National Medical Spending Attributable To Overweight And Obesity: How Much, And Who's Paying?

Further evidence that overweight and obesity are contributing to the nation's health care bill at a growing rate.

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ABSTRACT: We use a regression framework and nationally representative data to compute aggregate overweight- and obesity-attributable medical spending for the United States and for select payers. Combined, such expenditures accounted for 9.1 percent of total annual U.S. medical expenditures in 1998 and may have been as high as $78.5 billion ($92.6 billion in 2002 dollars). Medicare and Medicaid finance approximately half of these costs.

More than half of Americans are either overweight or obese. Moreover, the prevalence of overweight and obesity has increased by 12 percent and 70 percent, respectively, over the past decade.[1] This trend is alarming, given the association between obesity and many chronic diseases, including type 2 diabetes, cardiovascular disease, several types of cancer (endometrial, postmenopausal breast, kidney, and colon), musculoskeletal disorders, sleep apnea, and gallbladder disease.[2]

The excess medical expenditures that result from treating these obesity-related diseases are significant. Roland Sturm used regression analysis to show that obese adults incur annual medical expenditures that are $395 (36 percent) higher than those of normal weight incur.[3] This analysis, however, was limited to people under age sixty-five. People age sixty-five and older now account for roughly one-fourth of the obese population, and, because of the chronic nature of obesity-attributable diseases, medical spending for treating elderly obese people is likely to be much higher than spending for nonelderly obese people.

Anne Wolf and Graham Colditz used an epidemiologic approach to quantify aggregate medical spending attributable to obesity (excluding overweight).[4] They calculated the relative risk of disease for obese versus nonobese people for type 2

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diabetes; coronary heart disease; hypertension; gallbladder disease; musculoskeletal disease; and breast, endometrial, and colon cancer. They then applied the relative risk estimates to published estimates of disease costs to determine obesity-attributable medical spending. They found that such spending equaled 5.7 percent of U.S. national health spending in 1995 ($51.6 billion). However, because their disease costs were based on data from as far back as 1985, their spending estimate may be outdated.

In this study we use a regression framework and nationally representative data for adults, including those over age sixty-five, to compute per capita and total medical spending attributable to overweight (body mass index [BMI] = 25.0–29.9) and obesity (BMI ≥ 30). This approach allows us to assess the impact of overweight and obesity on select payers, including individuals, private insurers, Medicare, and Medicaid.

Data And Methods

■ **Data.** The 1998 Medical Expenditure Panel Survey (MEPS) and the 1996 and 1997 National Health Interview Surveys (NHIS) are the primary data sets used to develop spending estimates. MEPS is a nationally representative survey of the civilian noninstitutionalized population that quantifies people's total annual medical spending (including insurance spending) and annual out-of-pocket spending. The latter includes copayments and deductibles, payments for noncovered services (such as prescription drugs for Medicare beneficiaries), and payments made by those without insurance. The data also include information about each person's health insurance status and sociodemographic characteristics (such as race/ethnicity, sex, and education).

The MEPS sampling frame is drawn from the 1996 and 1997 NHIS. Although MEPS does not capture height and weight (the determinants of BMI), these self-reported variables are available for a subset of adult NHIS participants and can be merged with the MEPS data. We exclude from the MEPS/NHIS population pregnant women and those who have nontraditional types of health insurance (such as veterans' coverage or workers' compensation). Our final analysis sample includes 9,867 adults (age nineteen and older) with weighting variables that allow for generating nationally representative estimates.

■ **Methods.** We use a four-equation regression approach to predict annual overweight- and obesity-attributable medical spending. This approach was pioneered by authors of the RAND Health Insurance Experiment to assess the impact of cost sharing on annual medical spending and is now commonly applied to medical spending data.[5] The inclusion of variables depicting each person's BMI category (underweight, normal, overweight, or obese) into the regressions allows for predicting the impact that these variables have on annual medical spending.[6]

The regressions also include each person's insurance category (uninsured, privately insured, Medicaid, or Medicare) and BMI category/insurance category in-

teraction terms.[7] These variables allow for computing separate estimates of the increase in annual medical spending attributable to overweight and obesity for each insurance category.

