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Does Health Insurance have Influence on Obesity?

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DOES HEALTH INSURANCE HAVE INFLUENCE ON OBESITY?

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ABSTRACT

Obesity in the United States has been continuing increasing and cited as a major health issue in recent decades. Many researchers have studied its socio-economic cause, but very few studies center on the potential influence that health insurance has on obesity. In our common sense, health insurance reduces the money that we pay for health care and makes many treatments' cost affordable which we may choose to give up originally due to our financial situation. However, everything has two sides. The benefits from insurance also can lead people to change their choices and behaviors. As an insured, people may take on more health risk than they did without insurance. Insurance reduces people's responsibility, and reduced responsibility decrease health consciousness. Using 3 years of individual-level data from the Integrated Health Interview Series corresponding to year 2000, 2005 and 2010, I attempt to research if the presence of health insurance has effect on body weight. Then by dividing overall BMI into detailed group, I study further on if health insurance affects overweight and obesity. The 2SLS result shows insurance is positively related with BMI, so insured individuals tend to be heavier than those non-insured. What's more, the presence of health insurance affects obesity much more than overweight. People with health insurance have a higher probability to be obese.

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INTRODUCTION

According to a study in The Journal of the American Medical Association (JAMA), in 2008, the obesity rate among adult Americans was estimated at 32.2% for men and 35.5% for women. Obesity in the United States has been continuing increasing and cited as a major health issue in recent decades. While many industrialized countries have experienced similar increases, obesity rates in the United States are among the highest in the world. In a survey from the World Health Organization in 2007, the United States has the highest prevalence of overweight adults in the English-speaking countries. Obesity increases the likelihood of various diseases, particularly heart disease, type 2 diabetes, obstructive sleep apnea, certain types of cancer, and osteoarthritis. Obesity is most commonly caused by a combination of excessive food energy intake, lack of physical activity, and genetic susceptibility. Many socio-economic causes of obesity have been studied by researchers. Baum and Chou did a research on factors that may have influences on body weight, including employment, physical activity at work, food prices, the prevalence of restaurants, cigarette smoking, cigarette prices and taxes, food stamp receipt, and urbanization. However, very few studies center on the potential influence that health insurance has on obesity.

In this paper, insurance plays an important role in the model I used to determine body weights. I want to find what effect health insurance has on people's body weight. If health insurance

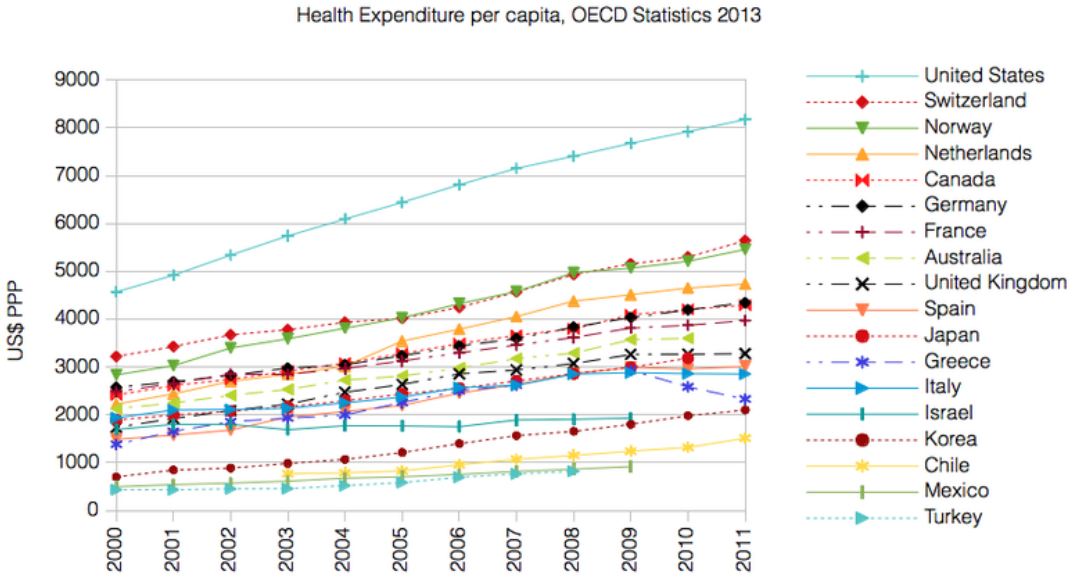
makes body weight increase, then the concern we discussed before is true. Yet if people are heavier without health care, it means medical services improve health outcomes, and this might be a support for universal health insurance coverage since health insurance helps to decrease obesity status.

