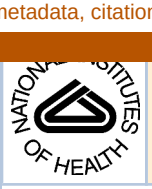

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A Longitudinal Study on the Relationship between Weight Loss, Medical Expenditures, and Absenteeism among Overweight Employees in the WAY to Health Study

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Abstract

Objective—To quantify the extent to which successful weight loss among overweight/obese employees translates into subsequent savings in medical expenditures and absenteeism.

Methods—This analysis relied on medical claims and absenteeism data collected from overweight/obese employees at 17 community colleges in North Carolina.

Results—We find no evidence that participants achieving at least a 5% weight loss experienced reduced medical expenditures or lower absenteeism during the 12 month weight loss intervention or in the subsequent 2 years.

Conclusions—These results suggest that a quick return on investment from weight loss programs, even effective ones, is unlikely. However, as with other employee benefit decisions, the decision about whether to offer weight loss programs should take into account many factors, such as employee health, in addition to the potential for a quick return on investment.

INTRODUCTION

Over the past two decades, increasing rates of obesity have been associated with corresponding increases in the prevalence of diabetes, heart disease, cancer, and other medical conditions.[1, 2] Thorpe et al.[3] estimate that treatment for obesity-related diseases accounted for 27% of the rise in inflation-adjusted per capita medical spending between 1987 and 2001. Today, the medical costs required to treat diseases resulting from obesity exceed $90B per year, roughly half of which is paid by the private sector.[4]

Employers bear a large share of the costs resulting from obesity. In addition to increased health insurance premiums resulting from higher medical costs due to obesity, some literature suggests that employers may also face increased absenteeism and presenteeism costs (a term signifying decreased productivity while present at work), a greater number of workers' compensation and disability claims, and higher life insurance premiums for employees.[5]

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Many employers offer work-site wellness programs, disease management programs, weight loss programs, financial incentives for wellness, and other strategies to improve employee health.6 Although a goal of these programs is to reduce weight and improve the health of their employees, an additional goal is often to reduce the financial burden of poor employee health and related problems. However, while it is well documented that overweight and obese employees cost more,[7] little evidence exists documenting the short-term savings that employers might realize if overweight employees were successful in losing weight. For employer-sponsored weight loss programs to demonstrate positive return on investment (ROI) in employee health, the resulting savings must be large enough to offset the costs of the program, and these savings must occur before employees leave the employer, sending health-related benefits to new employers.

This analysis used medical claims and absenteeism data from a sample of overweight and obese employees to quantify the extent to which successful reductions in weight translate into savings in medical expenditures and absenteeism in the 1-year period during which the weight loss is achieved and in the subsequent 2 years. If reductions in medical expenditures and/or rates of absenteeism are found in this period, it would further strengthen the business rationale for employer-funded weight loss and health promotion programs.

METHODS

Study Design

This analysis relied on data collected from a group randomized trial in which overweight or obese employees at 17 community colleges in North Carolina were recruited and randomized by college to participate in one of three interventions aimed at reducing weight as part of the NC WAY to Health research study: Arm 1, an environmental change intervention, focused on implementing the Winner's Circle Dining Program to increase access to healthy foods and promote their selection through point of purchase programming in cafeteria and vending on campus8; Arm 2, an environmental change plus self-directed Web-based weight loss program[9]; and Arm 3, an environmental change plus self-directed Web-based weight loss program plus modest cash incentives based on weight loss. The financial incentive rewarded participants $5 for each 1% of weight loss (from baseline weight) at all subsequent weigh-ins. The study was powered to detect statistically significant differences in weight across Arms of 2.2 kg (just under 5 lbs) or greater. All study participants attended a baseline weigh-in and were asked to attend follow-up weigh-ins at 3, 6, and 12 months.

Employees were recruited via mass e-mails, flyers, and posters displayed at the colleges. All potential participants were screened to determine initial eligibility using the following inclusion criteria: (1) full- or part-time employee, (2) at least 18 years of age, and (3) overweight or obese, as defined by national guidelines of a body mass index (BMI) at or above 25 kg/m^2. Participants were excluded if they met any of the following criteria: currently pregnant or lactating; recent weight loss (greater than 20 pounds within 6 months); type 1 diabetes; currently taking weight loss medication; malignancy requiring chemotherapy/radiation in the past 5 years; previously had or plan to have weight loss surgery during the study period; BMI greater than 42; answered “yes” to having a known history of heart disease, stroke, or type 2 diabetes and did not obtain signed MD consent; or did not have Internet access either at work or at home (Internet access was required to complete participant surveys and for two of the three treatment groups to access the Web-based weight loss intervention). To comply with institutional review board (IRB) and Health Insurance Portability and Accountability Act (HIPAA) guidelines, all participants completed informed consent prior to enrolling in the study and were asked to provide a second consent to allow access to their medical claims data from the state health insurance provider for use in the analysis. Even with informed consent, the University of North Carolina IRB also required that we do not receive claims data related to

mental health, drug or alcohol use, HIV/AIDS or other communicable diseases, or genetic testing, as identified by diagnosis codes listed in the claims.

