The Economic Weight of Overweight and Obesity: A Review of the Literature

Anne Wolf, MS, RD, Scott McFarland, JD, and Susan M. Schwartz, PhD

Summary

The objective of this article is to review the costs associated with adult overweight and obesity, including direct medical costs and losses in worker productivity, and to discuss cost-effective strategies that will help address this growing epidemic. We reviewed the literature using Medline search; publications retrieved were evaluated and synthesized.

More than one-third of the U.S. population is currently overweight and another third is obese, numbers that have increased steadily and dramatically since 1980. These conditions are risk factors for chronic diseases that drive up health care costs: About 9 percent of today's health care expenditures are a direct result of excess weight. Increases in the amount spent on each obese person and the growing prevalence of obesity account for 27 percent of the rise in inflation-adjusted per capita spending between 1987 and 2001. Obesity not only imposes added health insurance costs on employers, but also added costs for life insurance, disability insurance, and paid sick leave. Furthermore, overweight and obese employees are less productive while at work. Public health measures to prevent obesity are being initiated but do not address the 130 million Americans who are overweight, obese, and severely obese. Addressing overweight and obesity in a systematic manner is needed to deal with this growing epidemic.

Key Points

- The cost of overweight and obesity in the U.S. is well documented.
- Obesity greatly increases direct medical costs and decreases worker productivity.
- The cost effectiveness and return on investment of obesity treatment is in the initial stages of evaluation.
- Strategies to address obesity and reduce health care costs can be developed with the most promising being based on severity of obesity and co-morbid conditions.

GOVERNMENT, HEALTH CARE, AND business leaders are concerned with the marked increase of overweight and obesity in the United States and the resulting impact on our nation's health, health care costs, and productivity. The prevalence of overweight (Body Mass Index, BMI 25 to 29.9 kg/m^2) and obesity (BMI $\geq$ 30 kg/m^2) among adults has increased almost 20 percent over the past 25 years.[1] Currently, two out of every three adults in the U.S. have a BMI $\geq$ 25 kg/m^2. While the prevalence of overweight has consistently remained around 30 percent, the prevalence of grade I, II, and III obesity has risen steadily[1,2]—an observation suggesting that overweight is a pathway to obesity. This increased prevalence of obesity is evident regardless of age, gender, or race/ethnicity.[2] Indeed, the prevalence of overweight among children has tripled.[1]

Most concerning is that excess weight carries major health risks. Obesity is the single most important predictor of type 2 diabetes[3]. Overweight and obesity are also major risk factors for hypertension,[4,5] dyslipidemia,[4,5] coronary artery disease,[5,6] ischemic stroke,[5,7] osteoarthritis of the knee,[8] low back pain,[9] gallstones,[10] sleep apnea,[11] and cancer.[12]

These conditions are associated with high costs, including both the direct costs of medical care and the indirect costs of lost productivity and disability. A recent report identified the growing prevalence of obesity as one of the primary factors responsible for the growth of private health care spending between 1987 and 2002.[13] In the past five years there have been numerous studies on the cost of obesity. The purpose of this paper is to review and synthesize the current literature on the cost of overweight and obesity. Finally, this paper will propose ways that will allow stakeholders to address this growing problem.

Direct Medical Costs

Exhibit 1 provides the methodology background on the primary papers presented within this review. Finkelstein et al,[14] report that in 1998 overweight- and obesity-related medical spending was approximately $51.5 billion—or $78.5 billion if nursing home costs are included ($71.5 billion and $103 billion in 2006 dollars). Overweight costs represented 3.7 percent of the national health care expenditure while obesity represented an additional 5.3 percent.