In our common sense, health insurance is an essential way to finance the production of good health. It reduces the money that we pay for health care and makes many treatments' cost affordable which we may choose to give up originally due to our financial situation. It seems like insurance only has good influences on our health. Isn't it a good thing that we spend less money on health care, or get some costly medical care we normally cannot afford without health insurance? However, everything has two sides. The benefits from insurance also can lead people to change their choices and behaviors.

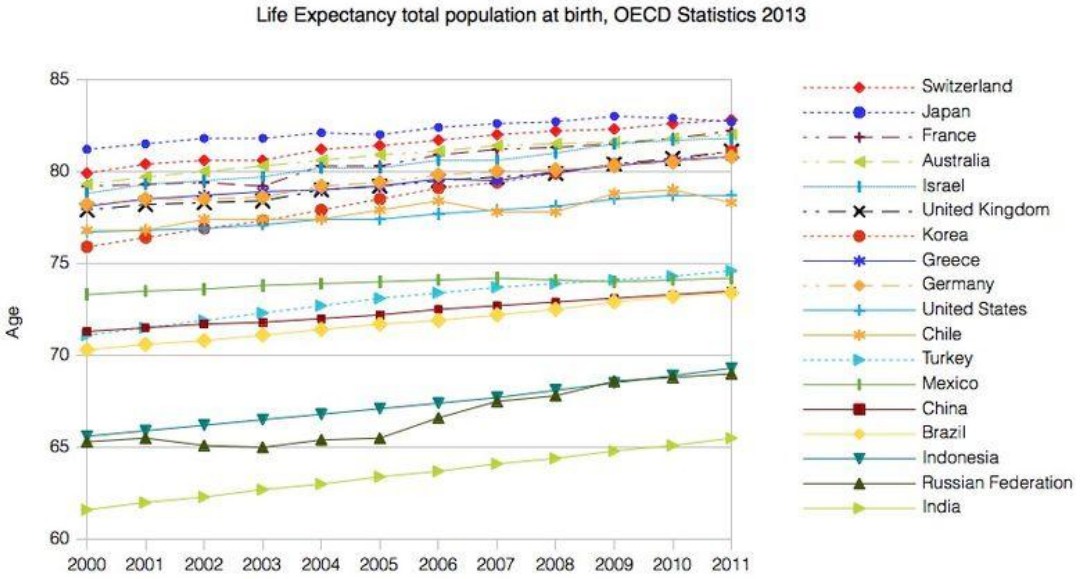
For instance, people may eat more vegetables and fruits, less fried chicken, and work out regularly when they do not have health insurance. They know they would be fully responsible for any penny paid for their healthy issues. After buying health insurance, they begin to eat lots of fast food, little vegetables, seldom work out. That is to say, as an insured, people take on more health risk than they did without insurance. Insurance reduces people's liability, and reduced liability decrease health consciousness. There is another aspect that insurance affect our choices and behaviors. If we have a minor illness, like sniffle or allergy symptoms in spring, we do not think it is necessary to see a doctor when we have no insurance. However, with insurance, we

are more likely to make an appointment and get a prescription for these minor illnesses since we just need to pay a very small part of the cost. Different decisions are made though the situation is the same. People use insurance to cover costs they would not have incurred prior to getting insurance.

In recent years, the percentage of health care expenditures paid directly by consumers has continuing decreasing. The Commonwealth Fund, in its annual survey, "Mirror, Mirror on the Wall", compares the performance of the health care systems in Australia, New Zealand, the United Kingdom, Germany, Canada and the U.S. According to its 2007 study, although the U.S. system is the most expensive, it consistently under-performs compared to the other countries. One difference between the U.S. and the other countries in the study is that the U.S. is the only country without universal health insurance coverage.