All regressions control for sex, race/ethnicity (white, black, Hispanic, Asian, other), age, region (Northeast, Midwest, South, West), household income (less than 100 percent of poverty, 100–199 percent, 200–399 percent, 400 percent or more), education (less than college graduate, college graduate, master's or doctoral degree, other degree), and marital status (married, widowed, divorced/separated, single). The regressions were estimated using SUDAAN to control for the complex survey design used in MEPS.[8]

The regression results allow for assessing the impact of overweight and obesity on annual medical spending. The percentage of aggregate expenditures attributable to obesity in each insurance category is calculated by dividing aggregate predicted expenditures attributable to obesity (which is calculated as aggregate predicted expenditures for the obese group with the dichotomous obesity variable set to 1 minus aggregate predicted expenditures for the obese group with the dichotomous obesity variable set to 0) by total predicted expenditures for all people in the corresponding insurance category, and similarly for overweight. Standard errors for the aggregate and per capita estimates are computed via the bootstrap method described by Dana Goldman and colleagues.[9]

For a variety of reasons, including the lack of data on institutionalized populations, MEPS spending estimates are much lower than comparable estimates from the National Health Accounts (NHA), which are generally considered the gold standard for annual health spending data in the United States.[10] Therefore, we report overweight- and obesity-attributable spending estimates based on the 1998 NHA in addition to the MEPS estimates. To compute the NHA estimates, we multiply the percentage of total expenditures attributable to overweight and obesity estimated via MEPS by total expenditures for the corresponding insurance category reported in the 1998 NHA.[11]

Study Results

Exhibit 1 uses the MEPS/NHIS data to present nationally representative estimates of normal weight, overweight, and obesity prevalence among adults, stratified by insurance category. The combined prevalence of overweight and obesity averages 53.6 percent across all insurance categories and is largest for those enrolled in Medicare (56.1 percent). Medicaid has by far the highest prevalence of obesity: nearly ten percentage points higher than other insurance categories.

Based on the four-equation regression results (not reported), Exhibit 2 shows the average dollar and percentage increase in per capita annual medical spending attributed to overweight and obesity. The estimated increase associated with being overweight is 14.5 percent ($247) and ranges between 11.4 percent ($53) for out-of-pocket spending and 15.1 percent ($271) for Medicaid spending. Only the

EXHIBIT 1
Prevalence Of Normal Weight, Overweight, And Obesity Among U.S. Adults, By Insurance Status, 1996–1998

Insurance category	Normal	Overweight	Obese	Overweight and obese combined
Uninsured	47.0%	33.5%	17.1%	50.6%
Private	44.8	36.2	17.0	53.2
Medicaid	42.1	28.2	27.4	55.6
Medicare	41.5	37.3	18.8	56.1
Total	44.3	35.7	17.9	53.6

SOURCES: Authors' calculations based on data from the 1998 Medical Expenditure Panel Survey merged with the 1996 and 1997 National Health Interview Surveys.
NOTES: Normal, body mass index (BMI) 18.5–24.9; overweight, BMI 25–29.9; obese, BMI ≥ 30. Percent underweight (BMI < 18.5) is not reported.

out-of-pocket estimate, which includes payments by the uninsured and non-covered payments by those in the other insurance categories, however, is statistically significant ($p < .05$).

The average increase in annual medical spending associated with obesity is 37.4 percent ($732) and ranges from 26.1 percent ($125) for out-of-pocket to 36.8 percent ($1,486) for Medicare and 39.1 percent ($864) for Medicaid. Estimates for all payers are statistically significant ($p < .05$). However, because of the relatively large standard errors generated from the bootstrap algorithm, we cannot reject the hypothesis that the percentage increase in spending is identical across payers.

Exhibit 3 combines the prevalence rates in Exhibit 1 with the per capita spending estimates from Exhibit 2 to show the percentage of each payer's medical expenses that are attributable to overweight and obesity. For the U.S. adult popula-

EXHIBIT 2
Increase In Adult Per Capita Medical Spending Attributable To Overweight And Obesity, By Insurance Status, 1996–1998

	Overweight		Obesity	
Insurance category	Spending increase	Percent increase	Spending increase	Percent increase
Out-of-pocket	$ 53[a] (24)	11.4%[a] (5.1)	$ 125[a] (33)	26.1%[a] (7.1)
Private	143 (112)	13.8 (10.7)	423[a] (167)	37.7[a] (15.0)
Medicaid	271 (316)	15.1 (17.1)	864[a] (374)	39.1[a] (18.6)
Medicare	533 (526)	15.0 (17.8)	1,486[a] (730)	36.8[a] (19.6)
Total	247 (200)	14.5 (12.9)	732[a] (345)	37.4[a] (17.4)

SOURCES: Authors' calculations based on data from the 1998 Medical Expenditure Panel Survey merged with the 1996 and 1997 National Health Interview Surveys.
NOTES: Bootstrapped standard errors are shown in parentheses. Overweight, body mass index (BMI) 25–29.9; obese, BMI ≥ 30.
[a] Increased spending estimate is significantly greater than zero ($p < .05$).

