Approved: January 30, 2004
Date

MINUTES OF THE SENATE PUBLIC HEALTH AND WELFARE COMMITTEE

The meeting was called to order by Chairperson Susan Wagle at 1:30 p.m. on January 22, 2004 in Room 231-N of the Capitol.

All members were present except:
Senator Pete Brungardt- excused

Committee staff present:
Ms. Emalene Correll, Legislative Research
Mr. Norm Furse, Revisor of Statutes
Mrs. Diana Lee, Revisor of Statutes
Ms. Margaret Cianciarulo, Committee Secretary

Conferees appearing before the committee:
Ms. Linda Kenney, Director, Bureau for Children, Youth, and Families
Ms. Chris Clarke, Principal Auditor

Others attending:
Please See Attached List.

Handout

Upon calling the meeting to order, Chairperson Wagle asked the Committee to look at the first handout for their reading regarding "State Level Estimates of Annual Medical Expenditures Attributable to Obesity" from the Department of Health and Human Services and signed by Dr. Dietz. She stated that this handout is the information requested during the joint committee meeting of the Senate Public Health and Welfare Committee and the House Health and Human Services Committee held on January 20, 2004. A copy of Dr. Dietz's letter and three enclosures are (Attachment 1) attached hereto and incorporated into the Minutes by reference.

Introduction of Bills

Chairperson Wagle then announced that Ms. Linda Kenney, Director of the Bureau for Children, Youth, and Families, who asked that the Committee introduce legislation regarding an act amending two Kansas statutes concerning the reorganized reporting of cancer cases to the cancer registry for the state of Kansas by health care providers. A motion was made by Senator Barnett to introduce the legislation, Senator Brownlee seconded and the motion carried.

Post Audit Overview - Low-Birthweight and Premature Babies Reviewing Programs Aimed at Reducing Their Incidence and Associated Costs

As there were no more bill requests, the Chair announced that Ms. Chris Clarke, Principal Auditor would be presenting a post audit overview regarding low-birthweight and premature babies, particularly, reviewing programs aimed at reducing their incidence and associated costs. Highlights of her overview is as follows:

1) The audit answers four questions:

a) Does it appear that a lack of prenatal care is the major factor contributing to the high Medicaid costs associated with low-birthweight or premature babies in Kansas?

b) What programs are available to provide prenatal care for mothers who cannot otherwise afford it, and what is the cost of those programs?

c) Why are some low-income women not getting prenatal care services?

d) Is the Department of Health and Environment collecting and reviewing the types of information necessary to know whether prenatal care programs in Kansas are effective in bringing down the incidence and cost of premature and low-birthweight babies?

2) Explained the process of their audit (ex. Assembling an inventory, reviewing data in the SRS MISS program, using birth and vital statistics compiled and maintained by KDHE.)

3) Provided an overview of the incidence and cost of low-birthweight and premature babies in Kansas, which accounted for more than one-third of the first-year payment for all Medicaid babies. The audit also provided numerous charts. (Ex. Average hospital costs and the number of hospital days for the first year of life, the total and hospital only Medicaid payments for Medicaid babies born in 2002, at-a-glance charts of the Department of Health and Environment - Bureau for Children, Youth, and Families and the Kansas Medicaid Program, and programs that provide prenatal care services to low-income women, 2002.)

4) Conclusions included: low-birthweight and premature babies cost the State's Medicaid program more that 5 times as much as normal-birthweight babies during their first year of life, and many of these children will have long-term health problems that will place continuing demands on the medical and education systems; and, most of the spending in Kansas for prenatal care comes from Medicaid and the Women, Infants, and Children (WIC) nutrition program with relatively little spent on wraparound-type services.

5) Lastly, Ms. Clarke provided a list of recommendations. (Ex. To ensure that as many women as possible know about available prenatal care programs, KDHE should increase it educational marketing campaigns and should encourage local health departments to increase their efforts as well.

A copy of this post audit has been filed in Senator Susan Wagle's office.

The Chair then asked the Committee for questions and comments. Senators Salmans, Haley, Brownlee, and Ms. Correll asked a range of questions from comparing money spent for low-birthweight and premature babies as opposed to drug and alcoholic-dependent babies, are breakdowns available on money spent on babies who survived and those who did not, looking at the genetics of other family members as opposed to just the mother and have they been charted, percentage of those served by WIC and Medicaid, vital statistics act, is the data simply all low-birthweight babies, are you linking data, to why no testing on smoking cessation (Senator Brownlee, in regards to the smoking, asked if any of the tobacco funding could be used?)

Adjournment

As there was no further discussion and with no further business, the meeting was adjourned. The time was 2:30 p.m.

The next meeting is scheduled for January 27, 2004.

23 attach

SENATE PUBLIC HEALTH AND WELFARE COMMITTEE

GUEST LIST

DATE: January 22, 2004

NAME	REPRESENTING
CHARLES HUNT	KS DEPT. OF HEALTH & ENV.
Linda Kenney	KDHE
Chris Clarke	Post Audit
J. Tj Shelley	Post Audit
Mary Ellen Conlee	Via Christi Health System
Carolyn Middendorf	Ks St'D's Assn
GREG CRAWFORD	KDHE
Norm Hess	March of Dimes
Megan Dunn	Heim Law Firm
Jim Byrnes	Sen. Salmans
Chip Wheelen	Assn of Osteopathic Medicine
Bobbie Graff-Hendrixson	SRS
Mike Hutfles	Ks. Governmental Health
Michael L. White	Kearney & Associates

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control
and Prevention (CDC)
Atlanta GA 30341-3724

January 15, 2004

Re: "State-Level Estimates of Annual Medical Expenditures Attributable to Obesity"

Dear Colleague:

Thank you for participating in the Division of Nutrition and Physical Activity (DNPA) teleconference last week. As you heard, the article titled "State-Level Estimates of Annual Medical Expenditures Attributable to Obesity" by Eric A. Finkelstein and Ian C. Fiebelkorn, RTI International, and Guijing Wang, Centers for Disease Control and Prevention (CDC) is scheduled for publication in the journal *Obesity Research* on **January 23, 2004.** We are very excited to get this important information disseminated.