The Commonwealth Fund completed its thirteenth annual health policy survey in 2010. A study of the survey "found significant differences in access, cost burdens, and problems with health insurance that are associated with insurance design". Of the countries surveyed, the results indicated that people in the United States had more out-of-pocket expenses, more disputes with insurance companies than other countries, and more insurance payments denied; paperwork was also higher although Germany had similarly high levels of paperwork.



LITERATURE REVIEW

Previous studies have revealed many factors having influence on BMI. Chiappori(2012) reports that men may compensate 1.3 additional units of BMI with a 1 percent increase in wages, whereas women may compensate two BMI units with 1 year of education. Some researchers are even studied on the BMI document record situation. Hillman, Corathers and Wilson (2009) states that, according to 397 medical records they have reviewed, 59.7% contained the 2000 Centers for Disease Control and Prevention growth curve with BMI for age; 5.5% documented BMI, and 4.3% plotted BMI. Resident physicians were more likely to document and plot BMI compared with attending physicians. Children with a BMI >95% for age were more likely to have their BMI documented.

Adolescence obesity also plays an important role in adulthood BMI. Engeland, Bjorge, Tverdal and Sogaard(2004) find that obesity in adolescence tends to persist into adulthood. According to Herman and Hopman(2010), youth overweight conveyed a long-term positive impact on several aspects of adult health-related quality of life, and this impact may be both direct and indirect through BMI change and the effect on adult BMI; Youth physical activity had no long- term impact on adult health-related quality of life.

School performance, knowledge of the adverse health consequences that cigarettes and alcohol bring and benefits that exercise produces can affect our BMI, too. Alatupa and her

partners did a 21-year follow-up study of school performance as a predictor of adulthood obesity. They examined the impact of school performance measured in terms of grade point averages (GPAs) in early and middle adolescence (ages 9, 12, and 15), and the impact of school performance throughout the different school stages on adult obesity. Birth weight, childhood BMI, adulthood physical activity, maternal and paternal BMI, and maternal education were controlled for. Their results showed that low GPAs in each measurement and low GPAs throughout the comprehensive school were a risk factor of adulthood obesity, but only among women. They underscores that low school performance is a health risk factor that should be taken seriously in preventive health education.

Kenkel(2000)'s results show: for cigarettes and alcohol consumption is decreased by knowledge of the adverse health consequences, for both males and females; increases in knowledge about exercise increase exercise. Schooling has a statistically significant negative effect on smoking and heavy drinking, and a statistically significant positive effect on exercise. The only exception to the pattern is that the effect of schooling on total drinks is positive.

What's more, BMI also has a relationship with race and income. Deurenberg and other researchers (2001) reports blacks have a higher bone mineral density and bone mineral content than whites, and their muscle mass is higher. This may make them have a higher average body weight than whites. Scharoun-Lee, Kaufman, Popkin and Gordon-Larsen (2009) state in their paper: "Obesity, race/ethnicity and life course socioeconomic status across the transition from

adolescence to adulthood", that no significant interactions with race/ethnicity were observed, although racial/ethnic minorities had the highest obesity risk across SES(socio economic status) groups; The relationship between SES and obesity patterns is similar across race/ethnicity and differs by gender during the transition to adulthood.

Martin (2005) thinks poverty is associated with higher levels of obesity, as well as obesity-related disease, in the United States, and poverty may play in driving the present obesity epidemic. Lee and Harris (2009) find that poverty may impact female obesity through the mediating effects of physical activity, inadequate sleep, skipping breakfast and certain forms of parental monitoring, while race is an important confounder of poverty's influence.

Researchers did some researches on health insurance and body weight. In Lee and his partners' study (2010), very few states ensure coverage of recommended treatments for adult and pediatric obesity through Medicaid or private insurance. Newhouse (1993) used data from the RAND Health Insurance Experiment and found there was no difference in BMI in behaviors like smoking, alcohol consumption and levels of physical activities, compared individuals enrolled in cost-sharing insurance plans and free plans.