Participants who consented to be enrolled in the study completed a baseline questionnaire that captured basic demographic data and also included the following question to measure absenteeism: Over the past 30 days, how many days did you miss work due to illness or injury? This question was repeated on the 12-month survey to capture changes in absenteeism between the intervention and post-intervention periods.

After enrollment, participants' height and weight were measured and the study arm to which they were enrolled was revealed via e-mail.[1] To minimize attrition, participants were offered $5, $10, and $20 for attending the 3-, 6-, and 12-month weigh-ins, respectively, regardless of their weight loss. The study was approved by the IRB committees at the University of North Carolina and RTI International.

Analysis Sample

The study enrolled 965 individuals at baseline. Overall study attrition was 31%, leaving 667 participants available for the absenteeism analysis (i.e., data on absenteeism at both baseline and follow-up). For the medical claims analysis, 685 (71%) enrollees signed HIPAA consent allowing access to their medical claims data. Of those who signed the HIPAA consent, we requested claims data on 641 individuals. Forty-four participants could not be reached to obtain information to complete the request or withdrew their request after enrollment. To comply with the additional exclusions requested by the University of North Carolina IRB, rather than analyze partial claims, we removed from the analysis dataset all individuals who had one or more claims with a diagnosis on the exclusions list. Of the 641 participants for whom we requested data, 219 individuals (34%) were excluded for the presence of an ICD-9 in their claims indicating one or more of the following: mental health problems (ICD 230–319) (187), infectious disease (ICDs V01 and V02) (17), HIV (ICDs 042–044 and V08) (1), and genetic testing (ICD 83912) (21).[2] Of the 422 remaining individuals, 279 (66%) completed both the baseline and 12-month weigh-ins and were included in the medical claims analysis sample. Table 1 presents the analysis sample for the absenteeism and medical claims analyses. Almost 20% of participants in the absenteeism analysis and 16% of participants in the medical claims analyses sample lost 5% or more of their baseline weight during the intervention period.

Analysis

For this analysis, regardless of study arm, participants were classified into one of two groups: those with 5% or more weight loss between baseline and 12 months and those with less than 5% weight loss in the same period. Weight loss of 5% or more was chosen because weight loss of this magnitude has been shown to have clinically relevant health benefits. Because the weight loss of participants who dropped out of the study is unavailable, these individuals were excluded from the analyses in the current study. Excluding noncompleting participants and pooling individuals across study arms is appropriate in the current study because our research question is not intervention specific and only warrants consideration of participants we know were (or were not) successful at achieving a 5% weight loss. Subsequent manuscripts will examine the effectiveness of the interventions and include intent-to-treat analysis.

A difference-in-difference regression analysis was used to test whether participants who lost 5% or more of their baseline weight had lower medical expenditures (or smaller increases) and fewer days missed from work compared with participants who did not lose 5%. The difference-

[1]The randomization was at the college level so all employees in a given college were randomized to the same treatment.
[2]Note that some individuals were excluded for multiple causes.

in-difference approach controls for any baseline differences in expenditures between the two groups prior to enrollment and therefore allows for quantifying unbiased estimates of the effect of weight loss on subsequent medical expenditures.

For each individual, using the medical claims data provided from the state health plan, quarterly medical expenditures were quantified for three periods: the pre-intervention period that included the four quarters of data before the baseline weigh-in, the intervention period that included the four quarters between the baseline and 12-month weigh-in, and the post-intervention period that captured the eight quarters beyond the 12-month weigh in. For each quarter, medical expenditures were captured in total and separately for hospital inpatient, outpatient, pharmacy, and physician practices. Separately for each source of payment, the following regression was applied:

$$Med\$ = (\beta_0 + \beta_1 \times 5\%WL + \beta_2 \times INT + \beta_3 \times 5\%WL \times INT + \beta_4 \times POST + \beta_5 \times 5\%WL \times POST + \mathbf{X}\prime\delta),$$

where *Med$* corresponds to each individual's quarterly medical expenditures, *5%WL* is a dummy variable identifying those individuals who lost 5% or more of their baseline weight, and *INT* and *POST* are dummy variables identifying the intervention and post-intervention periods, respectively. The X vector includes control variables for age and baseline BMI and dummy variables for white and male.