EXHIBIT 3
Percentage Of Total Aggregate Medical Spending Attributable To Overweight And Obesity, By Insurance Status, 1996–1998

Insurance category	Overweight	Obesity	Overweight and obesity combined
Out-of-pocket	3.3%[a] (1.8)	3.9%[a] (1.9)	7.3%[a] (3.0)
Private	3.4 (2.7)	4.7[a] (1.9)	8.2[a] (3.6)
Medicaid	2.2 (2.5)	6.7[a] (2.9)	8.8[a] (4.2)
Medicare	4.6 (4.5)	6.5[a] (3.4)	11.1[a] (4.9)
Total	3.7 (3.0)	5.3[a] (2.6)	9.1[a] (4.6)

SOURCES: Authors' calculations based on data from the 1998 Medical Expenditure Panel Survey merged with the 1996 and 1997 National Health Interview Surveys.
NOTES: Bootstrapped standard errors are shown in parentheses. Overweight, body mass index (BMI) 25–29.9; obese, BMI ≥ 30.
[a] Increased spending estimate is significantly greater than zero ($p < .05$).

tion as a whole, 3.7 percent of medical expenditures are attributable to overweight. The payer-specific estimates range from 2.2 percent for Medicaid to 4.6 percent for Medicare. Only the out-of-pocket estimate, however, is statistically greater than zero.

For the U.S. adult population as a whole, 5.3 percent of medical spending is attributable to obesity. The payer-specific estimates range from 3.9 percent for out-of-pocket to 6.7 percent for Medicaid. All of the obesity-attributable spending increases are statistically significant ($p < .05$); however, similar to the per capita estimates, we cannot reject the hypothesis that the obesity-attributable spending increase is identical across all payers.

Exhibit 4 combines the percentages in Exhibit 3 with the MEPS and NHA estimates of total annual expenditures to compute aggregate adult medical expenditures attributable to overweight and obesity for each payer. Combined, annual overweight- and obesity-attributable medical spending is estimated to be $51.5

EXHIBIT 4
Aggregate Medical Spending, In Billions Of Dollars, Attributable To Overweight and Obesity, By Insurance Status And Data Source, 1996–1998

Insurance category	Overweight and obesity		Obesity	
	MEPS (1998)	NHA (1998)	MEPS (1998)	NHA (1998)
Out-of-pocket	$ 7.1	$12.8	$ 3.8	$ 6.9
Private	19.8	28.1	9.5	16.1
Medicaid	3.7	14.1	2.7	10.7
Medicare	20.9	23.5	10.8	13.8
Total	51.5	78.5	26.8	47.5

SOURCES: Authors' calculations based on data from the 1998 Medical Expenditure Panel Survey merged with the 1996 and 1997 National Health Interview Surveys, and health care expenditures data from National Health Accounts (NHA).
NOTE: MEPS estimates do not include spending for institutionalized populations, including nursing home residents.

"Obese people who survive to age sixty-five have much larger annual Medicare expenditures than those of normal weight."

billion using MEPS data and $78.5 billion using NHA data. Focusing solely on obesity, the numbers are reduced to $26.8 billion and $47.5 billion, respectively. Much of the difference between the MEPS and NHA estimates results from inclusion of nursing home expenditures in the NHA estimates.[12] This has the largest effect on Medicaid, the source of the majority of nursing home spending for these payers. Both the MEPS and NHA estimates reveal that the public sector is responsible for financing nearly half of overweight- and obesity-attributable medical spending.

