Review

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Cost of obesity in the workplace

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As the prevalence of obesity increases, its economic consequences must be understood. This review summarizes published literature on the costs and resource use associated with obesity in the workplace. A Medline literature search was conducted for English-language publications. References from identified articles were also reviewed for relevance. The identified studies evaluated several cost components, including absenteeism, sick leave, disability, injuries, and claims data. Overall, overweight or obese employees had higher sick leave or disability use. Workplace injuries were higher among overweight or obese employees. Health care costs, based on claims data analyses, were also consistently higher for employees with higher body mass indices. Obesity is an important driver of costs in the workplace. These findings quantify the costs and can help employers consider whether to introduce workplace interventions or provide coverage for weight loss programs.

Key terms absenteeism; body weight; burden of illness; economic analysis; health care expenditures; productivity; review.

Chronic health conditions, such as migraine and gastroesophageal reflux disease (GERD), are common in the working population in the United States. Employers often bear a substantial burden of the medical care costs incurred by patients with these chronic conditions in the form of insurance premiums and coverage. However, in addition to the direct medical costs, there are other ways in which these chronic conditions affect the financial health of the workplace, particularly through increased absenteeism and decreased productivity. For example, over a 6-month period, almost two-thirds of the patients with asthma in one study reported taking days off from work due to their asthma (1). Even patients with mild GERD symptoms reported decrements in productivity due to symptoms (2). Furthermore, productivity surrounding a work absence may also be affected, as one small study demonstrated measurable decreases in productivity of about 16% before and after a work absence (3).

Employers are making efforts to identify and contain the costs associated with chronic conditions. Certain conditions that already require regular medical attention are addressed within the context of plan-specific guidelines, formularies, and disease management plans, all of which can be designed to optimize treatment and minimize the impact on the workplace. However, beyond traditional concerns about workplace productivity for conditions such as allergies, asthma, and migraine, interest in the cost impact of obesity in the workplace has arisen. Although it is understood that obesity has a substantial cost in terms of health care resources, there has not been a thorough review of the published literature. This review fills that gap, summarizing what is known from published studies of the estimated cost of obesity in the workplace, including both health-care-related costs and indirect costs such as work loss (absenteeism) and reductions in productivity.

Methods

A literature search was conducted in Medline, the EBSCOhost Electronic Journals Service, and Questia databases for English-language publications. No year constraints were used, and articles were not limited to the United States. The search is up to date through March 2005. The MeSH headings and key words used included "obesity" or "overweight," and "cost of illness," "cost," "employer health costs," "cost-benefit analysis," or "cost and cost analysis," and "work," "workplace," "business," "industry," "occupations," "employment," or "personnel management." We also crossed "obesity" and "overweight" with "absenteeism," "disability," "presenteeism," "productivity," and "sick leave." For the EBSCOhost search, the results were limited to peer-reviewed articles, while the Questia search was limited to journal articles. In addition, the references and tables in each article were reviewed to identify other papers,

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conference proceedings, or consensus workshop publications that were not indexed in Medline. Finally, general Internet searches were conducted, national and international organizations and government health sites being of particular interest. There was no attempt to exclude articles based on differential definitions of overweight or obesity; instead cut-offs for body mass index (BMI) or definitions of obesity are reported in this review for each included study. As the goal of this review was to summarize available information on workplace impacts of obesity, not impacts on obese persons, articles that focused only on wages were not included.

Results

Workplace impacts

Absenteeism, sick leave and disability. The extent to which obesity and other chronic conditions affect productivity can vary by industry and the demographic characteristics of the workforce. Existing studies on productivity and presenteeism have generally not included obesity per se, although some have included its sequelae (eg, hypertension, heart disease, diabetes). More is known about absenteeism. Several studies have shown that overweight and obese employees take more sick leave and spend less time at work than their normal weight counterparts. Table 1 summarizes published studies regarding the relationship impact of obesity on absenteeism and disability.

