The Prevalence of Obesity and Overweight Among Young Adults: An Analysis Using the NLSY

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Abstract According to the National Center for Health Statistics, 145 million Americans are overweight, and 74 million are obese. In addition, rates of obesity for almost all demographic groups have increased dramatically over the past thirty years. The purpose of the present study is to ascertain the determinants of both obesity and overweight among young adults. Results indicate that the factors that are associated with being overweight are not the same factors that are associated with being obese. Higher income persons are more likely to be overweight but are less likely to be obese. Men are more likely to be overweight but less likely to be obese. Race has no relationship to overweight, but African-Americans and Hispanics are more likely to be obese. Healthy living habits, such as exercising and eating right, are not related to overweight but are related to obesity. However, the most statistically significant factor associated with being both overweight and obese is whether the individual was obese or overweight five years earlier. This result suggests that past behaviors or genetics have much greater impacts on the likelihood of being obese or overweight than do socioeconomic or demographic factors.

Keywords: Obesity, Young Adults

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1. Introduction

According to the National Center for Health Statistics, 145 million Americans are overweight, and 74 million are obese. In addition, rates of obesity for almost all demographic groups have increased dramatically over the past thirty years. This is especially troubling when considering the health consequences associated with obesity. Obese individuals are more likely to develop coronary heart disease, type 2 diabetes, various cancers, hypertension, strokes, and a variety of other ailments. It is estimated that in the year 2000 alone, obesity-related health care costs were over $117 billion, the approximate annual cost of recent health care reform legislation proposed in Congress.

Given the enormous social and personal costs associated with these conditions, numerous prior studies have attempted to ascertain the determinants of obesity. Many of these studies examined the socioeconomic and demographic factors most closely associated with obesity (Singh, et al. (2008); Wang and Beydoun (2007); Moreno, et al (2004); Reidpath, et al (2002); and Wamala, et al (1997)). Other studies focused more on social factors or medical and behavioral health issues in order to explain the rise in obesity (Ali and Lindstrom (2005); Costa-Font and Gil (2004); Kruger, et al (2002)).

Although these prior studies examined many factors that may explain the dramatic increase in obese individuals, there has been scant work done on the factors associated with overweight persons. An overweight person is defined as a person whose body mass index (BMI) is between 25 and 30; an obese person has a BMI greater than 30. Since many overweight individuals eventually become obese, identification of those factors that are most closely related to being overweight may provide guidance as to how to reduce the chance that an individual will become obese.

In addition, early intervention may reduce the social costs associated with obesity and overweight. In order to illustrate the impact of early intervention, the social cost of obesity and overweight may be calculated as follows:

$$SC = M_{ob}(Ob) + M_{ov}(Ov) + WR_{ob}(Obw) + WR_{ov}(Ovw) \quad (1)$$

where M_{ob} is the per capita medical care cost associated with obesity, Ob is the total number of obese individuals in the US, M_{ov} is the per unit medical care cost associated with overweight, Ov is the total number of overweight individuals in the US, WR_{ob} is the per capita cost of weight reduction for an obese individual, Obw is the number of obese individuals seeking weight reduction, WR_{ov} is the per capita cost of weight reduction for an overweight individual, and Ovw is the number of overweight individuals seeking weight reduction. If it is assumed that the per capita costs are constant, then the only way to reduce the social costs associated with obesity and overweight is to reduce the total number of obese and overweight individuals. However, this comes at a cost since weight reduction is not assumed to be costless. In addition, it is reasonable to assume that the following conditions hold:

$$M_{ob} > M_{ov} \quad (2)$$

$$WR_{ob} > WR_{ov} \quad (3)$$

Hence, because the weight reduction costs for obese individuals are greater than the weight reduction costs for overweight persons, the overall social cost may be higher if society focuses their attention on obese weight reduction rather than overweight weight reduction.

In addition, because overweight typically leads to obesity, concentrating weight reduction efforts on the overweight segment of the population may be more socially beneficial and less costly than focusing weight loss efforts on the obese. Looking at the social costs of weight reduction as an inter-temporal problem, one may model it as follows:

$$SC = \sum [M_{ob}(Ob_t\ (Ov_{t-1})) + M_{ov}(Ov_t) + WR_{ob}(Obw_t) + WR_{ov}(Ovw)] \quad (4)$$

In this equation, Ob in time period t depends on Ov in time period t-1. Hence, if the number of overweight individuals falls in t-1, then the number of obese individuals should fall in time period t. Thus, by reducing the number of overweight individuals today, there will be fewer obese individuals tomorrow, assuming all else is constant. In addition, by focusing weight reduction efforts on the overweight, social costs are immediately reduced since $WR_{ov} < WR_{ob}$.