Enclosed please find the following: 1) the full article to be published, 2) a sample press release, and 3) questions and answers. Please refrain from forwarding these documents as to not risk breaking the embargo. The embargo expiration has been updated to **1 p.m. Eastern on January 21, 2004**. We anticipate that the national press release will be issued on Tuesday, January 20. We will send this press release to you electronically as soon as it becomes available.

In addition, we've included a copy of the article "National Medical Spending Attributable to Overweight and Obesity: How Much, and Who's Paying?" that was published in health Affairs this past year. It can also be found online at:
http://content.healthaffairs.org/cgi/reprint/hlthaff.w3.219v1.pdf

All questions regarding the article should be forwarded to Eric Finkelstein, RTI, at finkelse@rti.org. Correspondence regarding press activities should be sent to Tim Hensley, CDC/DNPA Press Representative, at 770-488-5820 or TKH2@cdc.gov.

Sincerely,

William Dietz, MD, Ph.D.
Director
Division of Nutrition and Physical Activity
National Center for Chronic Disease
Prevention and Health Promotion

Enclosures (4)

Senate Public Health & Welfare Committee
Attachment 1
Date: January 22, 2004

tapraid1/z78-oby/z78-oby/z7800104/z780908d04a | yodert | S=7 | 12/9/03 | 10:43 | Art: 03-166 | Input-dlw

Embargoed for Release Until 1:00 P.M. (EST) January 21, 2004

State-Level Estimates of Annual Medical Expenditures Attributable to Obesity*

Eric A. Finkelstein,† Ian C. Fiebelkorn,† and Guijing Wang‡

Abstract

FINKELSTEIN, ERIC A., IAN C. FIEBELKORN, AND GUIJING WANG. State-level estimates of annual medical expenditures attributable to obesity. *Obes Res.* 2004;12:?–?.

Objective: To provide state-level estimates of total, Medicare, and Medicaid obesity-attributable medical expenditures.

Research Methods and Procedures: We developed an econometric model that predicts medical expenditures. We used this model and state-representative data to quantify obesity-attributable medical expenditures.

Results: Annual U.S. obesity-attributable medical expenditures are estimated at $75 billion in 2003 dollars, and approximately one-half of these expenditures are financed by Medicare and Medicaid. State-level estimates range from $87 million (Wyoming) to $7.7 billion (California). Obesity-attributable Medicare estimates range from $15 million (Wyoming) to $1.7 billion (California), and Medicaid estimates range from $23 million (Wyoming) to $3.5 billion (New York).

Discussion: These estimates of obesity-attributable medical expenditures present the best available information concerning the economic impact of obesity at the state level. Policy makers should consider these estimates, along with other factors, in determining how best to allocate scarce public health resources. However, because they are associated with large SE, these estimates should not be used to make comparisons across states or between payers within states.

Key words: cost, Medicaid, Medicare, state, BMI

Introduction

Results from the 1999 to 2000 National Health and Nutrition Examination Survey indicate that an estimated 64% of U.S. adults are either overweight or obese (1).[1] This is alarming, given that obesity has been shown to promote many chronic diseases, including type 2 diabetes, cardiovascular disease (2,3), several types of cancer (endometrial, postmenopausal breast, kidney, and colon cancer) (4), musculoskeletal disorders, sleep apnea, and gallbladder disease (2,3). Fn1

Recent studies have documented the impact that obesity has on annual medical expenditures among adults. Sturm (5) found that obese adults (18 to 65 years of age) have 36% higher average annual medical expenditures compared with those of normal weight. Finkelstein et al. (6) found that aggregate obesity-attributable medical expenditures account for 5.3% of adult medical expenditures in the United States and that roughly 50% of these expenditures are financed by Medicare and Medicaid. To date, however, no estimates are available that document obesity-attributable medical expenditures at the state level, including the amount of state Medicare and Medicaid expenditures attributable to obesity. This analysis fills that gap. These estimates will assist state policy makers in determining how best to allocate scarce public health resources and provide information concerning the economic impact of obesity on states.

Because no single data set exists that allows for directly quantifying state-level expenditures attributable to obesity (BMI $\geq$ 30 kg/m^2), we first used nationally representative data to develop a model that predicts obesity-attributable medical expenditures. We then used this model and state-representative data to quantify total obesity-attributable medical expenditures for each state and Medicare and Medicaid obesity-attributable expenditures within each state. This approach has been successfully applied to estimate state-level expenditures for smokers (7–9).

Received for review May 13, 2003.
Accepted in final form November 12, 2003.
*The online version of this article (available at http://www.obesityresearch.org) contains supplemental tables.
†RTI International, Research Triangle Park, North Carolina and ‡Centers for Disease Control and Prevention, Atlanta, Georgia.
Address correspondence to Eric A. Finkelstein, RTI International, 3040 Cornwallis Road, P.O. Box 12194, Research Triangle Park, NC 27709.
E-mail: finkelse@rti.org

AQ: 1

[1] The National Institutes of Health weight classification system relies on BMI (BMI = weight in kilograms divided by height in squared meters) and uses the following cut-off points: underweight, BMI < 18.5 kg/m^2; normal, BMI = 18.5 to 24.9 kg/m^2; overweight, BMI = 25.0 to 29.9 kg/m^2; obese, BMI > 30.0 kg/m^2.

1-2

Research Methods and Procedures

Data

We used the 1998 Medical Expenditure Panel Survey (MEPS)[2] linked to the 1996 and 1997 National Health Interview Surveys (NHISs) to develop a national model for predicting obesity-attributable medical expenditures. MEPS is a nationally representative survey of the civilian non-institutionalized population that quantifies total annual medical expenditures for each individual and the percentage of expenditures financed by third-party payers. The data also include information about each individual's health insurance status and sociodemographic characteristics (e.g., race/ethnicity, gender, education).

The MEPS sampling frame was drawn from the 1996 and 1997 NHISs. 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 MEPS data. We excluded from the MEPS/NHIS population those with missing height and weight data (which included all individuals less than age 18 at the time of the NHIS interview) and pregnant women. Our final population included 10,128 adults, with weighting variables that allowed for generating nationally representative estimates of the adult civilian non-institutionalized population.