Card, Dobkin, and Maestas (2004) used the discrete changes generated by the rules of the Medicare program to identify the impact of health insurance on access to care and utilization. The Medicare eligibility threshold at age 65 is associated with an increase in overall insurance coverage and a narrowing of coverage disparities across different subgroups. There is also an

increase in the incidence of multiple coverages and a reduction in managed care, concentrated among higher educated and nonminority groups, as people with insurance prior to 65 enroll in fee-for-service Medicare and supplementary coverage plans. Meier (1999) investigated how health insurance parameters influence preventive behavior and studied the structure of optimal health insurances. He found the first-best allocation with full coverage for the costs of curative care could generally be reached if all prevention is observable by the insurer; and if unobserved prevention was not negligible, consumers would usually purchase only partial coverage for the costs of curative care. Observable prevention may be restricted by the insurer in order to encourage unobserved prevention. If the advice of physicians could bias the decision of the insured, the insurer usually recommends a relatively low level of prevention.

Using 10 years of individual-level data from the Behavioral Risk Factor Surveillance System over the period 1993-2002, Kelly and Markowitz researched on insurance's effect on body weight. Their hypothesis is that in the presence of insurance, people have less incentive to guard against illness and change their health-related behaviors accordingly. The instruments they used are the percentage of each state's workforce employed in firms of sizes of 100 to 499 employees and 500+ employees, because health insurance is strongly tied to employment in the United States, and firm size is a known predictor of whether health insurance is offered to employees, with individuals in large firms more likely to have health insurance. They found health insurance can lead certain individuals to change health-related behaviors and to gain weight; however, the

magnitude is small and the effect is concentrated only along the boundary of what is considered to be overweight. Obesity is not affected by the presence of health insurance. In other words, Americans are not getting fat because of their health insurance.

There are also many other researches about body weight. For instance, Ferraro(1998) did a unique research on religion, body weight and well-being. He used state-level ecological data and a national sample of adults surveyed in 1986 for the bulk of the analysis. He found religious practice was associated with all measures of well-being and generally acted to counterbalance the negative effect of body weight on well-being. Obese persons were more likely to be depressed and had lower levels of health satisfaction despite their higher levels of religious practice.

METHODOLOGY

The relationship between BMI and health insurance is complicated since health status may affect insurance status, and other factors may influence or be influenced by both body weight and health insurance. For example, People who have health insurance may pay more attention to their health than those without health insurance, so they always watch their weight and have a lower chance to be obese; however, there is another possibility that people without health insurance have a lower body weight because they know that if they get disease because of obesity, like heart disease, they may be not able to afford the treatment cost. As to the people with health insurance, they may pay less attention to their weight, thinking that the doctor will remind them if they need to lose weight or something, and if they are sick because of obesity, their health insurance can cover most of the cost. Plus, many people who are obese have certain illnesses, so they are more likely to get insurance for their current or potential future treatment cost.

We cannot simply use OLS here hence the GM assumptions are violated and our OLS estimates will be biased. To solve this problem and examine the causality, we need to use Two Stage Least Squares (2SLS) and find an instrumental variable Z which affect health insurance in the world, but that does not influence BMI. First we examine how strong this instrumental variable is in STATA, and then if it is strong enough, we do ivreg. Staiger and Stock (Econometrica,

1997) formalized the definition of weak instruments. Many researchers conclude from their work that if the first-stage F statistic exceeds 10, their instruments are sufficiently strong. So if the instrumental variable is stronger enough, we then do ivregress to examine our assumptions. The basic estimation equation is as bellowing:

$$BMI = \beta_0 + \beta_1 \text{ insured} + \beta_2 X_i + \varepsilon_1$$

$$\text{Insured} = \alpha_0 + \alpha_1 Z + \alpha_2 X_i + \varepsilon_2$$

where BMI is an individual's BMI, insured represents the presence of health insurance, X_i represents the vector of other relevant variables such as age, sex, race, legal marital status, work status, person's total earnings and educational attainment, and Z represents variable that predict health insurance status but not body weight.