Multiple studies of sick leave and disability related to obesity have been conducted in Scandinavian countries. Narbro et al reported that obese Swedish women (BMI ranged from 28 to 68 and averaged 39) aged 30–59 years took at least 1.5 times more sick leave than the general Swedish population and were more than twice as likely to receive disability pensions (5% of nonobese women received disability compared with 12% of obese women) (4). The incremental sick leave and use of

Table 1. Published literature on the relationship between obesity and absenteeism and disability. (95% CI = 95% confidence interval, BMI = body mass index, NA = not assessed, RR = relative risk, US = United States)

Citation	Population	Definition of obesity	Difference in absenteeism associated with overweight and obesity	Difference in disability associated with overweight and obesity
Bungum et al, 2003 (9)	US municipal employees, mean age 41–44 years	Normal = BMI <25, overweight = BMI 25–30, obese = BMI >30	Average annual days absent: normal = 27 (SD 27), overweight 30 (SD 32), obese = 35 (SD 31); BMI was a significant predictor of inclusion in the lowest or highest quartile of absences (OR=1.37)	NA
Mansson et al, 1996 (6)	Swedish men, median age 48 years	Underweight = BMI <20, normal = BMI 20 to ≤25, overweight = BMI 25 to ≤30, obese = BMI ≥30	NA	Relative risk of receiving disability compared with that of normal-weight persons (adjusted for smoking): overweight 1.3 (95% CI 1.1–1.6), obese 2.8 (95% CI 2.2–3.5); pension-free survival was significantly longer for normal versus obese men
Narbro et al, 1996 (4)	Swedish women, age range 30–59 years	BMI >28.6	Sick leave 1.5–1.9 times greater than that of general population; overweight women had lower use of short-term sick leave but higher use of long-term sick leave than the general population	Disability pensions 2.0–2.8 times greater than for general population
Nathell et al, 2002 (11)	Swedish men and women, mean age 40 years	BMI >30	Higher prevalence of obesity among asthmatic patients on sick leave compared with employees on sick leave for nonspecific pain or controls (20.7%, 13.7%, 6.5%, respectively, P <0.001)	NA
Rissanen et al, 1990 (7)	Finnish men and women, age range 25–64 years	BMI >30 (reference BMI <22.5)	NA	Relative risk of disability for overweight persons significantly greater for women (RR 2.0, 95% CI 1.8–2.3) and men (RR 1.5, 95% CI 1.3–1.7) than for reference persons (adjusted for age, geographic region, occupation, and smoking)
Robbins et al, 2002 (22)	US active duty Air Force personnel, age range 17–60 years	Maximum allowable weight approximately BMI 27.9 for men and 25.0 for women	Exceeding maximum allowable weight associated with 28 351 lost workdays per year (USD 3.5 million annually in 1997)	NA
Thompson et al, 1998 (17)	US employees, age range 25–64 years	Nonobese = BMI <25, mildly obese = BMI 25–28.9, moderately to severe obese = BMI ≥29	Number of annual workdays missed higher among the moderately to severely obese compared with nonobese (ranging from 5% to 93% higher) for all comparisons except men 55–64 years of age (14% less than the nonobese)	Disability (defined as self-reported inability to work) was higher among the moderately to severely obese than the nonobese (ranging from 14% to 140% higher) for all comparisons except men 55–64 years of age (7% less than the nonobese)
Tucker & Friedman, 1998 (8)	US employees, mean age 39 years	Women: obese = body fat 30% or more; men: obese = body fat 25% or more age	Obese significantly more likely to have moderate and high absenteeism (absent 3–6 and 7 days in past 6 months, respectively) than the nonobese	NA