This specification allows for comparing quarterly medical expenditures between those who lost 5% of baseline weight or more and those who did not separately in the pre-intervention and post-intervention periods. A negative coefficient on the difference-in-difference interaction terms B_3 and B_5 suggests that those who lost 5% or more weight had smaller medical expenditures (or lower increases compared to the pre-intervention period) in the intervention and post-intervention periods, respectively, compared to those who did not lose the weight.

A similar approach was used for the absenteeism analysis. However, because of the discrete nature of the dependent variable (days missed from work over the past 30 days), a negative binomial regression specification was used in the analysis. Moreover, because only two time periods (baseline and 12 months) were available for that analysis, the difference-in-difference estimate compares differences in days missed from work between the two groups at baseline and follow-up. A negative coefficient on the interaction term suggests that weight loss has a beneficial effect on absenteeism during the study period.

RESULTS

Table 2 presents demographic characteristics comparing those who did or did not lose 5% or more of their baseline weight for the larger absenteeism sample.[3] Nineteen percent of the sample lost 5% or more of their baseline weight. Those who did not were roughly 2 years older and less likely to be white. Percentage male, baseline weight, and baseline BMI were similar across the two groups. On average, the 5% weight loss group lost an average of 19 pounds, or 9.5% of their baseline weight, during the 12 months of the intervention. The comparison sample gained nearly 2 pounds during this same period. With the exception of lower quarterly pharmacy expenditures for the 5% weight loss sample, there are no statistically significant differences in quarterly medical expenditures or absenteeism between the two groups averaged over the 4-year analysis period.

[3]Differences were of similar magnitude in the medical claims sample.

Table 3 presents the results of the medical expenditures regression for each payment source. Row one of the table suggests that those who subsequently lost 5% of their baseline weight had a different medical profile prior to the start of the intervention. Their average quarterly costs in the year prior to the start of the intervention were lower for each type of service and statistically different in total and for outpatient and pharmacy claims. Once these differences are taken into account, there is no evidence that the weight loss leads to reduced medical expenditures either during the analysis period or in the subsequent 2 years. In fact, the coefficients on the interaction term in row 3 suggest that those who had 5% weight loss had greater costs during the intervention period, although this difference is only statistically significant for the total expenditure variable. The coefficients on the interaction variables for the post-intervention period are not statistically significant in any of the expenditures models, suggesting that in the 2 years after completion of the intervention, there are no discernable cost differences between the two groups. Similar results were found when the post-intervention period was stratified into two 1-year periods (results available upon request). In sum, these results do not support the hypothesis that short-term reductions in weight translate into reductions in medical expenditures for employees.

Older participants, whites, and those with a higher baseline BMI were associated with statistically greater quarterly payments in the overall payment model. This trend was similar in the other payment models although differences were often not statistically significant. Costs also increased for nearly every payment source between the pre- and post-intervention periods.

Table 4 presents results for the absenteeism analysis. There were no differences in rates of absenteeism between the two groups at baseline. Between baseline and 12 months, there was a statistically significant increase in days missed for those who did not lose 5% but no statistically significant differences in absenteeism for the 5% weight loss group during this same time frame. As with the expenditures results, the interaction term is not statistically significant. This suggests that there is no discernable beneficial impact on absenteeism during the study period for those who lost 5% or more of their baseline weight. Among the covariates, only males showed statistically different rates of absenteeism by reporting fewer workdays missed than females.

DISCUSSION

This analysis compared differences in medical expenditures and rates of absenteeism between two groups of overweight and obese employees who participated in a weight loss study and who either did or did not lose 5% of their baseline weight. Participants in the ≥5% weight loss group on average lost substantially more than 5% (close to 10% of baseline weight), whereas participants not in the ≥5% weight loss group gained about 2 pounds. Despite these large and statistically significant differences in weight change, there was no evidence that those in the ≥5% weight loss group showed improvements in absenteeism or medical expenditures compared with those who did not lose 5% weight. In fact, the 5% weight loss group actually had greater average quarterly medical expenditures during the intervention period. This could occur if participants who aggressively attempt to lose weight also begin to take a greater interest in managing their overall health. This might result in more frequent contact with physicians, who might diagnose and treat conditions that would have gone untreated in the absence of the weight loss. Under these circumstances, overall medical expenditures could increase in the short term, even if there are some reductions in medical expenditures resulting from improved health due to weight loss. However, noting that the 5% weight loss group had lower costs prior to the start of the intervention and no statistically significant differences in the post-intervention period, the higher costs during the intervention period may also result from a trend back toward the mean.