Other evidence supports a continuing increase in obesity-related costs. Thorpe et al,[15] found that per capita health care spending rose by $1,110 over a 14-year period. Twenty-seven percent of this growth was attributed to obesity—12 percent to the increase in the number of obese people, and the remainder to faster growth in health care expenses among obese people. Thorpe et al. recently reported that private health care spending attributable to obesity increased ten-fold between 1987 and 2002, raising spending to more than $36 billion within this health sector in 2002.[13]

Health Care Costs Across Weight Classes

Health care costs increase as weight increases. Finkelstein et al. report a 14.5 percent and 37.4 percent increase in per capita medical spending among the overweight and obese, respectively, compared to people with a healthy body weight (18.5 to 24.9 kg/m^2).[14] The increase in medical spending by weight class has been consistently reported in other populations as well.[16] After adjusting for age, gender, race, income, education level, type of health insurance, marital, and smoking status, Arterburn et al.[16] reported that health care expenditures for individuals with BMI $\geq$ 40 were 81 percent greater for healthy weight adults and were disproportionate to prevalence. Thorpe also reported that in 2002, 25 percent of people with severe obesity were treated for six or more medical conditions—an increase of 11 percent since 1987.[13]

Effects of Gender, Age and Race

Wee et al. examined the interaction of weight with race and age in determining health care expenditures.[17] Although there was a clear age effect of overweight and obesity on costs for whites, none was apparent for blacks or Hispanics which may have been due to a smaller sample size among non-white race/ethnic groups. Among whites, no effect of weight on health care costs was seen in the younger (18 to 35 years) age group, but obesity had a significant effect in the middle and older (35 years+) age groups. Overweight had a financial impact among the older population ($\geq$ 55years). This pattern presumably reflects the time required for chronic diseases associated with overweight and obesity to make their appearance in the Caucasian population. Andreyeva et al. did find significant differences by gender within specific BMI categories, but they were not consistent in direction and overall do not provide strong evidence for gender-associated cost differences in obesity.[18]

Who Pays?

Finkelstein et al. examined overweight and obesity costs by type of insurance.[14] Based on 1996 to 1998 data, the payer-specific percentage of medical expenditures attributable to overweight varied between 2.2 percent (Medicaid) and 4.6 percent (Medicare), with those for obesity ranging from 3.9 percent (for out-of-pocket payers) to 6.7 percent (Medicaid). Among private health insurers, overweight accounted for 3.4 percent and obesity, an additional 4.7 percent of total health care expenditures. As significant as this sounds, overweight and obesity accounted for almost 20 percent of Medicaid's and Medicare's total health care expenditures. The government is paying almost 50 percent of the health care costs associated with these conditions.

Costs within Managed Care Populations

Studies among members of large managed care organizations, including two divisions of Kaiser Permanente (KP), have shown similar obesity-related increases in health care costs. Quesenberry et al. found that, compared to non-obese members of KP of Northern California, costs were 25 percent higher for members with BMI 30 to 34.9 kg/m^2 and 44 percent higher for those with BMI $\geq$ 35.[19] The authors found significantly higher annual rates for inpatient days, number and cost of outpatient visits, and laboratory and outpatient pharmacy costs. In KP of Colorado, Raebel et al. similarly reported that obese patients had more hospitalizations ($p < 0.001$), prescription drug use ($p < 0.001$), and outpatient visits ($p < 0.001$) compared to matched non-obese patients; independent of co-morbid disease (e.g., diabetes); every 1 percent increase in BMI was associated with a 2.3 percent increase in health care costs.[20]

Exhibit 1: Study Design and Methodology of the Primary Cost of Overweight and Obesity Papers