We will regress the overall BMI on insurance and other independent variables first, and then use 3 different BMI groups: overweight group, obesity group and overweight obesity group, since if insurance does make our body weight heavier, it does not necessary mean it causes obesity. We want to see if the influence of insurance is different among the 3 groups, and if having health insurance is associated with the probabilities of being overweight and obese.

DATA

My analysis uses 3 years of individual-level data from the Integrated Health Interview Series. IHIS is a project dedicated to harmonizing data and documentation for the U.S. National Health Interview Survey (NHIS). It has annual harmonized data from the 1960s to the present. IHIS contains a lot of detailed data of individuals, like insurance, work status and BMI. The data I use in this study corresponds to year 2000, 2005 and 2010, and it is individual cross-section data. Information on self-reported body weight and height are available in all years of data. Knowing this information, we can use the body mass index (BMI) as a measure of weight. Although there are some other measures of obesity, like skin fold thickness and bio-impedance, may be better measures of obesity, they are more expensive and inconvenient, and are not included in the basic physical examinations. We do not have enough data about these measurements. BMI is a measure of relative weight based on an individual's mass and height. It is defined as the individual's body mass divided by the square of their height – with the value universally being given in units of kg/m2. The BMI is used in a wide variety of contexts as a simple method to assess how much an individual's body weight departs from what is normal or desirable for a person of his or her height. BMI' provides a simple numeric measure of a person's thickness or thinness, allowing health professionals to discuss overweight and underweight problems more objectively with their patients. A BMI of 18.5 to 25 indicates optimal weight, a BMI lower than

18.5 suggests the person is underweight, a number above 25 may indicate the person is overweight, a number above 30 suggests the person is obese. BMI is the dependent variable here. Since some respondents were not willing to provide their personal height and weight information, there are many null values in the dataset. I dropped these null values because it is not meaningful to keep them in this study.

Insurance is a dummy variable and 1 means the individual has a health insurance. To deeply research the relationship between BMI and health insurance, an instrumental variable is needed here. I use if an individual's siblings have cancer as the instrumental variable, since on the one hand, if someone's sibling has cancer, he would think there is a big chance for him to have cancer, so he might be more cautious of his health and more likely to get a health insurance; on the other hand, an individual's siblings have cancer or not, does not affect this individual's own BMI. The original data about siblings' cancer are very detailed and separate. The questions in the survey are like "Does your full brothers have pancreatic cancer" "Does your full brother have blood cancer" "Does your full sister have ovarian cancer", and dozens of cancers are listed here. I conclude all of these full brothers and sisters' cancer into one variable named "cancer". So when the dummy variable equals to 1, it means this individual's siblings have cancer.

Other individual characteristics include the following variables: age, sex, race, legal marital status, work status, person's total earnings (previous calendar year), and educational attainment. Race as represented by indicators for white. I divided level of education into 4 groups: less than

high school, high school degree, college degree and graduate or higher level degrees (the omitted reference category); I limit the sample to individuals no younger than 18 years old since I want to do my research on American adults, and divide age into 3 groups: 18-34(age1) (the omitted reference category); 35-54(age2); 55 and above(age3), considering that the effect of health insurance on BMI may be different among young, middle age and old adults; Sex as represented by indicators for female; person's total earnings are divided into 4 category: 1-24,999(earnings1) (the omitted reference category), 25,000-44,999(earnings2), 45,000-75,000(earnings3) and above 75,000(earnings4); marital status is set to be a dummy variable, 1 equals to married and 0 equals to single; work status is also a dummy variable which means have job when it equals to 1. Education usually promotes a healthy lifestyle in common sense. Hence, we may predict a negative relationship between years of education and BMI. As to earnings, those with high incomes maybe have a lower BMI, because they are more health-conscious and buy more organic food. The reason why I set “race” as a dummy variable (white and not white), is because in some previous studies, white people tend to have a higher BMI. I want to test if this is the case.