An interesting finding of this study is that, although baseline demographics were similar in most respects across the two groups, those who achieved 5% weight loss had lower quarterly medical expenditures before the weight loss was achieved. Although the cause of this difference is unknown, it suggests that there are differences between the two groups in addition to weight loss and highlights the importance of controlling for baseline differences in the analyses.

The lack of statistically significant differences between the two groups should not be surprising. Obesity is a risk factor for many serious chronic diseases; however, there are also many overweight and obese individuals with few, if any, risk factors. The sample used in the medical claims analysis is likely to be even healthier than the general obese population given the exclusion criteria required by the IRB. For obese individuals who have yet to develop serious complications, weight loss likely reduces the risk of obesity-related diseases later in life; however, modest weight loss may not directly translate into measureable short-term reductions in medical expenditures or absenteeism. Even for those individuals with obesity-related co-morbidities, it is not apparent that modest reductions in weight would reduce expenditures. For example, most insulin-dependent adults with diabetes will not be able to discontinue their use of medications altogether as a result of a moderate amount of weight loss. However, it may reduce their requirements for increased medications in the future.[10]

From a public health perspective, the fact that 19% of employees in a minimal intensity weight loss study were able to achieve a 5% weight loss over a 12-month period is encouraging. The health benefits of modest weight loss include improvement in glycemic control and reduction in blood pressure and cholesterol levels, among others.[11] Despite the successful weight loss of participants in this study, the results suggest that a quick ROI for weight loss programs, even effective ones, is not likely. From these findings, it is reasonable to question whether employer investment in work-sponsored weight loss programs is worthwhile for those employers whose main interest is short-term cost savings. However, as with other employee benefit decisions, the decision about whether to offer weight loss programs at work should take into account many factors, only one of which is the potential for ROI. For example, when employees are asked what type of health promotion programs they would like to have at work, weight loss and physical activity interventions are often among the top choices. Because these programs are of interest to employees, and because of the potential for health improvements and perhaps longer-term financial savings, it may make sense to prioritize weight loss programs when deciding which programs to offer.[12,13]

This study has several limitations. First it is based on a highly select sample of overweight/obese employees at community colleges in North Carolina who agreed to participate in a research study on weight loss, responded to baseline and follow-up surveys, signed appropriate consents for access to medical claims data, and who did not have a number of co-morbid conditions that made them (or their data) ineligible for use in this study. Moreover, the sample size is relatively small, especially for the medical claims analysis. A larger sample size might have generated statistically significant improvements in rates of absenteeism for the 5% weight loss group. However, for the medical claims analysis, the coefficients were `wrong-signed' from an ROI perspective. In response to IRB concerns, 29% of the eligible sample for the claims analysis was removed due to the presence of a mental health condition and an additional 5% was removed due to other restrictions. Not only does this point to the high diagnosed prevalence of mental health conditions among those with excess weight, but excluding them from the analysis may have downwardly biased the results given the high correlation between BMI and poor mental health.[14] Assuming that IRB approval is attained, future studies should attempt to include a larger and more representative sample of overweight and obese employees.

An additional limitation of this analysis is that we do not track the weight of participants beyond the intervention period and that we only follow participants for 24 months post intervention.

Employers may be looking for a quick ROI resulting from a successful weight loss program. This study suggests that a short ROI is unlikely to materialize, even for employees who achieve greater than 5% weight loss. Specifically, we found no evidence of reductions in medical expenditures or absenteeism in the period during and 2 years after the weight loss. However, the financial benefits of a less obese workforce may begin to accrue in subsequent time periods, such that there is a positive ROI by year 3, 4, or 5. Of course, it is also possible that it takes even longer to break even or that there never is a positive ROI. In this case, there is still value in improving the health of the workforce, but the financial motivation for employers to fund such programs is significantly reduced.

In addition, future research should address other factors (e.g., job turnover, worker's compensation costs, presenteeism), in addition to absenteeism and medical expenditures, that might enter into the ROI equation. Research should also address employer motivations for implementing weight management and other wellness programs, and the extent to which they trade off financial for other potential benefits like employee productivity, job satisfaction, morale, recruitment and retention. It is also useful to understand employee preferences for these programs and whether or not they would be willing to absorb some of the costs. Greater cost sharing may improve the financial outlook for employers and make the programs more likely to be implemented. Research should also continue to address the quality and effectiveness of worksite based weight loss programs. Studies that investigate weight change over time, along with the health and economic implications of weight loss and weight management programs over an extended time period will contribute needed information to inform the next generation of employer-sponsored programs that address the serious public health threat of obesity.

