The impact of obesity and other factors on health care expenditures in the elderly

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Summary

Federal health spending on Medicare is forecasted to grow from 3% of US Gross Domestic Product in 2010 to 11.5% in 2080 due to an aging US population exhibiting chronic health conditions (5). Many of the most expensive health conditions, such as diabetes and heart disease, are connected to or at least exacerbated by obesity. Using MEPS 2005 Survey Data, we worked to isolate and quantify the true cost of obesity to Medicare, the primary health care payer for the elderly in the United States. Our model suggests that individuals with BMI in the obese or morbidly obese range would experience 23% and 38% increases in health care expenses from a baseline that takes into consideration numerous other possible contributing factors. The growing epidemic of obesity, along with its sizeable impact on health care expenditures in the elderly is an important concern for the US Government, as the primary insurer for the majority of these individuals (2).

Introduction

The Congressional Budget Office forecasts that in 2080 Medicare will reach 12% of U.S. GDP, from 3% in 2010 (5). Medicare is a federal program entitling seniors to heavily subsidized health insurance coverage. Isolating and quantifying the cost to the Medicare system posed by chronic health conditions is necessary to prioritize spending on preventative healthcare and public health campaigns. If effective, these efforts can lessen the fiscal burden posed by Medicare.

Healthcare inflation is presently estimated to be 4% above the annual inflation rate (2). Finding ways of curbing medical inflation through health interventions is an important tool to solving the long-term fiscal problems posed by Medicare.

Methods

About the Data

Data for this analysis is from the 2005 Medical Expenditures Panel Survey (MEPS), collected by the Agency for Healthcare Research & Quality, United States Department of Health & Human Services. MEPS provides nationally-representative healthcare data on cost, accessibility, quality, health insurance status and other variables of interest. MEPS is available as longitudinal data, however we have limited our analysis to data collected from 2005.

We measured BMI according to standard AMA categories (0 to <25 normal, 25 to <30 overweight, 30 to <40 obese, 40+ is morbidly obese (4). BMI is weight in kilograms divided by the square of height in meters. This measurement, although easy to calculate, is not as reliable a measure of body fat ratios as skin fold tests or submersion tests. We do not know what methods were used to measure BMI, or if the means of measurement was standard, which may cause measurement error in our model.

Summary Statistics

Our subset of data contains 2970 individuals, aged 65 or above, and currently enrolled in Medicare. Of the total participants 40% of have diabetes, 11% are smokers, and 47% have high blood pressure. The average BMI is 27, which is considered overweight. The distribution of BMIs is relatively normal, though skewed slightly to the right, due a number of high BMI outliers. The median is 26. In our data set, 19% are normal, 37% are overweight, 24% are obese, and 3% are morbidly obese. The mean expenditure for all observations is $8,358.25 with a standard

deviation of $14,109. The median is $3,935, which is due to the fact that the distribution is strongly skewed to the right, towards higher total expenditures.

The data are comprised of 41% men and 59% women, reflecting international trends of higher male mortality respective of birth cohort. Minimal difference between health expenditures between men and women, though due to ageing differences, men may have lower expenditures because they die at an earlier age. On average, total healthcare expenditures for men are $7038.53 and for women $7745.61.

Our data is divided into five racial categories, with the following average and median total Medicare expenditures: white non-hispanic ($8485.89, $4105), black non-hispanic ($8456.07, $3808), other non-hispanic ($6003.36, $3123), hispanic ($8371.05, $3146). White non-hispanics, black-non hispanics and hispanics have relatively similar mean Medicare expenditures, but their medians diverge substantially. The other non-hispanics diverge significantly from this trend, and have much lower overall healthcare expenditures measured by both the mean and the median. Basic summary statistics are also organized in Chart One of the Appendix.

Limitations of the Data

The MEPS data from 2005 is cross-sectional-- it includes Medicare expenditures measured by observations exclusively from 2005. A more robust analysis of obesity's contribution to Medicare spending could be drawn from longitudinal data. By structuring the data in this format and measuring the outcomes, an analysis could demonstrate time trends, and if the data from 2005 do a good job of representing the relationship between old-age obesity and Medicare expenditures. For example, there could be year-specific variation in Medicare spending from 2005 that would under or overstate the trend, curtailing our ability to generalize the results of this analysis. This is further compounded by medical inflation which has increased in recent years and is presently 4% above annual inflation measured by the Consumer Price Index, Measured in (1).