The Behavioral Risk Factor Surveillance System (BRFSS) is a state representative telephone survey of the adult non-institutionalized population that tracks health risks in the United States. To increase the precision of our predictions, we pooled 3 years of BRFSS data (1998 to 2000). Although BRFSS does not directly capture annual expenditures, it includes information about each individual's height and weight, health insurance status, and sociodemographic characteristics (e.g., race/ethnicity, gender, education). This information was input into our national model to compute expenditures at the state level.

Analogous to our MEPS restrictions, we excluded from the BRFSS population those with missing height and weight data (n = 12,195) and pregnant women (n = 5032). We also excluded those with missing sociodemographic variables (n = 68,931) necessary to predict annual expenditures based on the MEPS model. Our final BRFSS population included 398,446 adults, with weighting variables that allowed for generating state-representative estimates. Appendix Table A1 (available at *Obesity Research Online*: http://www.obesityresearch.org) presents descriptive statistics for the MEPS/NHIS and BRFSS populations.

[2] Nonstandard abbreviations: MEPS, Medical Expenditure Panel Survey; NHIS, National Health Interview Survey; BRFSS, Behavioral Risk Factor Surveillance System.

Methods

Estimating state-specific obesity-attributable medical expenditures involved three steps. First, we used the MEPS/NHIS data, which included information on obesity and expenditures, to create a model that predicts annual expenditures as a function of obesity status, insurance status, and sociodemographic characteristics. Second, we used BRFSS and results from the MEPS/NHIS analysis to estimate the fraction of each state's expenditures attributable to obesity and the fraction of each state's Medicare and Medicaid expenditures attributable to obesity. Third, we multiplied these fractions by state-specific medical expenditure estimates to compute obesity-attributable medical expenditures for each state (and for Medicare and Medicaid within each state).

MEPS/NHIS National Model

We used two independent four-part regression models to predict 1) total annual obesity-attributable medical expenditures among adults (i.e., medical expenditures for adults with BMI $\geq$ 30 kg/m^2), and 2) annual obesity-attributable medical expenditures financed by Medicare and Medicaid. The four-part regression approach was pioneered by authors of the RAND Health Insurance Experiment to assess the impact of cost sharing on annual medical expenditures and is now commonly applied to medical expenditure data (10,11). The inclusion of dummy variables indicating each individual's BMI category (underweight, overweight, and obese with normal weight as the omitted reference category) allowed us to predict the impact that obesity had on annual medical expenditures. A detailed Methods appendix is available from the authors on request.

The primary difference between specifications 1) (total expenditures) and 2) (insurance expenditures) is that the dependent variable in specification 2) is limited to expenditures paid by an insurer (Medicare, Medicaid, other public, private)[3]; therefore, these regressions do not include the uninsured. In actuality, some of the expenditures for Medicare recipients are financed by supplemental insurers. However, this will not bias our estimates for Medicare unless the fraction of expenditures among Medicare recipients that are attributable to obesity varies between Medicare-funded services and services funded by other insurers.

All regressions included the same set of independent variables and were limited to variables contained in both the MEPS/NHIS and BRFSS data. Besides BMI category variables, these included dummy variables for insurance cate-

[3] Individuals and their corresponding insurance payments were assigned to insurance categories based on the following algorithm: those with any evidence of Medicare during the year were classified as "Medicare," those with any evidence of Medicaid and no evidence of Medicare were classified as "Medicaid," those with evidence of another source of public insurance (e.g., VA, CHAMPUS, Indian Health Service) and no evidence of either Medicare or Medicaid were classified as "Other Public," and those with any evidence of private insurance and no evidence of public insurance were classified as "Private Insurance." The remainder were classified as "Uninsured."

gory (Medicaid, Medicare, and other public insurance with private insurance as the omitted reference category). Specification 2) also included BMI category × insurance category interaction terms, which allowed us to compute separate estimates of obesity-attributable medical expenditures for Medicaid and Medicare. Other independent variables included gender (male, female), race/ethnicity (white, black, Hispanic, Asian, other), age, region (Northeast, Midwest, South, West), household income (<100% of poverty, 100% to 199%, 200% to 399%, ≥400%), education (less than college graduate, college graduate, masters or doctoral, other degree), and marital status (married, widowed, divorced/separated, single). Regressions were estimated using SUDAAN (12) to control for the complex survey design used in MEPS. Appendix Table A2, a and b (available at *Obesity Research Online*: http://www.obesityresearch.org), presents regression results for both specifications.

BRFSS State-Level Estimates

Using the regression output from specification 1), we predicted total annual medical expenditures for each individual contained in BRFSS. This was accomplished by multiplying each individual's characteristics (the independent variables) by their respective coefficients generated from the four regressions and combining the results as described in Manning et al. (11). Using the BRFSS weighting variables and each individual's predicted medical expenditures, we computed total predicted medical expenditures for each state. We then limited the sample to each state's obese population to predict total obesity-attributable medical expenditures within each state. These were calculated as the difference between predicted expenditures for the obese population with the obesity dummy variable set to 1 and predicted expenditures for the obese population with the obesity dummy variable set to 0, leaving all other variables unchanged. Because normal weight was the reference category, the second term predicted total expenditures for the obese population had they been of normal weight. This allowed us to isolate the effect of obesity while maintaining any other inherent characteristics that may contribute to higher annual medical expenditures.

Within each state, the percentage of aggregate medical expenditures attributable to obesity was calculated by dividing aggregate predicted expenditures attributable to obesity by total predicted expenditures for the entire state. An analogous approach used specification 2) to determine the fraction of state-specific medical expenditures attributable to obesity for Medicare and Medicaid recipients. Because BRFSS is limited to adults, the results should be interpreted as the fraction of adult medical expenditures that are attributable to obesity among adults in each state (and for Medicare and Medicaid within each state).