disability pensions amounts to approximately USD 300 million (in 1994) annually, reflecting approximately 10% of the total sick leave and disability cost among Swedish women. A later study by this group also evaluated the impact of surgical treatment for obesity and found that it resulted in more sick days in the first year following surgery, but significantly fewer sick days in subsequent years (5). In a study of Swedish men, Mansson et al also found that the receipt of a disability pension was related to BMI (6). Compared with normal weight men, underweight men had a relative risk of receiving a disability pension of 1.9 [95% confidence interval (95% CI) 1.4–2.6], while overweight and obese persons had relative risks of 1.3 (95% CI 1.1–1.6) and 2.8 (95% CI 2.2–3.5), respectively. Among employed Finnish obese people, there was a weak association between BMI and mortality, but BMI was also a strong predictor of the early use of disability, women with a BMI of ≥30 being twice as likely as those with a BMI of ≤22.5 to receive disability and men 1.5 times more likely (95% CI 1.3–1.7) (7).

Studies in the United States have identified obesity-related sick leave overall and in the military sector. Tucker & Friedman (8) classified employees as obese if their body fat was ≥25% for men and ≥30% for women, as lean if their body fat was ≤15% for men and ≤20% for women, and average if their body fat was in-between. Employees who were lean or average were also aggregated into a "nonobese" category. Obese employees were significantly more likely to have high or moderate absenteeism (defined as more than seven absences or three to six absences due to illness in the past 6 months, respectively) than the lean or nonobese employee groups, even after control for age, gender, smoking status, and other sociodemographic characteristics.

Bungum et al (9) categorized employees in the municipal workforce of an undisclosed city in the United States into the following three BMI groups: normal (BMI <25), overweight (BMI 25–30), and obese (BMI >30). Among those in the obese group, absenteeism was highest when compared with that of the normal weight and overweight groups.

A 33-month study of student nurses in the United Kingdom assessed sickness and absenteeism related to weight, smoking, and mental health (10). Relative weight was defined as the BMI divided by the sample mean [21.7 (SD 2.6)]. Absence was assessed as episodes, and sickness was treated as a categorical variable since the distribution was highly skewed. Relative weight demonstrated a curvilinear association with absence, and smoking had additive effects. A high relative weight accompanied by poorer mental health was associated with increased absence. Only 23% of the study population had a BMI above 23.5. While these data, as reported, cannot speak directly for work loss and obesity, the relationship between relative weight and sickness and absenteeism in this younger population (most students at baseline were between 18 and 25 years of age) is important, as are findings about the interaction between relative weight and mental health.

The use of sick leave may be higher among patients who are obese and also have asthma. One study comparing the prevalence of obesity (BMI ≥30) among employees taking sick leave for asthma, for other nonspecific pain, and a general population found the prevalence of obesity to be significantly higher for the asthmatic employees (20.7% versus 13.7% and 6.5%, respectively) (11). The presence of asthma was self-reported and then clinically validated. The authors suggested that weight reduction plans may be important to decreasing sick leave associated with asthma.

Workplace injuries

Several studies have also reported that the rate of workplace injuries is significantly higher among overweight persons. For example, New Zealand patients diagnosed with carpal tunnel syndrome were twice as likely as the general population to be overweight (BMI ≥25), and women with carpal tunnel syndrome were twice as likely to be obese (BMI ≥30) (12).

An analysis of over 10 000 employees working at a Shell Oil manufacturing facility in Texas found that the rate of injuries was higher among employees who were overweight than among the normal-weight population (13). The rate of lower back injuries was 1.42 times higher among overweight employees than among normal-weight employees, and the rate of other, nonback musculoskeletal injuries was 1.53 times higher. The authors suggested that ergonomic improvements, as well as weight reduction programs, would decrease the rate of injuries.

In a survey of over 6000 adults aged 15 years and older in France, there was a significant increase in the rate of occupational injuries with an increased self-reported BMI (BMI categories ≤19, 20–24, and ≥25 had annual rates of injury of 2.6%, 4.3%, and 5.4% respectively) (14). This study also found significant differences in the rate of injury by gender, job category, smoking status, use of alcohol and psychotropic drugs, and comorbid conditions, while there were no differences by age. It is difficult to isolate the effect of BMI alone, as there are multiple significant interaction effects and there are significant correlations between BMI and the presence of a disease and smoking status.