Results

Model

We used ordinary least squares regression to model the impact of various factors on total health care expenditures. We took the log of total health care expenditures to normalize the data, making it more suitable for OLS. The log of total health care expenditures was our dependent variable and we considered the following independent variables: BMI category, race category, education category, age, gender, smoker, chronic heart disease, and diabetes. The model suggests that these independent variables account for 12.2% of the overall impact on total health care expenditures. While this may seem to be a small percentage, it is important to take into account the fact that health care expenditures could possibly be dependent on near countless variables, and that explaining 12.2% from these seven variables alone is quite significant.

$$y = \hat{\beta}_0 + \hat{\beta}_1 overbmi + \hat{\beta}_2 obesebmi + \hat{\beta}_3 morbidbmi + \hat{\beta}_4 whitenhsp + \hat{\beta}_5 blacknhsp + \hat{\beta}_6 othernhsp + \hat{\beta}_7 highschool grad + \hat{\beta}_8 somecol + \hat{\beta}_9 collegegrad + \hat{\beta}_{10} age + \hat{\beta}_{11} male + \hat{\beta}_{12} diabetes + \hat{\beta}_{13} smoker + \hat{\beta}_{14} chd + u$$

Controls

There are many differences between individuals other than BMI and therefore our model controls for a number of such factors. We chose to include race because we assumed that communities of color would have lower expenditures due to their lower income and more limited access to health services. We also controlled for education because we assumed that those with higher education would have higher incomes, greater access to health services and thus receive more health services through Medicare.

We also controlled for diabetes and chronic heart disease. We included these variables because we found that these diseases were correlated with health care expenditures and may be a confounder when examining the impact of BMI on health care expenditures (Appendix, Chart Two).

Similarly, we controlled for smoking because when analyzing the summary statistics, we noticed that Medicare spending on smokers was lower

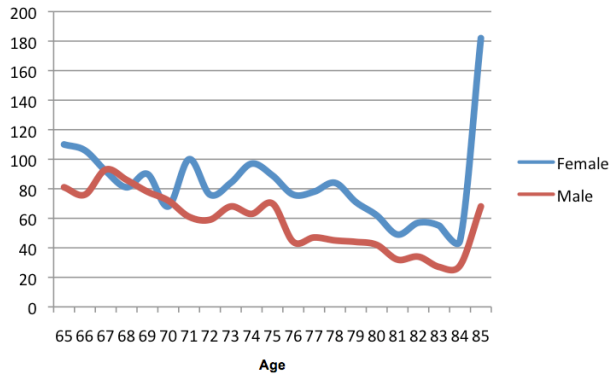
overall. We reason this to be the case because smokers are statistically much more likely to die earlier in life from chronic health conditions, such as emphysema, lung cancer and heart disease. Those who are smokers in old age are much more likely to be more healthy overall. Therefore we wanted to net out the differences from smokers. We also controlled for sex because men had lower total expenditures than women.

Lastly, we included age because we assumed that expenditures would increase with age, as the incidence of age-related illness increases.

MEPS provided variables for BMI (continuous), education (years), and race group (white non-hispanic, black non-hispanic, other non-hispanic and hispanic). We transformed these variables into categorical, mutually exclusive, dummy variables where being normal weight, not being a high school graduate and being hispanic were the reference categories. While the overweight BMI category alone did not have significance ($p = .897$), jointly, the BMI categories were significant at the .0007 level. Similarly, both categories black non-hispanic and other non-hispanic were insignificant individually ($p = .551$ and $p = .218$, respectively) while jointly, all race categories were significant at the .0002 level. Each of the education categories were significant, and jointly they were significant at the .0003 level. The remaining independent variables were all highly significant.

