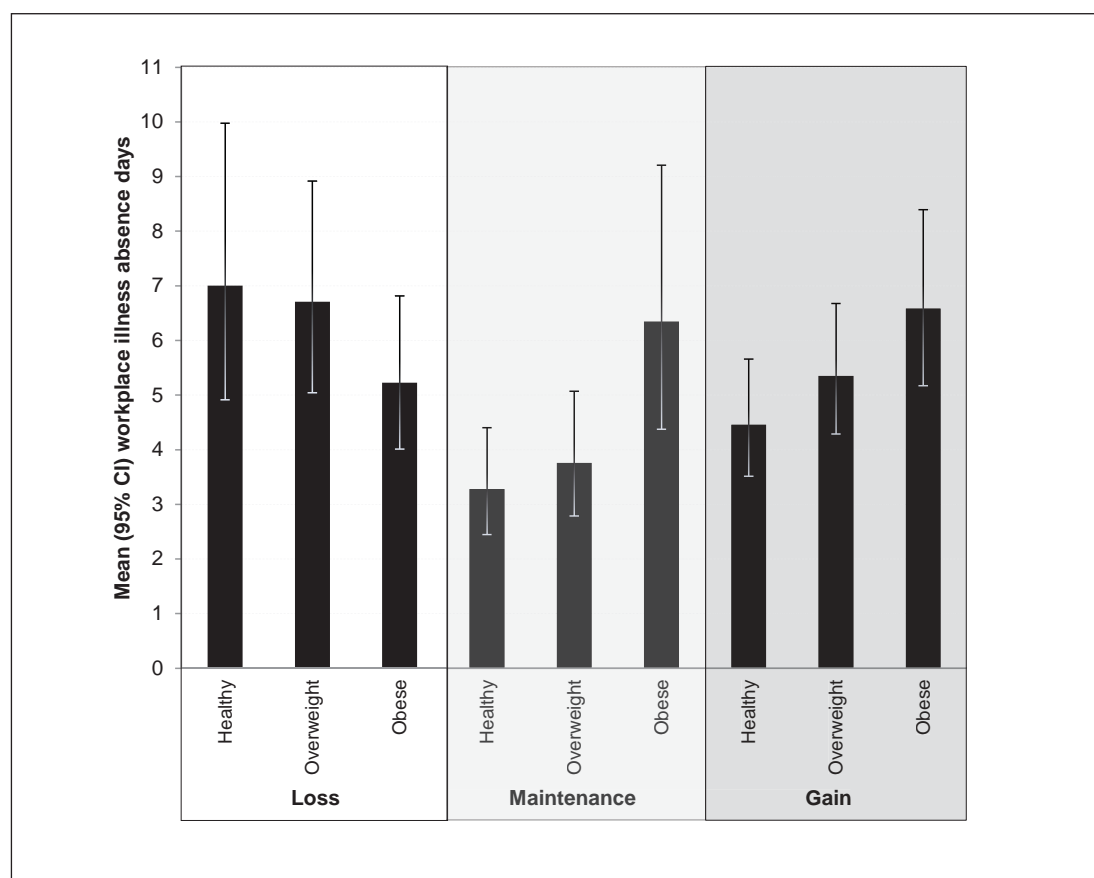


Fig. 1. Least square adjusted mean workplace illness absence days by baseline body mass index and weight change categories (adjusted for baseline sex, smoking, depression, and absenteeism) over two years in the HealthWorks study (n = 1,228).

Table 2. Final multivariate negative binomial regression model depicting the association between workplace absenteeism and weight change, with significant baseline covariates, over 2 years in the HealthWorks study

Model predictors (n =1,228)	Workplace absenteeism, days		
	β	SE	p
Intercept	1.167	0.119	<0.001
Sex			
Male	–0.366	0.092	<0.001
Female (ref)	–	–	–
Smoking			
Current	0.299	0.123	0.017
Former or never (ref)	–	–	–
Depression			
Yes	0.448	0.105	<0.001
No (ref)	–	–	–
Baseline workplace absenteeism, days	0.046	0.009	<0.001
BMI			
Obese: ≥ 30.0 kg/m ²	0.390	0.156	0.012
Overweight: 25.0–29.9 kg/m ²	0.182	0.152	0.231
Healthy weight: <25.0 kg/m ² (ref)	–	–	–
Weight change			
Maintenance	–0.307	0.176	0.081
Loss	0.451	0.210	0.032
Gain (ref)	–	–	–
Interaction (BMI \times weight change)			
Obese \times maintenance			
Obese \times loss	0.270	0.275	0.327
Overweight \times maintenance	–0.682	0.267	0.012
Overweight \times loss	–0.046	0.251	0.854
Healthy weight \times gain (ref)	–0.225	0.271	0.407
	–	–	–

β values are equal to (natural) logarithmic rate ratio of workplace illness absence days over the previous 2 years, as measured at study follow-up. Positive values indicate that as the predictor variable increases (relative to the reference category for categorical predictors or a 1-unit increase for continuous predictors), the rate of workplace absenteeism increases. Negative values indicate that as the predictor variable increases (relative to the reference category for categorical predictors or a 1-unit increase for continuous predictors), the rate of workplace absenteeism decreases. Other table column headings indicate: SE = standard error and p = probability value.