RESULTS

Table 1 shows sample means for the overall sample, those with health insurance and those without health insurance. These summary statistics do not account for any confounding factors. We can see people with health insurance have a larger BMI than those without insurance on average. It is not surprising that the table of means also shows that people with health insurance, are more likely to be married, are older, are more educated and have higher incomes than those without health insurance.

Table 1: Sample means for the overall sample, those with health insurance and those without health insurance.

Variable	Description	All observations (n= 58,040)	Without health insurance (n=11,499)	With health insurance (n=46,541)
BMI	Body mass index, weight in kilograms divided by height in squared meters	27.125	27.045	27.144
Marstat	Legal marital status, dummy variable, equals 1 if married	0.484	0.339	0.520
Age1	dummy variable, equals 1 if 18-34	0.353	0.480	0.321
Age2	dummy variable, equals 1 if 35-54	0.465	0.425	0.474
Age3	dummy variable, equals 1 if 55 and above	0.183	0.095	0.204
Female	Sex, dummy variable, equals 1 if female	0.508	0.446	0.523
White	Race, dummy variable, equals 1 if white	0.742	0.654	0.763
Employed	Work status, dummy variable,	0.890	0.835	0.904

	equals 1 if has a job			
Earnings1	Person's total earnings, previous calendar year, dummy variable, equals 1 if 1-24,999	0.553	0.795	0.493
Earnings2	dummy variable, equals 1 if 25,000-44,999	0.234	0.157	0.253
Earnings3	dummy variable, equals 1 if 45,000-75,000	0.141	0.036	0.166
Earnings4	dummy variable, equals 1 if 75,000 and above	0.072	0.012	0.087
Edu1	Educational attainment, dummy variable, equals 1 if less than high school	0.130	0.286	0.091
Edu2	dummy variable, equals 1 if high school degree	0.578	0.593	0.574
Edu3	dummy variable, equals 1 if college degree	0.188	0.086	0.213
Edu4	dummy variable, equals 1 if graduate or higher level degree(s)	0.105	0.035	0.123
Insured	dummy variable, equals 1 if the individual has health insurance	0.802	0	1
cancer	dummy variable, equals 1 if the individual's siblings have (had) cancer	0.087	0.057	0.094.

Table 2 is the detailed mean value of presence of health insurance among male & female, white & non-white, and poverty & non-poverty people. We can clearly find that, women are more likely to have health insurance than men; white are more likely to have health insurance than non-white; the poor are less likely to have health insurance than non-poverty people.

Table 2: Detailed mean value of presence of health insurance among male & female, white & non-white, and poverty & non-poverty people

	Insured	Insured	
female	.826	.777	male
Non-white	.735	.825	white
poverty	.715	.909	Non-poverty

Table 3 shows the results for overall BMI. The first column is the baseline OLS model and the second column uses 2SLS with the siblings having cancer or not as an instrument variable. The coefficient on having health insurance is positive and statistically significant in both models. The 2SLS model performs well since the instruments have strong first-stage F-statistics (21.87), much bigger than 10. The coefficient of insurance on BMI shows if someone switches from no health insurance to having health insurance, there will be an obvious increase in his BMI.

Results for the remaining explanatory variables in 2SLS are as predicted for the most part. Those individuals who are single, younger, female, white, and employed have lower BMIs on average. More educational attainment and personal earnings also decrease BMI. American's body weight is increasing from year 2000 to year 2010.

Table 4 shows the first stage results of 2SLS. Sibling's cancer is positively related with an individual's health insurance, and it is very significant. Actually, all the coefficients are statistically significant except college degree.

Table 3: Results for overall BMI using OLS and 2SLS model

	OLS	IV
Insured	.234*** (.063)	17.962*** (5.594)
Marstat	.222*** (.048)	-1.248*** (.470)
Age 35-54	1.397*** (.053)	.890*** (.180)
Age 55 and above	1.517*** (.068)	-.831 (.748)
Female	-.611*** (.047)	-1.975*** (.437)
White	-.759*** (.054)	-1.437*** (.229)
Employed	-.087 (.076)	-1.058*** (.328)
Earnings 25,000-44,999	.483*** (.059)	-1.710** (.698)
Earnings 45,000-75,000	.431*** (.074)	-2.728*** (1.004)
Earnings 75,000 and above	.212** (.100)	-2.861*** (.982)
Less than high school	2.001*** (.102)	6.654*** (1.476)
high school degree	1.793*** (.081)	2.962*** (.389)
college degree	.483*** (.090)	.391*** (.141)
Year2000	-.961*** (.058)	-1.879*** (.304)
Year2005	-.383*** (.058)	-.764*** (.150)