Estimating Total and Public Sector Expenditures

To quantify annual adult obesity-attributable medical expenditures for each state (and Medicare and Medicaid expenditures within each state), we multiplied the corresponding fractions by published estimates of 1998 state-specific expenditures (13). We used 1998 because it is the most recent year that annual state-level medical expenditures are available for the total, Medicare, and Medicaid populations. We then inflated these estimates to 2003 using national adjustment factors for total, Medicare, and Medicaid expenditures (1.41, 1.24, and 1.61, respectively). Adjustment factors were calculated as the ratio of 2003 projected annual medical expenditures to 1998 annual medical expenditures, both reported by the Centers for Medicare and Medicaid Services Office of the Actuary.

The 1998 state-specific expenditure estimates included medical expenditures for adults and children, and because of data limitations, our fractions are for adults only. Therefore, before applying these fractions, it was necessary to reduce the expenditure estimates by the percentage of expenditures dedicated to youth (those less than age 18). For total state medical expenditures, these fractions were generated from MEPS. However, because MEPS only allows for regional stratification, we applied census region-specific fractions rather than state-specific fractions. These fractions are detailed in Appendix Table A3 (available at *Obesity Research Online*: http://www.obesityresearch.org).

The fraction of each state's Medicaid expenditures attributable to adults was calculated based on age-specific expenditure data available from the 1999 Medicaid Statistical Information System (14), which was the first year this information was available for all states. We assumed that the fractions did not change between 1998 and 1999. All Medicare expenditures were assumed to be for adults. Appendix Table A4 (available at *Obesity Research Online*: http://www.obesityresearch.org) presents estimates of total, Medicare, and Medicaid expenditures for adults in 2003.

Results

Based on 1998 to 2000 BRFSS self-reported data, obesity prevalence is estimated at 20% for the total U.S. adult population, 21% for Medicare recipients, and 30% for Medicaid recipients. Overall, obesity prevalence varies considerably by state, ranging from 15% in Colorado to 25% in West Virginia. Obesity prevalence ranges from 12% (Hawaii) to 30% (Washington DC) for Medicare recipients and from 21% (Rhode Island) to 44% (Indiana) for Medicaid recipients. Appendix Table A5 (available at *Obesity Research Online*: http://www.obesityresearch.org) shows state-specific obesity prevalence for the total, Medicare, and Medicaid populations.

Table 1 shows the estimated percentage of total, Medicare, and Medicaid adult medical expenses that are attributable to obesity. For the United States as a whole, ~6% of T1

Table 1. Estimated adult obesity-attributable percentages and medical expenditures by state (BRFSS 1998 to 2000)

	Total population		Medicare population		Medicaid population	
State	(%)	(Millions $)	(%)	(Millions $)	(%)	(Millions $)
Alabama	6.3	$1320	7.7	$341	9.9	$269
Alaska	6.7	$195	7.7	$17	8.2	$29
Arizona	4.0	$752	3.9	$154	13.5*	$242
Arkansas	6.0	$663	7.0	$171	11.5	$180
California	5.5	$7675	6.1	$1738	10.0	$1713
Colorado	5.1	$874	5.1	$139	8.7	$158
Connecticut	4.3	$856	6.5	$246	11.0	$419
Delaware	5.1	$207	9.8	$57	13.8	$66
District of Columbia	6.7	$372	6.5	$64	12.5	$114
Florida	5.1	$3987	6.1	$1290	11.6	$900
Georgia	6.0	$2133	7.1	$405	10.1	$385
Hawaii	4.9	$290	4.8	$30	11.2	$90
Idaho	5.3	$227	5.6	$40	12.0	$69
Illinois	6.1	$3439	7.8	$805	12.3	$1045
Indiana	6.0	$1637	7.2	$379	15.7	$522
Iowa	6.0	$783	7.5	$165	9.4	$198
Kansas	5.5	$657	6.4	$138	10.2*	$143
Kentucky	6.2	$1163	7.5	$270	11.4	$340
Louisiana	6.4	$1373	7.4	$402	12.9	$525
Maine	5.6	$357	5.7	$66	10.7	$137
Maryland	6.0	$1533	7.7	$368	12.9	$391
Massachusetts	4.7	$1822	5.6	$446	7.8	$618
Michigan	6.5	$2931	7.8	$748	13.2	$882
Minnesota	5.0	$1307	6.6	$227	8.6	$325
Mississippi	6.5	$757	8.1	$223	11.6	$221
Missouri	6.1	$1636	7.1	$413	11.9	$454
Montana	4.9	$175	6.2	$41	9.8	$48
Nebraska	5.8	$454	7.0	$94	10.3	$114
Nevada	4.8	$337	5.0	$74	10.1*	$56
New Hampshire	5.0	$302	5.4	$46	8.6*	$79
New Jersey	5.5	$2342	7.1	$591	9.8	$630
New Mexico	4.8	$324	4.6	$51	8.5	$84
New York	5.5	$6080	6.7	$1391	9.5	$3539
North Carolina	6.0	$2138	7.0	$448	11.5	$662
North Dakota	6.1	$209	7.7	$45	11.7	$55
Oklahoma	6.0	$854	7.0	$227	9.9	$163
Ohio	6.1	$3304	7.7	$839	10.3	$914
Oregon	5.7	$781	6.0	$145	8.8	$180
Pennsylvania	6.2	$4138	7.4	$1187	11.6	$1219
Puerto Rico	7.4		8.1		10.1	
Rhode Island	5.2	$305	6.5	$83	7.7	$89
South Carolina	6.2	$1060	7.7	$242	10.6	$285
South Dakota	5.3	$195	5.9	$36	9.9	$45
Tennessee	6.4	$1840	7.6	$433	10.5	$488

1-5

Table 1. *(Continued)*

State	Total population		Medicare population		Medicaid population	
	(%)	(Millions $)	(%)	(Millions $)	(%)	(Millions $)
Texas	6.1	$5340	6.8	$1209	11.8	$1177
Utah	5.2	$393	5.8	$62	9.0	$71
Vermont	5.3	$141	6.9	$29	8.6	$40
Virginia	5.7	$1641	6.7	$320	13.1	$374
Washington	5.4	$1330	6.0	$236	9.9	$365
West Virginia	6.4	$588	7.3	$140	11.4	$187
Wisconsin	5.8	$1486	7.7	$306	9.1	$320
Wyoming	4.9	$87	5.9	$15	8.5	$23
Total	5.7	$75,051	6.8	$17,701	10.6	$21,329

* Estimates based on fewer than 20 observations.

total adult expenditures, 7% of Medicare expenditures, and 11% of adult Medicaid expenditures are attributable to obesity. At the state level, percentages range from 4% (Connecticut) to 7% (Alaska; Washington DC). Medicare percentages range from 4% (Arizona) to 10% (Delaware), and Medicaid expenditures range from 8% (Rhode Island) to 16% (Indiana). The higher percentages for Medicaid are largely driven by the higher prevalence of obesity among Medicaid recipients.