Discussion

Participants who maintained their weight, were male, not depressed, non-smokers, and had lower baseline absenteeism reported fewer illness absence days during the 2-year study. These factors were largely consistent with other studies in this area [13]. However, the influence of weight change on absenteeism also depended on participants' baseline BMI. In particular, the direction of the interaction suggested that weight loss was only beneficial for absenteeism among those who were obese at baseline. In contrast, absenteeism was higher for both healthy weight and overweight participants who gained weight over the 2-year study, whereas weight gain appeared to matter little for obese participants. Overall, absen-

teeism was lowest among participants who were at a healthy weight at study enrollment and maintained their weight over time.

Based on previous intimations from other studies in this area [7, 8], it was somewhat surprising that weight loss did not have a stronger association with absenteeism in the HealthWorks study. Another recent project failed to find a relationship between a 5% weight loss and workplace absenteeism over 1 year in overweight adults [14]. These collective findings suggest that the benefits of weight loss, from an absenteeism perspective at least, may be limited to the subset of the population that is very overweight. Explanations for this are unclear but may involve resilient learning histories whereby typical (short-term) patterns of calling in sick change little for ‘modestly overweight’ individuals, even after weight loss. Also, extreme weight changes at the tails of the distribution may mask some effects in that individuals who lose a substantial amount of weight may also have experienced precipitating health events (e.g., diabetes, exercise injury) that lead to more sick days.

Based on these results, it could be argued that weight maintenance programs are of limited economic value for employers. However, a longer-term view is important that takes into account the background trend of an increasingly overweight workforce in developed countries. The full range of possible economic indicators (e.g., presenteeism, medical care costs, short-term disability) was not measured in the HealthWorks study. Also, the main effect findings for baseline BMI were noteworthy in that obese participants generally had about 1.5 more sick days than healthy weight participants. This has implications for future weight gain prevention programs in that they may yield better absenteeism-related results if they focus on the primary prevention of weight gain in the subgroup of employees that are currently at a healthy weight (but will likely become overweight or obese over time without intervention). Such focused programs may outperform overly-broad worksite weight management programs that are less effective due to their resources being diluted across the entire workforce.

There were several methodological strengths in these analyses. The sample size was relatively large, and the attrition rate was comparable or better than other weight management studies with similar timeframes [3]. Also, the analytical approach was able to adjust for several key baseline variables and was more appropriate for the underlying distribution of illness absence days.

There were also several methodological limitations. Participants with missing data were excluded and a single self-report measure of workplace absenteeism was used over a long recall timeframe. Though similar forms of assessing workplace absenteeism are common and well correlated with objective timecard records of sick days, longer recall periods for self-reported absenteeism tend to have higher SEs (though are not systematically biased in one direction or the other) relative to absenteeism data derived from administrative records [15]. This can make the statistical detection of subtle effects challenging. Also of note, the baseline illness absenteeism rate was relatively low at about 2.5 days annually, which is about one fourth that in the general northern European workforce and half that observed in the USA [16]. This may be related to the more ‘white collar’ (and presumably low-impact or otherwise sedentary) nature of the occupations associated with participating organizations in HealthWorks, as they were drawn from finance, healthcare, lifestyle/beauty, higher education, and energy industries. Future research should include more diverse industries, along with specific assessments of job classifications in order to determine the degree to which occupational activities or cultural factors influence both weight change and absenteeism. For example, research in Finland recently indicated that substantial variation exists in the underlying local rates of workplace absenteeism, and such regional-sociological proclivities can be used to inform more targeted worksite health interventions [17].

Weight gain prevention interventions may offer a more realistic, scalable approach to combat the obesity epidemic. Given the effect modification of baseline BMI observed in this study, future weight gain prevention interventions may be most effective in improving workplace attendance by first focusing on the primary prevention of weight gain among healthy weight employees. If weight loss support is also added as a component of more comprehensive worksite weight management programming, it may be most beneficial for the heaviest employees. However, more long-term experimental research is needed to better understand the interplay between health habits, weight change, and various other forms of workplace productivity loss.

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Disclosure Statement

The authors have no conflicts of interest or funding disclosures to report related to this research.

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