Our model suggests that elderly individuals with a bmi in the obese range would result in a 22.6% increase in health care expenditures while being morbidly obese would result in a 37.7% increase. Such an increase is widely supported in the literature (6). Individuals with major chronic diseases such as diabetes and chronic heart disease experience a near 100% increase in expenditures. Interestingly, males have a 33.6% reduction in health care costs. The data shows that males, with lower life expectancy, are not as prevalent in the data during later years in life. While women are more prevalent throughout the sample, there is actually a huge spike of females in the last year of the data, which could be why women are seeing higher health care costs overall, more utilization (figure one). Finally, as individual ages, they are experiencing a 3.3% increase in expenditures each year. The regression table with all coefficients is available in Chart Three of the Appendix.

Figure One: Number of Participants by Age



Conclusion

Policy Implications

The results of our analysis demonstrate that reducing the prevalence of obesity among seniors would have a sizable impact on Medicare spending. However, research has shown that it is difficult and expensive to help individuals lose weight and sustain weight loss (6). Therefore health researchers must continue to search for new tools in fighting America's obesity crisis. Due to US population is ageing; many more Americans will soon qualify for Medicare benefits. If current rates of obesity are not reduced they will contribute to the looming fiscal crisis poised by the Medicare and crowd out spending for other important public programs.

42.5 million Americans qualified for Medicare in 2005. In our sample, 65% were beyond a normal BMI. Such a large percentage of overweight individuals, with the increased costs our model ssuggest, has huge implications for health care costs and specifically the US Government when 42.5 million individuals are being supported by the federal health insurance, Medicare.

Appendix

Chart One

Summary Statistics of Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
totalexp_log	2970	8.045003	1.904871	0	12.36901
overbmi	2970	.3774411	.4848283	0	1
obesebmi	2970	.2390572	.4265796	0	1
morbidbmi	2970	.0299663	.1705231	0	1
whitenhsp	2970	.716835	.4506117	0	1
blacknhsp	2970	.1282828	.3344608	0	1
othernhsp	2970	.0447811	.2068579	0	1
highschool~d	2970	.3242424	.4681699	0	1
somecol	2970	.1569024	.3637699	0	1
collegegrad	2970	.1767677	.3815362	0	1
age	2970	74.07576	6.228823	65	85
male	2970	.410101	.4919346	0	1
diabetes	2970	.2063973	.4047871	0	1
smoker	2970	.1104377	.3134873	0	1
chd	2970	.1282828	.3344608	0	1

Chart Two

Strong Correlations of Interest

	totale_log	diabetes	chd	age	smoker
totalexp_log	1.0000				
diabetes	0.2071	1.0000			
chd	0.1955	0.0730	1.0000		
age	0.1146	-0.0431	0.0679	1.0000	
smoker	-0.1140	-0.0470	-0.0484	-0.1449	1.0000

Chart Three

Model Ouput, Coefficients, Confidence Intervals, Etc.

Linear regression — Number of obs = 2970; F(14, 2955) = 33.08; Prob > F = 0.0000; R-squared = 0.1219; Root MSE = 1.7892

totalexp_log	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
overbmi	-.0106214	.0820163	-0.13	0.897	-.1714363	.1501935
obesebmi	.2261062	.0914757	2.47	0.014	.0467437	.4054688
morbidbmi	.3772473	.1797135	2.10	0.036	.0248709	.7296237
whitenhsp	.4503497	.1305487	3.45	0.001	.1943741	.7063252
blacknhsp	.0949422	.1590716	0.60	0.551	-.2169601	.4068446
othernhsp	.2239685	.1816731	1.23	0.218	-.1322502	.5801872
highschool~d	.233022	.0881236	2.64	0.008	.0602321	.4058119
somecol	.3767124	.1015092	3.71	0.000	.1776766	.5757483
collegegrad	.3773791	.0981335	3.85	0.000	.1849621	.5697961
age	.0325031	.0055082	5.90	0.000	.0217028	.0433034
male	-.336154	.0727757	-4.62	0.000	-.4788501	-.1934579
diabetes	.9976228	.0678178	14.71	0.000	.8646478	1.130598
smoker	-.4018093	.1347051	-2.98	0.003	-.6659347	-.1376839
chd	.9797338	.0681479	14.38	0.000	.8461117	1.113356
_cons	4.8802	.4498888	10.85	0.000	3.998073	5.762327

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