F1 Figure 1 and Table 1 combine the percentages reported above with estimates of adult medical expenditures to produce state-specific (and Medicare and Medicaid within state-specific) estimates of obesity-attributable medical expenditures among adults in 2003. For the United States as a whole, obesity-attributable medical expenditures are estimated at $75 billion, with $17 billion financed by Medicare and $21 billion financed by Medicaid. State-level estimates range from $87 million (Wyoming) to $7.7 billion (California). Obesity-attributable Medicare estimates range from $15 million (Wyoming) to $1.7 billion (California), and obesity-attributable Medicaid expenditures range from $23 million (Wyoming) to $3.5 billion (New York).

Discussion

Our results show that obesity imposes a substantial drain on health care resources across states, averaging ~6% of adult medical expenditures, and that roughly one-half of these expenditures are financed by Medicare and Medicaid. Obesity prevalence among Medicare recipients and the percentage of Medicare expenditures attributable to obesity are nearly identical to that for the privately insured population. However, as a percentage of the total, Medicaid enrolls a more obese population and incurs greater obesity-attributable costs. Self-reported obesity prevalence among adult Medicaid recipients is roughly 50% higher than that for the general population, ranging from 8% higher in Wisconsin to 241% higher in Arizona. As a result, the percentage of U.S. adult Medicaid expenditures that are devoted to treating obesity-related medical conditions (11%) is nearly double the percentage for non-Medicaid medical expenditures. To put these results into perspective, if all obesity-attributable medical expenditures were financed through taxes levied at the national level, the tax would need to be set at approximately $350 per adult to fully recover the costs. This tax would be reduced by about one-half if limited to obesity-attributable expenditures financed by Medicare and Medicaid.

The dramatic increase in obesity prevalence over the past two decades is well documented. As a result of this increase in obesity prevalence, the cost of treating obesity-related diseases has also been increasing. In addition, methods for treating obesity, as opposed to obesity-related diseases, are becoming more widespread. It has been estimated that there were ~80,000 bariatric surgeries performed on obese patients in 2002, with an average cost of between $15,000 and $30,000 (http://portland.bizjournals.com/portland/stories/2003/08/25/story4.html). In the long run, it is possible that these treatments will reduce the burden of obesity. In the short run, however, obesity treatments have the potential to substantially increase obesity-attributable costs, suggesting that these costs are likely to continue to increase over the next several years.

This analysis estimates the financial burden of obesity on states. Whereas all sectors of the economy should be concerned about the medical and financial implications of obesity, the fact that government, and ultimately the tax payer, is responsible for financing roughly one-half of obesity-attributable medical expenditures should strengthen the

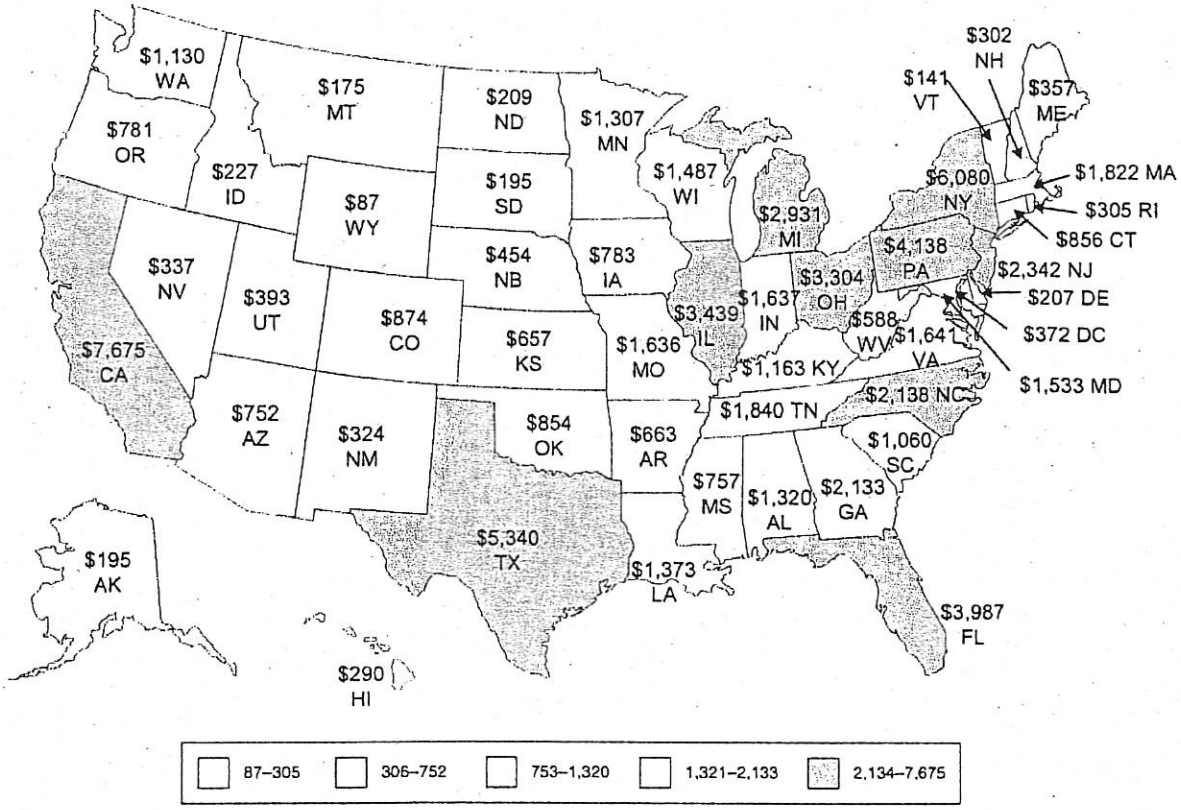

Figure 1: Estimated adult obesity-attributable medical expenditures (2003 dollars in millions).