In addition to the impact of acute injuries due to obesity, emergent conditions may be more likely to develop into chronic conditions or require more recovery time. Fransen and her colleagues examined predictors of the transition between acute and chronic back pain.

Employees in New Zealand who filed a new claim for a work-related back injury were identified and followed for 3 months (15). Along with increasing age, functional disability, and radiating leg pain, an above-normal BMI (≥25) was a significant predictor of the transition to chronic back pain. Those who were overweight (BMI 25.1–30) had an odds ratio (OR) of 1.56 (95% CI 1.08–2.25) for chronicity when compared with normal-weight employees; those who were obese (BMI >30) had an odds ratio of 1.85 (95% CI 1.17–2.90). Other personal characteristics, including gender, age, education, smoking status, recent back pain, prior claim of back pain, and general physical fitness, were not significant predictors of chronic back pain. The study also examined psychosocial characteristics, including psychological well-being and role functioning, and workplace characteristics, including amount of lifting, sitting, walking, and driving, and found that many of these factors were also significant predictors of the transition from acute to chronic pain.

Recovery time after an injury may also be longer for those who are overweight or obese. For example, overweight (BMI ≥30) French male railway workers were more likely to have absences of 8 days or more in association with an imbalance-related injury than normal-weight employees (OR 2.08, 95% CI 1.04–4.11) (16). However, the occurrence of injury did not differ depending on weight (OR 1.22, 95% CI 0.83–1.82); smoking and alcohol use, sleep disorders, inactivity, and a request for a job change were associated with the occurrence.

Workplace costs

The relationship between medical charges and BMI has been examined in several working populations, including the private sector, government agencies, and the military. Studies have used a variety of methods but have consistently found that there is a substantial financial impact, in terms of direct health care costs, increased sick leave, and disability payments, in association with overweight and obesity.

Using data from firms in the private sector in the United States in 1994, Thompson and his colleagues determined that obesity cost businesses USD12.7 billion (in 1994) (17). This sum not only includes health insurance, but also life and disability insurance, as well as paid sick leave for employees between 25 and 64 years of age. Employees with a BMI of ≥25 were considered obese. The proportion of each of these costs attributable to obesity was determined by estimating the prevalence of obesity among age groups (in 10-year increments) and estimating the percentage of medical care costs due to various obesity-related conditions (coronary heart disease, hypertension, stroke, type 2 diabetes, gallbladder disease, hypercholesterolemia, osteoarthritis of the knee, endometrial cancer) that are incurred by employers. The primary assumption made in this calculation (ie, that the cost of a condition is proportional to the rate incidence) should be considered cautiously, as the costs of a specified condition in an obese population may actually be higher than that in a nonobese population due to comorbidities or other complicating factors among obese persons. This study presents costs for those with mild obesity, defined as BMI from 25 to 28.9, and moderate-to-severe obesity, defined as BMI 29 or greater. Type II diabetes was the single highest contributor to workplace spending for obesity. The researchers cautioned that many indirect costs of obesity are accrued by those over the age of 64 years, who are less likely to be working and likely to be using Medicare for a proportion of their medical care costs.