Study	Study Design	Data Source/Methods	Study Group/ Sample Size
Finkelstein, 2003 (19)	Cross sectional Questionnaire	Analysis of national surveys (US) weighted for generating nationally representative estimates: 1998 MEPS*, 1996 & 1997 NHIS*, 1998 NHA* Four part regression analysis. SR weight/height and actual utilization/cost data	N=9,867 US adults
Thorpe, 2004 (20)	Cross sectional Questionnaire	Analysis of national surveys (US) weighted for generating nationally representative estimates: 1987 NMES*, 2001 MEPS-HC Two part regression prediction analysis. SR weight/height and actual utilization/cost data	1987 NMES: n=20,989 US adults 2001 MEPS: n=21,460 US adults
Thorpe, 2005 (18)	Cross sectional Questionnaire	Analysis of national surveys (US) among privately insured individuals weighted for generating nationally representative estimates: 1987 NMES*, 2002 MEPS Two part regression analysis prediction equations. SR weight/height and actual utilization/cost data	1987 NMES: n= 13,974 US adults 2002 MEPS: n=14,091 US adults
Andreyeva, 2004 (21)	Baseline question-naire and follow up telephone surveys	Nationally representative survey of older population (Health & Retirement Study); pooled data from 1996,1998,& 2000 surveys. SR weight/height and all outcomes	Adults age 54-69 yrs n=7,971 contributing 19,648 observations
Arterburn, 2005 (22)	Cross sectional Questionnaire	Analysis of national survey (US) weighted for generating nationally representative estimates: 2000 MEPS* Two part regression analysis. SR weight/height and actual utilization/cost data	2000 MEPS: 16,262 adults
Wee, 2005 (23)	Cross sectional Questionnaire	Analysis of national survey (US) weighted for generating nationally representative estimates: 1998 MEPS*, 1997 NHIS Two part regression analysis. SR weight/height and actual utilization/cost data	10,860 adults
Quesenberry, 1998 (24)	Cross sectional Questionnaire	SR weight/height. Healthcare utilization from computerized databases of Kaiser Permanente, Oakland, Calif.	Health maintenance (KP) members of N. CA Adults, n=17,118
Raebel, 2004 (25)	Retrospective matched- controlled analysis	Measured weight/height from clinical trial. Healthcare utilization from computerized databases of Kaiser Permanente, Denver Colo.	Health maintenance (KP) members. of CO n=545 obese members n=1229 non-obese members
Wang, 2003 (27)	Cross sectional	SR* & measured weight/height. Health care charges from claims data. Analysis by BMI category	Employees and dependents of General Motors Corp. who underwent one HRA, n=177,971
Burton, 1998 (28)	Cross sectional over 3 year period	Integrated health data system including SR* & measured weight/height. Health care charges from claims data. Analysis by BMI category	Employees of First Chicago National Bank (Chase) , n=3,066. Cost analysis, n=843
Tucker, 1998 (29)	Cross sectional	Questionnaire and HRA data. SR absenteeism. Adiposity measured by skinfold thickness. Analysis by body fat category	Employees of 50 different US companies who underwent HRA, n=10,825
Tsai, 1997 (30)	Prospective	Shell Oil Health Surveillance System. Person Years Actual absenteeism	Employees of Shell Oil Norco Complex, n=2287

MEPS: Medical Expenditure Survey. NHIS: National Health Interview Survey. NHA: National Health Accounts. NMES: National Medical Expenditure Study. MEPS-HC Medical Expenditure Survey-Household Component. HCC: Analysis of national survey (US) weighted for generating nationally representative estimates:2000 MEPS. Kaiser Permanente (KP). * HRA: Health Risk Appraisal.~ SR= Self reported
All studies adjusted for basic covariates such as age, sex, education, health insurance, race, income, marital status and region; some controlled for smoking.

Costs to US Business

Employers are making efforts to identify and contain the costs associated with chronic health conditions. Thompson et al. estimated the cost of overweight and obesity to U.S. business in 1994 at $12.7 billion, 80 percent of which was due to moderate-to-severe obesity (BMI $\geq$ 29).[21] The greatest component of this expenditure was health insurance, representing $7.7 billion. Paid sick leave, life insurance, and disability insurance amounted to $2.4 billion, $1.8 billion, and $800 million, respectively. This may be an underestimate, however, since only eight diseases were included in the analysis.

Linking medical claims to health risk appraisal data, Wang et al. examined 1996 to 1997 medical costs for 175,000 General Motors employees.[22] Compared to the healthy weight group, mean annual charges were 7 percent higher among overweight employees and 46 percent higher among obese employees. There was a monotonic increase in medical charges with increasing BMI within this worksite. Results were consistent across gender and age groups except for men 75 years and older.

Burton et al. evaluated the direct and indirect costs of overweight/obesity to First Chicago National Bank (FCNB, now Chase).[23] "High risk" was defined as a BMI $\geq$ 27.3 and 27.8 kg/m^2 for women and men, respectively. A high-risk BMI increased mean health care costs by 52 percent over a three-year period ($6,822 compared with $4,496 for employees with weights less than the aforementioned cut points). The increase was more striking in women ($3,817) than in men ($440), with the greatest difference in employees over age 45. Employees with a BMI > 30 kg/m^2 represented 18.7 percent of this population but had 28.9 percent of the total health care costs and 26.3 percent of the total number of health care claims.