COLOR

need for government interventions to reduce obesity rates. This is especially true among Medicaid beneficiaries, for whom obesity is the most prevalent. The estimates presented in this analysis will help state policy makers determine appropriate funding levels to reduce obesity rates and provide additional information concerning the economic burden of obesity on states. Although the relative burden of disease and the extent to which this burden falls on the public sector should not be the only factors that influence priority setting in health policy, these expenditure estimates should be considered, along with other factors, in determining the allocation of scarce public health resources.

Our analysis has several limitations. First, both BRFSS and MEPS rely on self-reported data. For the MEPS regression analysis, under-reporting of weight may bias the regression coefficients, although the direction of the bias is uncertain. Under-reporting of weight in BRFSS implies that obesity prevalence is under-reported; therefore, our expenditure estimates may be conservative (15).

Second, both BRFSS and MEPS are limited to the non-institutionalized population; however, the resulting obesity-attributable fractions are applied to expenditure estimates that include both institutionalized and non-institutionalized populations. If these fractions are different for the institutionalized population, our expenditure estimates would be biased. This would have the largest effect on Medicaid, which finances the majority of institutionalized expenditures, primarily for nursing home recipients.

Third, data limitations precluded us from quantifying obesity-attributable medical expenditures for children. Although obesity among children has increased (16), the chronic nature of many obesity-related diseases suggests that expenditures for children are only a small fraction of total obesity-attributable expenditures.

Fourth, our analysis is limited to medical expenditures, and therefore, does not address other costs (e.g., decreased productivity, absenteeism) resulting from obesity. Wolf and Colditz (17) estimate these costs at the national level and show them to be nearly as high as direct medical costs.

Finally, even after pooling 3 years of BRFSS data, the obese sample (and especially the obese Medicaid sample) is small in some states (most notably Arizona, Kansas, Nevada, and New Hampshire). Therefore, there is likely to be substantial variation around our state-level estimates. Because our focus was not to statistically test whether obesity-attributable expenditures were larger in some states than others, we did not calculate SEs at the state level. Finkelstein et al. (6) presented bootstrapped SEs for national

1-7

medical expenditures attributable to obesity at 49%, 52%, and 43% of the mean for the total, Medicare, and Medicaid populations, respectively. The state-level estimates, although unbiased, are likely to be associated with larger SEs, and therefore, should not be used to make comparisons across states or between payers within states.

Acknowledgments

This work was supported by Contract 200-97-0621 from the Centers for Disease Control and Prevention (CDC), Division of Nutrition and Physical Activity. The authors thank David Thompson, Innovus; Frank Sloan, Duke University; Graham Colditz, Harvard University; Roland Sturm, RAND; Anne Wolf, University of Virginia; Kyumin Shim, CDC; and Deb Galuska, CDC, for participating in the obesity cost workshop; and Susan Murchie for editorial support.

References

1. **Centers for Disease Control and Prevention, National Center for Health Statistics.** Prevalence of overweight and obesity among adults: United States, 1999–2000. Available online at http://www.cdc.gov/nchs/products/pubs/pubd/hestats/obese/obse99htm. Accessed October 24, 2002.
2. **Must A, Spadano J, Coakley EH, Field A, Colditz G, Dietz W.** The disease burden associated with overweight and obesity. *JAMA*. 1999;282:1523–9.
3. **Field A, Coakley E, Must A, et al.** Impact of overweight on the risk of developing common chronic diseases during a 10-year period. *Arch Intern Med*. 2001;161:1581–6.
4. **Visscher T, Seidell J.** The public health impact of obesity. *Ann Rev Public Health*. 2001;22:355–75.
5. **Sturm R.** The effects of obesity, smoking, and drinking on medical problems and costs. Obesity outranks both smoking and drinking in its deleterious effects on health and health costs. *Health Aff*. 2002;21:245–53.
6. **Finkelstein E, Fiebelkorn I, Wang G.** National medical expenditures attributable to overweight and obesity: how much and who's paying? *Health Aff*. 2003;W3:219–26.
7. **Miller L, Zhang X, Novotny T, Rice D, Max W.** State estimates of Medicaid expenditures attributable to cigarette smoking, fiscal year 1993. *Public Health Rep*. 1998;113:140–51.
8. **Miller L, Zhang X, Rice D, Max W.** State estimates of total medical expenditures attributable to cigarette smoking, 1993. *Public Health Rep*. 1998;113:447–58.
9. **Zhang X, Miller L, Max W, Rice D.** Cost of smoking to the Medicare program, 1993. *Health Care Financ Rev*. 1999;20:179–96.
10. **Manning W.** The logged dependent variable, heteroscedasticity, and the retransformation problem. *J Health Econ*. 1998;17:283–95.
11. **Manning W, Newhouse J, Duan N, Keeler E, Leibowitz A, Marquis M.** Health insurance and the demand for medical care: evidence from a randomized experiment. *Am Econ Rev*. 1987;77:251–77.
12. **Shah B, Barnwell B, Bieler G.** *SUDAAN User's Manual, Release 6.4*. Research Triangle Park, NC: Research Triangle Institute; 1995.
13. **Martin A, Whittle L, Levit K.** Trends in state health care expenditures and funding: 1980–1998. *Health Care Financ Rev*. 2001;22:111–40.
14. **Centers for Medicare and Medicaid Services (CMS).** MSIS statistical report for federal fiscal year 1999. Available online at http://www.cms.gov/medicaid/msis/msis99sr.asp. Accessed October 23, 2002.
15. **Flegal K, Carroll M, Ogden C, Johnson C.** Prevalence and trends in obesity among US adults, 1999–2000. *JAMA*. 2002;288:1723–7.
16. **Troiano RP, Flegal KM.** Overweight children and adolescents: description, epidemiology and demographics. *Pediatrics*. 1998;101:497–504.
17. **Wolf A, Colditz G.** Current estimates of the economic cost of obesity in the United States. *Obes Res*. 1998;6:97–106.