Table 4: First stage results of 2SLS model for overall sample

Insured	Coef.
Marstat	.083*** (.003)
Age 35-54	.027*** (.004)
Age 55 and above	.128*** (.005)
Female	.076*** (.003)
White	.038*** (.004)
Employed	.055*** (.005)
Earnings 25,000-44,999	.124*** (.004)
Earnings 45,000-75,000	.178*** (.005)
Earnings 75,000 and above	.173*** (.007)
Less than high school	-.263*** (.007)
high school degree	-.066*** (.005)
college degree	.005 (.006)
Year2000	.052*** (.004)
Year2005	.021*** (.004)
Cancer	.023*** (.006)
R-squared	0.1477

Table 5 is the detailed results of 2sls on the 3 groups: Overweight&obesity, overweight and obesity. We can find that having health insurance is positively related to the 3 groups. The effect of health insurance status on being overweight is not statistically significant, but it is very significant on being heavier than ideal weight or obese. Actually, in the first group, all the coefficients are statistically significant except age over 55; in the obesity group, all the coefficients are statistically significant; however, most coefficients are not significant in overweight group, and we only have age 35-54, female, white and high school degree which are significant. From first group, we know that people with health insurance have a higher probability to be heavier than ideal weight. The presence of health insurance affects obesity much more than overweight. Obesity group shows, people who have health insurance are more likely to be obese. This may illustrate our assumption that individuals change their health related behavior after they have insurance.

Table 5: Detailed results of 2SLS on the 3 groups: Overweight&obesity, overweight and obesity.

2SLS model	Overweight&obesity	overweight	Obesity
Insured	1.662***(.501)	.286 (.314)	1.376***(.430)
Marstat	-.096**(.042)	.005 (.026)	-.101***(.036)
Age 35-54	.084***(.016)	.054***(.010)	.031**(.014)
Age 55 and above	-.052 (.067)	.056 (.042)	-.108*(.057)
Female	-.273***(.039)	-.174***(.024)	-.098***(.034)
White	-.121***(.021)	-.029**(.013)	-.093***(.018)
Employed	-.085***(.029)	-.0003 (.018)	-.085***(.025)
Earnings 25,000-44,999	-.169***(.063)	-.024 (.039)	-.145***(.054)
Earnings 45,000-75,000	-.243***(.090)	-.018 (.056)	-.226***(.077)
Earnings 75,000 and above	-.250***(.088)	-.014 (.055)	-.236***(.075)

Less than high school	.605***(.132)	.128 (.083)	.478***(.113)
high school degree	.250***(.035)	.046**(.022)	.204***(.030)
college degree	.037***(.013)	.013 (.008)	.024**(.011)
Year2000	-.141***(.027)	-.009 (.017)	-.132***(.023)
Year2005	-.057***(.013)	-.002 (.008)	-.054***(.012)

In conclusion, people with health insurance, are more likely to be married, older, more educated and to have higher incomes than those without health insurance. Men, non-white and poor people are less likely to have health insurance. The 2SLS result shows, those individuals who are single, younger, female, white, and employed have lower BMIs on average. More educational attainment and personal earnings also decrease BMI. American's body weight is increasing from year 2000 to year 2010. The result also shows insurance is positively related with BMI, so insured individuals tend to be heavier than those non-insured. If someone switches from no health insurance to having health insurance, there will be an obvious increase in his BMI. What's more, the presence of health insurance affects obesity much more than overweight. People with health insurance have a higher probability to be obese. Insurance reduces people's responsibility, and reduced responsibility decrease health consciousness. This may illustrate our assumption that individuals change their health related behavior after they have insurance.

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