Lost Productivity

In addition to the direct medical costs paid by insurers and patients, overweight and obesity impacts productivity, with resulting costs being borne by employers and society in general.

Within FCNB, overweight and obese employees had twice as many sick days (average 8.45 days/year) as employees with lower body weights (average 3.73 days/year).[23] The employers' excess sick leave cost for each moderately overweight/obese employee was $863 over a three-year period; this increased to $1,379 among older (> 45 years) overweight employees. Trends for increased disability among the obese population in the U.S. have also been reported.[21]

Tucker and Friedman reported that among 10,825 employed adults, obese individuals were more than twice as likely as lean employees to experience high absenteeism ($\geq$ 7 days over 6 months) and 1.5 times as likely to have moderate absenteeism (3-6 absences).[22]

Obesity may also impose limitations while at work: 6.9 percent of obese workers but only 3.0 percent of healthy weight workers have defined work limitations.[24] And worksite injuries are significantly higher among the overweight employee. Among Shell Oil employees, Tsai et al. reported low back injuries being 1.42 times higher and non-back musculoskeletal injuries 1.53 times higher among overweight/obese employees compared with healthy weight employees.[27] Additionally, acute back pain may be more likely to develop into chronic back pain among the overweight and obese. Overweight employees had a 56 percent greater chance for developing chronic back pain while obese employees had an 85 percent greater risk compared to employees with a healthy weight.[28]

What Can Be Done?

There are many strategies that would help reduce weight and improve health but regardless of what tack is taken, the nation would benefit from a systematic, cohesive approach. One such approach would base level of intervention on an individual's weight and health risk. The first level would focus on prevention of excess weight gain in the entire population. A second, intermediate level would focus on modest weight loss among the overweight, lower risk population. A third, more intense level would involve medical-model treatments for people with a BMI $\geq$ 30 kg/m^2 or BMI $\geq$ 25 kg/m^2 with two or more risk factors, especially those with diabetes, heart disease, or hypertension.

Prevention: Public Health Actions

Prevention of obesity and prevention of excess weight gain are important components of our battle against obesity. State and community partnerships and resources are slowly being mobilized to create settings where individuals, communities, and public and private sectors share responsibility for developing an environment that supports and promotes active lifestyles and access to healthy food choices (more fruits, vegetables, and fiber and lower fat). Programs aimed at the general public can create an important social shift that markets a healthier environment.

Workplace health initiatives also support these larger public health initiatives. Behavioral modification programs at the work site can improve dietary intake and physical activity levels but few have influenced body weight dramatically. One attraction of these programs is that costs are relatively low and have a positive return on investment.[29]

While community and workplace efforts are imperative and likely to help maintain healthy weight, they are usually too diffuse and not integrated with health care providers to promote weight loss among overweight and obese individuals.

Addressing Overweight

Overweight people receive the least attention, yet are the group that could benefit most by a 5 percent weight loss—a loss that is attainable through current low-cost interventions.[30] In 2003 to 2004, 34.1 percent of adults were overweight.[1] There are three

important reasons to address this group. First, there is clear evidence that risk of developing disease usually begins at a BMI of 25 kg/m^2.[5] Secondly, overweight people appear to be on the pathway to obesity.[2] From the Framingham study, 50 percent of the people who started out at a normal body weight, became overweight and 30 percent became obese within a 30 year period[31]- a harmful trend considering obesity is clearly associated with increased morbidity,[4,5-11] mortality,[12] and excess health care costs.[13-20] Lastly, interventions may be more effective because unhealthy behaviors may not be as entrenched.