SAMPLE STATE PRESS RELEASE
EMBARGOED FOR RELEASE UNTIL 1:00 P.M. (EST) JANUARY 21, 2004

Researchers Estimate Medical Costs of Obesity in (INSERT STATE)

In a paper published today, researchers at RTI International and the Centers for Disease Control and Prevention (CDC) provide the first state-by-state estimates of obesity-attributable medical expenditures. The paper also provides rough estimates of the cost burden that falls on taxpayers in each state, through Medicaid and Medicare. Published in the journal *Obesity Research*, the paper estimates that national medical expenditures resulting from obesity (excluding overweight) are $75 billion in 2003 dollars. State-level estimates range from $87 million (Wyoming) to $7.7 billion (California).

The prevalence of obesity, based on–self reported data in **(INSERT STATE)** is approximately **(INSERT STATE OBESITY #)**. Obesity-related medical expenditures total in **(INSERT STATE $)**, with **(INSERT AMOUNT: i.e. half, etc.)** of this total being financed by Medicare and Medicaid. Obesity-related expenditures represents approximately **(INSERT STATE PERCENTAGE)** of **(INSERT STATE)** annual health care bill. However, because the prevalence of obesity in **(INSERT STATE PERCENTAGE)** is higher in the Medicaid population than in the state's general population, the percent of Medicaid expenditures attributable to obesity is **(INSERT STATE NUMBER: i.e. nearly twice as high)**. It is estimated to be **(INSERT STATE AMOUNT)** of state Medicaid expenditures, or **(INSERT STATE $)** in 2003.

(INSERT QUOTE FROM STATE OFFICIAL)

"These estimates of obesity-attributable medical expenditures present the newest available information concerning the economic impact of obesity at the state level," the authors noted. Policy makers should consider these estimates, along with other factors, in determining how best to allocate scarce public health resources."

The authors caution, however, that because the state-level estimates are associated with large standard errors, the estimates should not be used to make cost comparisons across states or between payers within states.

The complete analysis, entitled "State-Level Estimates of Annual Medical Expenditures Attributable to Obesity", by Eric A. Finkelstein and Ian C. Fiebelkorn, RTI International, and Guijing Wang, CDC, appears in the January 2004 edition of the journal *Obesity Research*, published by the American Association for the Study of Obesity. Copies of the paper are available from the journal's web site (http://www.obesityresearch.org/). Copies of the full report may be requested by email to listen@rti.org.

Potential questions and answers for states re: article on state medical costs attributed to obesity.

Detailed analytic questions

1. Can you explain in more detail how this analysis was done?

   The analysis for this paper was not done by our state health department, but was done by scientists at RTI and at the CDC. As such, it would be best for you to contact them for specific questions. For details about the study methodology, please call the lead author, Eric Finkelstein, at 919-541-8074. To talk with CDC about the paper, please call Tim Hensley at 770-488-5820.

Simple analytic questions

1. Do the Medicaid data include children?

   No, this analysis is for adults only.

2. Some adults can have both Medicare and Medicaid. How was this addressed in the analysis?

   The obesity costs for persons with both Medicare and Medicaid coverage were attributed only to Medicare, not Medicaid. In other words, persons were not double counted.

3. Questions that ask a state to compare their numbers with another state. (Example questions: It is estimated your state spends $X on medical expenditures attributed to obesity and state B spends $Y? Why is your state spending so much more?)

   The estimates generated from this paper really should not be used to make cost comparisons across states (or between payers). First, there is substantial variability associated with the estimates. Therefore, estimates from one state may not be statistically different from each other, even though the numbers appear different. In addition, the estimates are influenced by many variables (i.e., population size, demographic characteristics, the amount of non-obesity related health care expenditures, and the prevalence of the obesity) that likely vary across states.

   However, we in {insert your state} are concerned by numbers generated for our state. As such, we are engaged in the following activities (provide state examples).

4. Why do the cost estimates for obesity-related health care expenditures in this study differ from the $117 billion cited in the *Surgeon General's Call to Action to Prevent Overweight and Obesity* and other sources?

The primary difference between these two estimates is that the $117 billion figure includes BOTH direct costs (i.e., direct medical care costs) and some indirect costs (i.e., cost related to lost productivity including items such as days of lost work). The current article on state-level obesity costs examines direct costs only. Consequently, this results in a lower estimate.

Policy/Implications

1. This paper focuses on the healthcare costs in adults. What about children?

   In the US, obesity and overweight are serious health problems for both children and adults. Major health consequences related to obesity occur in adults, and the problem is most costly in adults. However, sufficient evidence indicates that overweight children are more likely to become obese adults, and obesity-related diseases in children have increased in recent years. Therefore, preventing overweight among children is important, even though current medical costs attributable to overweight may be small in children. However, we need to also focus attention on adults. One promising area for the delivery of interventions related to weight in adults is the worksite.

2. This paper indicates that obesity accounts for 6% of health care expenditures. What percentage of health care expenditures is attributable to other health conditions?

   The paper does not calculate the percentage of health care expenditures attributable to other health conditions. This is because obesity is a risk factor for several other health conditions (e.g., diabetes). As such, the costs of obesity overlap with its associated conditions.

3. Are you concerned that messages in this paper regarding the burden of obesity-related health care expenditures bore by the taxpayers will stigmatize already vulnerable populations?

   It is true that the results of the paper indicate the percentage of adult Medicaid expenditures attributable to obesity is higher than the percentage of total adult medical expenditures attributable to obesity. Increased relative medical costs are likely due to the higher prevalence of obesity among Medicaid recipients (about 50% higher than the general population).

   It is also true that the results from this study indicate that about half of the medical costs attributable to obesity are financed by Medicare and Medicaid. However, it is also important to note that the other half of the costs are not funded by Medicare and Medicaid. Although obesity has a higher prevalence in some subgroups of the population, it is a problem across all subgroups. These findings emphasize the need to focus efforts on the entire population, but to devote special attention to understanding why some groups are disproportionately affected.