Finally, since body mass index increases as people age and since most diseases associated with obesity are diseases that typically manifest themselves in older individuals, weight reduction efforts would be more cost effective and easier to implement on a population of twenty year olds than they would be on a population of forty year olds. Hence, not only should the determinants of overweight be examined, but, more specifically, the determinants of overweight in twenty year olds should be ascertained; in this way, the most cost effective and socially efficient methods for reducing obesity in the US may be determined.

Therefore, if it is more socially efficient to focus weight reduction efforts on the overweight rather than the obese, then it is important to identify those factors that are most closely related with being overweight. It is important to note that these factors may not necessarily be the same as those associated with obesity. By identifying these factors, public policies may be implemented that would reduce the number of overweight, thus reducing the number of obese individuals in the future, and lowering the overall social cost of obesity and overweight.

The purpose of the present study is to ascertain the determinants of both obesity and overweight among young adults. The present study differs from prior research in several ways. First, the present study will focus on young adults; few prior studies have examined obesity or overweight in this age group. Second, this study will use a data set not previously used for studying obesity or overweight: the National Longitudinal Survey of Youth (NLSY). Third, this study will ascertain not only the determinants of obesity, but also those of overweight. As noted above, an analysis of the determinants of overweight may provide guidance on how to curtail the rise in obesity that the United States is currently experiencing.

2. Literature Review

A plethora of prior research has been devoted to the topic of obesity. An excellent review of some of the earlier work in this area is Sobal and Stunkard (1989). Several of the more current and relevant studies are discussed below. Singh, et al., (2008) attempted to determine if there were relationships between socioeconomic, demographic, and behavioral characteristics and obesity among children in the US. Using data from the 2003 National Survey of Children's Health, the authors found that African-American and Hispanic low-income children (aged 10-17) who watched more than three hours of television a day were more likely to be obese than other children.

In Wang and Beydoun (2007), the authors examined many prior studies on obesity, extracted data from these studies, and estimated the prevalence of obesity and overweight in the US. In addition, they estimated several regressions for various sub-groups of the populations. These regressions, however, had as their only explanatory variable a year dummy variable; hence the effects of various socioeconomic factors on obesity and overweight were not estimated.

Ali and Lindstrom (2005) looked at young (18-34) Swedish women in order to determine the factors associated with being obese, overweight, and underweight. Using a sample of over 1900 persons, their results suggest that overweight and obese women were more likely to be unemployed, uneducated, smokers, had poor self-esteem, and had few social contacts.

Costa-Font and Gil (2004) examined Spanish data from 1998 in order to determine if social interactions and other socioeconomic factors had any role to play in the prevalence of obesity and overweight; this study's focus is somewhat similar to Ali and Lindstrom (2005). Looking at a data set with over 12,000 observations, the authors found that married men are more likely to be obese than others, while higher income men and older women were more likely to be overweight. In addition, they found that social interactions allowed people to compare themselves to one another and thus may actually reduce the likelihood of obesity.

Moreno, et al, (2004) examined Spanish data on children and teenagers to determine if socioeconomic status and certain environmental factors are related to overweight and obesity. Using a very large data set (over 100,000 individuals), the authors estimated several logistic regressions and found that lower maternal education levels, parental obesity, and lower socioeconomic status were all associated with a greater likelihood of being obese.

Other studies found positive relationships between obesity and the following factors:

(1) higher incomes and physical inactivity for African women (Kruger, et al.(2002))
(2) lower incomes and density of fast food outlets for Australians (Reidpath, et al. (2002))
(3) lower socioeconomic status for Swedish women (Wamala, et al. (1997)).

As can be ascertained from the above review, income, age, and physical activity have all been shown to be related to obesity. None of the above studies, however, examined young adults in the US, and few have attempted to determine the factors that affect not only obesity but also overweight.

3. Empirical Technique and Data

Using previous research as a guide, the following equation is estimated in the present study:

$$\begin{aligned} OB = {} & a_0 + a_1 INCOME + a_2\, MALE + a_3 HIGH + a_4\, COLLEGE + a_5 BLACK \\ & + a_6\, HISP + a_7\, MARR + a_8\, DIVORCE + a_9\, NORTH + a_{10}\, SOUTH \\ & + a_{11}\, WEST + a_{12}\, URBAN + a_{13}\, FRUIT + a_{14}\, VEGE + a_{15}\, EXER \\ & + a_{16}\, TV1 + a_{17}\, TV2 + a_{18}\, SLEEP + a_{19}\, SMOKE + a_{20}\, OB_{t-5} + a_{21} OV_{t-5} \end{aligned} \quad (5)$$