Wang et al (18) grouped over 175 000 General Motors (GM) employees into six BMI groups, analyzed medical charges from 1996 and 1997, and expressed these results in USD 2000 (18). The "normal-weight" group (BMI 18.5–24.9) had the lowest annual medical charges (median of USD 2225), with groups who were underweight or overweight or obese (USD 2388–3753, significant at $P<0.01$ when compared with the "normal-weight" group) having higher charges. Charges for the underweight group (median USD 3184) were 43% higher than those for the normal-weight group; those in the most overweight group (BMI ≥40) had charges 69% higher than those of the normal-weight group. Median charges were used for the medical expenses. Although pharmaceutical costs were included, no analyses were performed by categories of charges (ie, pharmaceutical, inpatient, outpatient). Later work with a subset of this population examined the physical activity levels of these employees, with the objective of determining how much the employer would save if sedentary employees increased their levels of physical activity (19). Employees reported the amount and intensity of weekly physical activities. After adjustment for covariates, the costs were significantly higher by BMI (18.5–24.9, 25.0–29.9, ≥30) and by level of physical activity. Within the BMI categories, there was a trend towards lower costs with higher physical activity levels. Drugs represented a higher proportion of total medical costs as BMI increased. Additional analyses of GM employees from 1996 through 2000 also found that the annual average medical costs were higher depending on the BMI, with higher prevalence of diabetes by BMI (20).

Data on health care claims and health risk appraisals of over 3000 employees of First Chicago NBD were evaluated for an assessment of obesity-related costs (21). The employees were classified as obese if their BMI was ≥27.8 for the men and ≥27.3 for the women. The mean 3-year health care cost for obese employees was USD 6822 (in 1996) compared with USD 4496 for

nonobese employees. This increase in cost was not the result of higher costs for each health care claim, but reflected the greater number of health care claims in comparison with nonobese employees. There were also significant differences in the number and cost of sick days taken. Obese employees used, on the average, more than twice as many sick days as the lower BMI group (mean 8.45 versus 3.73 sick days, P<0.001). When the sum of sick day absences over a 6-year period were converted to costs, the obese employees had a cost of USD 863 per person greater than that of the nonobese employees.

Musich and her colleagues evaluated the costs associated with BMI and additional health risks in a population of GM employees (20). Although the study was focused on the prevalence and costs associated with diabetes, the results are still informative. The prevalence of diabetes and the average medical charges increased significantly by BMI group (<18.5, 18.5–24.9, 25–29.9, 30–34.9, ≥35). The average annual medical charges ranged from USD 3836 (normal weight) to USD 6103 (BMI ≥35).

Bungum et al (9) categorized employees in the municipal workforce of an undisclosed city in the United States into the following three BMI groups: normal (BMI <25), overweight (BMI 25–30), and obese (BMI ≥30). Those in the obese group experienced higher health care costs than the employees in the overweight group and the normal weight group. In this population, BMI was the only significant predictor of health care costs (P=0.009), while age, gender, race, education, and smoking status were not significant predictors.

Robbins and his colleagues (22) used a retrospective cohort of personnel who participated in a voluntary health assessment in 1996 and examined the impact of being over the maximum allowable weight on health care expenditures and lost workdays separately by gender. Maximum allowable weight is consistent with a BMI of 27.9 for men and 25.0 for women and may be exceeded on the basis of a demonstration of reasonable attempts to lose weight. The characteristics of the cohort were similar to those of the Air Force overall, and the results were applied to the entire active duty force. The one-fifth of active duty Air Force personnel in the United States who were above their maximum allowable weight were responsible for USD 19.3 million in excess direct medical costs and USD 3.5 million in indirect costs in 1997. Importantly, a validation substudy found that the self-reported height and weight values used to estimate maximum allowable weight for this study were highly correlated (r >0.92) with values obtained during annual fitness testing.

Bradham and his colleagues (23) explored the costs of obesity-related hospitalizations to the United States Navy. This study identified hospitalizations from 1993 through 1998 for conditions that were determined, through a literature review, likely to be caused by overweight or obesity, or to co-exist with either. After costs for this time period were estimated, data on differential costs by demographic and employment level were aggregated to project the annual cost to the Navy. They estimated that there were USD 5.8 million (in 1998) in obesity-related hospitalizations in 1998. Costs per obesity-related admission were estimated to be just over USD 4000, with personnel aged 34 years or less expected to have admissions costing less than USD 3400, while those aged 35 years and older were expected to have more expensive admissions.