4. What are the implications of the study findings for public policy?

The study findings reveal that the costs of obesity are sizable and contribute to a substantial proportion of total medical expenditures for adults, nationally and in each state. In addition, Medicare and Medicaid cover approximately 50% of obesity-related costs. These findings emphasize the need for public policy that supports continued research, development, implementation, and evaluation of effective primary- and secondary-level prevention efforts.

Given the high and growing prevalence of adult obesity, we will need to provide medical and lifestyle options for obese individuals to lose weight and keep it off. We will also need to know the most effective ways to help individuals maintain healthy weight and avoid becoming overweight or obese. Implementation of strategies in clinical settings has implications for policy related to care delivery and reimbursement.

For both primary and secondary prevention efforts, we need to understand the personal, familial, community, environmental, and policy influences that facilitate increased physical activity and healthy eating, make healthful choices easy choices, and eliminate the disparities of obesity across racial and ethnic groups. Strong public policies for preventing and reducing obesity will need to be supported by complementary policies in schools, worksites, and healthcare settings.

5. What can/should states do to address the obesity problem?

First, the interest generated from this article will provide an excellent opportunity for states to showcase what they are already doing to prevent and control overweight and obesity. With funding from a variety of sources, states have been actively engaged in strategic planning, forming coalitions, and working with local leaders, institutions and stakeholders to determine populations of highest need and effective strategies to reach these populations. States have also started to implement policies and programs designed to improve nutrition and increase physical activity in selected communities, and these efforts are contributing to our understanding of effective strategies. State press information officers and other health department staff should work together to decide the best stories and approach for sharing this information.

In addition, maintaining a healthy weight can be achieved by promoting the proper energy balance between calories consumed and calories expended. Effective strategies to support healthy eating and regular physical activity are important to achieving a proper energy balance that promotes achieving and maintaining a healthy weight.

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.

by Eric A. Finkelstein, Ian C. Fiebelkorn, and Guijing Wang

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

Eric Finkelstein is an economist at RTI International in Research Triangle Park, North Carolina. Ian Fiebelkorn is an associate economist there. Guijing Wang is an economist at the U.S. Centers for Disease Control and Prevention in Atlanta.

1.13

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-

1-14

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 ($p < .05$).

1-16

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.

NOTES

1. A. Mokdad et al., "The Continuing Epidemics of Obesity and Diabetes in the United States," *Journal of the American Medical Association* 286, no. 10 (2001): 1995–1200.
2. A. Must et al., "The Disease Burden Associated with Overweight and Obesity," *Journal of the American Medical Association* 282, no. 16 (1999): 1523–1529; A. Field et al., "Impact of Overweight on the Risk of Developing Common Chronic Diseases during a Ten-Year Period," *Archives of Internal Medicine* 161, no. 13 (2001): 1581–1586; and T. Visscher and J. Seidell, "The Public Health Impact of Obesity," *Annual Review of Public Health* 22 (2001): 355–375.
3. R. Sturm, "The Effects of Obesity, Smoking, and Drinking on Medical Problems and Costs," *Health Affairs* (Mar/Apr 2002): 245–253.
4. A. Wolf and G. Colditz, "Current Estimates of the Economic Cost of Obesity in the United States," *Obesity Research* 6, no. 2 (1998): 97–106.
5. W. Manning et al., "Health Insurance and the Demand for Medical Care: Evidence from a Randomized Experiment," *American Economic Review* 77, no. 3 (1987): 251–277; and W. Manning, "The Logged Dependent Variable, Heteroscedasticity, and the Retransformation Problem," *Journal of Health Economics* 17, no. 3 (1998): 283–295.
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.
8. B. Shah, B. Barnwell, and G. Bieler, *SUDAAN User's Manual*, Release 6.4 (Research Triangle Park, N.C.: Research Triangle Institute, 1995).
9. D. Goldman et al., "The Effects of Benefit Design and Managed Care on Health Care Costs," *Journal of Health Economics* 14, no. 4 (1995): 401–418.
10. T. Selden et al., "Reconciling Medical Expenditure Estimates from the MEPS and the NHA, 1996," *Health Care Financing Review* 23, no. 1 (2001): 161–178. The NHA estimate includes spending for hospital care, physician services, prescription drugs, and other personal health care.
11. K. Levit et al., "Inflation Spurs Health Spending in 2000," *Health Affairs* (Jan/Feb 2002): 172–181. A detailed Methods Appendix is available from the authors upon request; send e-mail to Eric Finkelstein at finkelse@rti.org.
12. MEPS is limited to the noninstitutionalized population and therefore does not directly capture nursing home spending.
13. Sturm, "The Effects of Obesity, Smoking, and Drinking."
14. Wolf and Colditz, "Current Estimates of the Economic Cost of Obesity."
15. K. Fiscella, "Is Lower Income Associated with Greater Biopsychosocial Morbidity? Implications for Physicians Working with Underserved Patients," *Journal of Family Practice* 48, no. 5 (1999): 372–395.
16. K. Warner, T. Hodgson, and C. Carroll, "Medical Costs of Smoking in the United States: Estimates, Their Validity, and Their Implications," *Tobacco Control* 8, no. 3 (1999): 290–300.
17. W. Max, "The Financial Impact of Smoking on Health-Related Costs: A Review of the Literature," *American Journal of Health Promotion* 15, no. 5 (2001): 321–331.
18. E. Keeler et al., "The External Costs of a Sedentary Life-Style," *American Journal of Public Health* 79, no. 8 (1989): 975–981.
19. J. Stevens et al., "The Effect of Age on the Association between Body-Mass Index and Mortality," *New England Journal of Medicine* 338, no. 1 (1998): 1–7.
20. K. Flegal et al., "Prevalence and Trends in Obesity among U.S. Adults, 1999–2000," *Journal of the American Medical Association* 288, no. 14 (2002): 1723–1727.
21. C. Ogden et al., "Prevalence and Trends in Overweight among U.S. Children and Adolescents, 1999–2000," *Journal of the American Medical Association* 288, no. 14 (2002): 1728–1732.