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Table 1

Analysis Sample for Absenteeism and Medical Claims Analysis

	Absenteeism Analyses	Medical Claims Analyses
Enrollees at baseline	965	965
Completed HIPAA consent and requested data (% of enrollees)	N/A	641 (66%)
Excluded for specific ICD-9 codes (% of requested)	N/A	219 (34%)
Attrition (% of enrollees)	299(31%)	143 (15%)
Analysis sample	667	279
5% weight loss (% of analysis sample)	124 (19%)	46 (16%)
Less than 5% weight loss (% of analysis sample)	543 (81%)	233 (84%)

Table 2

Demographic, Weight Loss, Absenteeism, and Medical Expenditure Summary Statistics by 5% Weight Loss

VARIABLE	Lost 5% of Weight Mean (std. error)	Did not lose 5% Mean (std. error)
	ABSENTEEISM SAMPE	
Average age	45.6 (.84)	47.7* (.41)
Percentage white	85.5% (3.2)	77.3%* (1.8)
Percentage male	20.3% (3.7)	17.0% (1.7)
Baseline weight (lbs)	205.1 (3.9)	201.0 (1.9)
Baseline body mass index	33.3 (0.55)	33.3 (0.29)
Average weight change (lbs)	−19.3 (0.81)	1.7* (0.29)
Average weight change (%)	−9.5% (0.37)	−0.8%* (0.15)
Days absent in the past 30 days	0.25 (.07)	0.35 (.05)
	CLAIMS ANALYSIS SAMPLE	
Quarterly medical expenditures (all quarters)	$623 (76)	$788 (48)
Quarterly inpatient expenditures (all quarters)	$87 (40)	$110(25)
Quarterly outpatient expenditures (all quarters)	$166 (35)	$200 (23)
Quarterly pharmacy expenditures (all quarters)	$124 (12)	$201* (8)
Quarterly physician expenditures (all quarters)	$246 (23)	$277 (12)

* Differences are statistically significant at $p < 0.05$.

Table 3

Quarterly Medical Expenditures Results—Multivariate Regression

Variable	Total	Inpatient	Outpatient	Pharmacy	Physician Practice
5% weight loss dummy	−291.9** (100.1)	−85.9 (43.8)	−58.7* (28.9)	−79.6* (32.3)	−67.7 (43.2)
Intervention period dummy	44.0 (85.9)	−39.9 (37.3)	63.6 (38.3)	21.6* (9.5)	−1.2 (26.9)
5% weight loss dummy X intervention period dummy	465.3* (221.5)	199.1 (110.9)	82.8 (73.8)	33.3 (31.5)	150.1 (78.5)
Post-intervention period dummy	343.2** (114.1)	32.9 (59.7)	121.9* (49.3)	75.6*** (37.7)	112.8*** (29.1)
5% weight loss dummy X post-intervention period dummy	120.6 (175.4)	76.8 (85.8)	5.1 (74.3)	16.6 (42.6)	22.2 (54.1)
Age	31.3*** (7.5)	7.7** (2.7)	6.4* (2.9)	7.9*** (1.8)	9.2*** (2.1)
White	244.3* (123.9)	7.1 (44.9)	48.5 (42.4)	105.8* (45.2)	82.9* (38.1)
Male	72.3 (218.1)	77.8 (80.2)	27.1 (82.9)	.19 (50.9)	−32.8 (54.1)
Baseline body mass index	23.7** (9.2)	3.8 (2.4)	2.4 (3.2)	13.4** (4.5)	4.1 (2.4)
Constant	−1,973.7*** (470.1)	−496.7** (162.8)	−266.3 (157.5)	−767.3*** (219.9)	−443.5*** (119.3)
N	4,208	4,208	4,208	4,208	4,208
Adj R^2	0.0208	0.0050	0.0051	0.0668	0.0285

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

Table 4

Absenteeism (Days Missed in the Past 30 Days) Regression Results

Variable	Coefficient (Std. Err.)
5% weight loss dummy	−0.144 (0.317)
12-month follow-up dummy	0.824** (0.245)
5% weight loss dummy X 12-month follow-up dummy	−0.271 (0.432)
Age	−0.01 (0.014)
White	−0.043 (0.288)
Male	−0.888** (0.321)
Baseline BMI	0.031 (0.019)
Constant	−1.52 (0.874)
N	1,090

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$