In addition to environmental changes that promote healthier food choices and physical activity at work and within the community, overweight people may also need modest interventions and tools to slow or stop the weight gain and help them lose a modest amount of weight. Programs such as Weight Watchers, Internet-based programs, and moderate-intensity lifestyle interventions have been shown to be effective.[30,32,33]

Historically, clinicians have been dubious of weight loss products sold over the counter and for good reason due to the lack of testing and safety, and from a plethora of unsubstantiated claims for DSHEA-based supplements. However, accessible options that have proven efficacy and safety could benefit this population. In February 2007, the FDA approved a low dose version of prescription medication Orlistat (Xenical®) for over-the-counter use when combined with a reduced calorie, reduced fat diet. As a prescription drug, several clinical trials have shown that it is both safe and effective in promoting and maintaining weight loss when used in conjunction with a reduced-calorie diet.[34] Among obese patients with type 2 diabetes Orlistat has been shown to be cost-effective even at prescription-drug prices.[35] Another option is SlimFast® for partial meal-replacement. SlimFast® has been shown to be effective for weight loss and maintenance of weight loss up to four years.[36]

Employers are attempting to leverage the least utilized resource in US healthcare, the individual member or patient, by empowering members with tools and resources to participate in their own health care and weight management. Some health plans are discussing participant cost-sharing in order to contain costs. However, this may act as a financial disincentive and create a barrier to program participation. The result could be counterproductive since modest weight loss has been associated with a reduction of medication use[33,37] and improved glucose and blood pressure control.[38,39] An alternative approach, which is increasingly being deployed within group health plan designs, is to provide member rewards and incentives for maintaining weight and health.

High Risk Overweight and Obesity: Medical-Model Interventions

The size of the obesity epidemic may make the total cost of treatment appear overwhelming. Yet, the health care system has a vital role to play in identifying, treating, and managing obesity—and there are cost-effective ways to do this.

NHLBI's evidence-based document on Identification, Evaluation, and Treatment of Overweight and Obesity in Adults[40] suggests that medical treatment needs to begin at a BMI $\geq$ 30 kg/m^2, or $\geq$ 25 kg/m^2 in the presence of two or more risk factors. The American Medical Association[41] and the American College of Physicians second these recommendations .[42] Thus, treatment is based not only on weight but also on co-morbid conditions and risk factors. This paper will not duplicate the many excellent reviews on the efficacy of obesity treatments involving behavior modification,[42] pharmacotherapy, and surgery,[43,44] but rather will provide cost-effective options to address this issue.

Cost may be the significant barrier to effective treatment, however, cost effective approaches are available. For example, a health system could address the needs of many obese patients with such low cost treatments as telephone counseling or an internet-based program. Both types of programs have been shown to be modestly effective.[32,45] Using a registered dietitian as a lifestyle case manager improved health and reduced health care costs among obese people with type 2 diabetes; this moderate-cost approach could easily be used for other lifestyle-related chronic diseases as well.[33,46]

Another approach is to intensively treat a smaller population that is high-risk based on BMI and number and type of chronic health conditions. It is clear from the literature that the dominant sources of obesity costs come from diabetes, heart disease, and hypertension.[15,19] Hence, it is more cost-effective to target the obese population with cardiometabolic conditions such as diabetes, hypertension, and hyperlipidemia.[35] Avenell et al. undertook a systematic review of the long-term effects and economic consequences of obesity treatment, and concluded that targeting high-risk individuals with drugs or surgery was likely to result in a cost per additional life-year or quality-adjusted life year (QALY) of no more than £13,000 ($22,571 USD).[47] For gastric surgery, complication and mortality rates are important considerations and patients should be referred only to high-volume centers until Centers of Excellence are developed.[48]

Conclusion

Overweight and obesity are associated with high costs—both direct costs of medical care and indirect costs of lost productivity. Multiple stakeholders including individuals, community, employers, health plans, and the government need to address this growing health issue. Involvement of health care providers and managers is vitally important if we are to make progress in overcoming obesity and improving the health of our nation. **JMCM**

Anne Wolf, MS, RD, is an instructor of research at the University of Virginia School of Medicine. She is also president of Anne Wolf & Associates, a company that supports health plans and employers with treatment options for chronic disease.

Scott McFarland, JD, is president of Axia Health Management. He leads development, coordination and evaluation of Axia Health Management's programming and services to new and early-stage markets.

Susan Swartz, PhD, is the director of new products research for weight control for GlaxoSmithKline Consumer Healthcare's weight control division. She has served in a leadership role for the current Rx-to-OTC Switch of Orlistat.

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