Discussion

Obesity will continue to be an important driver of costs in the workplace, with a unique distinction from other chronic conditions in that it is a condition not generally treated with pharmacological agents. While guideline and formulary-based decisions, such as using nonsedating antihistamines rather than sedating antihistamines, can have an impact on productivity (24), no such simple changes can solve all of the issues related to obesity. However, whether an employer chooses to include interventions for obesity in the arsenal of tools to increase worker productivity, health, and morale can have an impact on the health care costs of the company.

There are several limitations in our review. First, the thresholds for overweight and obesity used across studies differed. While the recommendations of the World Health Organization (WHO) will guide future research, a variety of BMI values has been used to define obesity in previous studies. According to WHO, persons with a BMI of 25 or greater, calculated as weight divided by height squared (kg/m^2), are overweight or obese. Although definitions have not been consistent in the past decades, the current WHO classification is now generally accepted globally. Overweight refers to people with a BMI of 25.0 to 29.9, while obese refers to people with a BMI of ≥30, and a BMI of ≥40 is classified as morbid obesity. This classification limits the comparability of the studies somewhat.

When interpreting the studies summarized in this review, one should note that obesity is only one of many issues that can affect workplace costs and productivity; not all of these factors have been controlled in published studies. In addition, there may be relationships between obesity and other workplace issues, such as relations with co-workers (25). Some types of health behavior may also influence workplace costs and productivity or mediate the relationship between obesity and workplace costs. For example, smoking has been shown to affect

absenteeism (perhaps more so among men than women) (26) and productivity (27). There may also be synergistic effects of smoking and obesity, although such effects have not been confirmed (28). In addition, alcohol abuse is associated with BMI and increased sick leave (29, 30), while increased participation in sports and physical activities is generally associated with a lower BMI and less sick leave (31, 32).

A variety of work-related characteristics can affect job performance and may be associated with obesity. Work characteristics related to absenteeism include burnout, role clarity, job autonomy, and company policies (33–37). Cultural norms and self-efficacy can also affect job performance (34). Stress, reward–effort balance, and the sedentary nature of the job may also be associated with BMI or weight (38, 39). Several analytic techniques, such as structural equation modeling, can help quantify the relationships among health behavior, work characteristics, and work performance. While it is beyond the scope of this review to explore these relationships in detail, future studies should build on what is known and also consider these possible modifiers.

Beyond its impact on employer costs, obesity appears to have negative consequences on wages earned. Baum & Ford (40) suggest that there is a wage penalty between 0.7% to 6.3%, with women suffering a larger penalty than men. Several analyses have examined the specific hypotheses about the relationship between BMI and wages (40–42). Some of the issues explored include whether obese people self-select jobs with better health benefits, as well as the converse, that employers offer lower wages due to expectations of higher health care costs; whether there is customer-based discimination that affects success in retail; whether rates of job-related training differs between the obese and nonobese; and whether obesity is related to other health limitations that affect type of job and performance (40–42). Reported findings are sometimes counterintuitive, and more research in the area is needed. When the cost of obesity is considered from the perspective of the employee, this wage differential is clearly an important issue.

The studies reviewed in this paper are largely cross-sectional. Studies that have evaluated medical and pharmacy costs have found decreases in costs associated with weight loss over time (43, 44). Additional longitudinal studies with interventions for obesity and other conditions, such as that described by Erfurt and his colleagues (45), are necessary to understand the potential for reducing costs in the workplace. With additional information detailing the workplace benefits of decreasing obesity, employers can consider creating environments more conducive to healthy eating and physical activity (eg, changes in cafeteria and vending options, flex-time for people who wish to exercise during the day).

Despite these limitations, some conclusions can be drawn. Compared with employees who are not obese, those who are obese take more sick time and have more injuries and higher health care costs. This difference has been shown across countries and across types of companies. As employers are recognizing the importance of disease management and wellness programs (eg, smoking cessation) for overall employee well-being and health care costs, they may also consider implementing programs to help employees achieve and maintain a healthy weight.

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