Discussion

The spending estimates we report here are markedly similar to those of the other studies we cited at the outset. Sturm's estimate of a 36 percent increase in average annual medical spending attributable to obesity is similar to our 37 percent estimate.[13] Wolf and Colditz's estimate that aggregate obesity-attributable medical expenditures account for 5.7 percent of U.S. national health expenditures is within half a percentage point of our estimate of 5.3 percent.[14]

Although the payer-specific estimates have large standard errors, precluding firm conclusions regarding the relative magnitude of obesity-attributable spending across payers, the fact that our aggregate results match the published studies so closely lends them additional credibility. They suggest that the per capita increase in obesity-attributable spending is greatest for Medicare recipients, presumably because the elderly obese are more likely to undergo costly obesity-related services than the nonelderly obese are. Following Medicare, Medicaid has the next highest per capita spending estimate attributable to obesity. Medicaid recipients may be more likely than the privately insured are to engage in behavior that complicates obesity treatment, including smoking cigarettes and overconsuming alcohol.[15] Medicare and Medicaid also have generous insurance coverage, encouraging people to seek more treatment for all services, including those associated with obesity.

According to our NHA estimate of $78.5 billion ($92.6 billion in 2002 dollars), annual medical spending attributable to overweight and obesity (9.1 percent) now rivals that attributable to smoking, which ranges between 6.5 percent and 14.4 percent, depending on the source.[16] Therefore, as with smoking, there is a clear motivation for payers to consider strategies aimed at reducing the prevalence of these conditions. Many health insurers (including Medicaid) include smoking cessation treatment as a covered benefit, and some private insurers (most notably life insurers and those in the individual market) charge smokers much higher rates. Although some insurers subsidize memberships to health clubs to promote

physical activity, most do not include incentives to encourage weight loss.

It has been argued that because smokers have a decreased life expectancy, the benefits imposed on government by smokers—namely, lower Social Security payments to smokers and fewer years with Medicare eligibility—may exceed the costs.[17] Regardless, government has been heavily involved in reducing smoking rates through taxation and regulation yet has done little to deter weight gain.

Although beyond the scope of this analysis, an accounting of the lifetime net costs (costs minus benefits) of overweight and obesity imposed on government is likely to show that these costs are much larger than the lifetime costs imposed by smokers. Prior work suggests that lifetime external costs (those imposed on collectively financed programs) for physical inactivity, a risk factor for obesity, were almost double those for smoking.[18] Our results show that obese people who survive to age sixty-five have much larger annual Medicare expenditures than those of normal weight, and June Stevens and colleagues show that the elderly obese have only a marginally shorter life expectancy.[19] Therefore, unlike for smokers, there are few "benefits" to Medicare and Social Security associated with obesity among the elderly.

Our analysis has several limitations. The NHIS relies on self-reported height and weight, and overweight and obese people tend to underreport their weight.[20] As a result, overweight and obesity prevalence and corresponding expenditures may be underreported. Additionally, the cross-sectional design of MEPS and NHIS precludes analyzing the effects of the duration of obesity on annual spending. Because the NHIS did not collect height and weight data for children, we are unable to quantify obesity-attributable medical spending for children. Although obesity among children has also increased, obesity-attributable medical expenditures for children are presumably only a small fraction of the total because of the chronic nature of many obesity-related diseases.[21]

Unless programs aimed at reducing the rise in obesity rates are successfully implemented, overweight- and obesity-attributable spending will continue to increase and government will continue to finance a sizable portion of the total. Moreover, given that such spending now rivals spending attributable to smoking, it may be increasingly difficult to justify the disparity between the many interventions that have been implemented to reduce smoking rates and the paucity of interventions aimed at reducing obesity rates.

Funding and support for this study were provided by the U.S. Centers for Disease Control and Prevention under Contract no. 200-97-0621.

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6. The National Institutes of Health weight classification system relies on body mass index (BMI) (BMI = weight in kilograms divided by height in squared meters) and uses the following cutoff points: underweight, BMI < 18.5; normal, BMI 18.5–24.9; overweight, BMI 25–29.9; obese, BMI ≥ 30.
7. Individuals, and their corresponding insurance payments, are assigned to insurance categories based on the following algorithm: Those with any evidence of Medicare during the year are classified as "Medicare," those with any evidence of Medicaid and no evidence of Medicare are classified as "Medicaid," and those with any evidence of private insurance and no evidence of Medicare or Medicaid are classified as "private insurance." The remainder are classified as uninsured for the entire year; all expenditures for these individuals are defined as being out of pocket.
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