$$\begin{aligned} OV = {} & a_0 + a_1 INCOME + a_2\, MALE + a_3 HIGH + a_4\, COLLEGE + a_5 BLACK \\ & + a_6\, HISP + a_7\, MARR + a_8\, DIVORCE + a_9\, NORTH + a_{10}\, SOUTH \\ & + a_{11}\, WEST + a_{12}\, URBAN + a_{13}\, FRUIT + a_{14}\, VEGE + a_{15}\, EXER \\ & + a_{16}\, TV1 + a_{17}\, TV2 + a_{18}\, SLEEP + a_{19}\, SMOKE + a_{20} OV_{t-5} \end{aligned} \quad (6)$$

where OB equals one if person is obese; OV equals one if person is overweight; INCOME is total family income; MALE equals one if person is male; HIGH equals one if person graduated from high school; COLLEGE equals one if person graduated from college; BLACK equals one if person is African-American; HISPANIC equals one if person is Hispanic; MARR equals one if person is married; DIVORCE equals one if person is divorced; NORTH equals one if person lives in the Northern states; SOUTH equals one if person lives in the Southern states; WEST

equals one if person lives in the Western states; URBAN equals one if person lives in urban area; FRUIT equals one if person eats fruit more than once per day; VEGE equals one if person eats vegetables more than once per day; EXERCISE is the number of days a week person exercises more than 30 minutes; TV1 equals one if person watches 10 to 30 hours of TV per week; TV2 equals one if person watches more than 30 hours of TV per week; SLEEP is the average number of hours a person sleeps per night; SMOKE equals one if person smokes; OB_{t-5} equals one if person was obese five years earlier; and OV_{t-5} equals one if person was overweight five years earlier. All dummy variables equal zero if condition is not met. Logit regression models were used to estimate equations (5) and (6).

The reason for including both the obese and overweight lagged dummy variables in the obese regression, but only the overweight lagged dummy variable in the overweight regression is because it is much more likely that an individual who was obese or overweight five years earlier will be obese now, but it is much less likely for an obese individual to become overweight. In addition, the reason for using a five year lag is because it was felt that a one year lag may be more correlated with several of the other explanatory variables than would a five year lag variable.

The present study is one of the first studies on obesity and overweight to use as explanatory variables the obese and overweight status of the individual in an earlier time period. The reason for including these variables is to more completely isolate the effects of the various socioeconomic and demographic variables on obesity and overweight. If these lagged weight variables were not included, then the effects of the other explanatory variables may not be correctly estimated.

All data were obtained from the National Longitudinal Survey of Youth. The NLSY was constructed to be a nationally representative sample of the civilian non-institutionalized population at the time of the initial survey in 1979. A second survey with a different cohort was started in 1997. The 1997 NLSY consisted of 8,984 men and women between the ages of 12 and 16 Interviews with NLSY respondents are conducted annually, and retention rates have been relatively high, averaging over 90%. Each age-sex cohort is represented by a multi-stage probability sample drawn by the Bureau of the Census from a list of sampling areas that had been constructed for the Monthly Labor Survey. The NLSY employed extensive household interviews in the selected sampling areas in order to obtain as random and as representative a sample as possible. In the present study, data from the 2007 survey of the 1997 NLSY was used. After eliminating all cases with missing data, the final sample contained 4,946 individuals.

4. Results and Conclusions

Descriptive statistics are presented on Table 1. Results are presented on Tables 2 and 3. For the data used in the present study, the average BMI in 2007 was 27.26, the average BMI in 2002 was 25.39; 26.3 percent of the respondents were obese, and 31.6 percent were overweight. Other interesting statistics obtained from this data are as follows: 84.6 percent of individuals who were obese in 2002 were also obese in 2007; 52 percent of individuals who were overweight in 2002 were also overweight in 2007; 37.6 percent of individuals who were overweight in 2002 became obese in 2007; and 12.9 percent of individuals who were obese in 2002 became overweight in

2007. Hence, inclusion of the lagged obesity and overweight variables is supported by these descriptive statistics.

Regarding some of the more pertinent explanatory variables, only 13 percent of young adults ate more than one serving of fruit per day, and only 19.6 percent ate more than one serving of vegetables per day. People on average exercised for thirty minutes or more 2.5 days per week, 42 percent smoked, and only 5.5 percent watched more than 30 hours of television per week.

Regarding the results for the overweight regression (Table 2), married men earning high incomes are more likely to be overweight than others. In fact, men are 60 percent more likely to be overweight than women, and married people are 21 percent more likely to be overweight than single people. In addition, people living in the North were less likely to be overweight, while urban dwellers were more likely to be overweight. Finally, although the following result may be controversial, it appears that good habits, such as exercise and eating right, have very small or no statistically significant negative effect on the likelihood of being overweight.

Most statistically significant variables in the regression had very minor impacts of the likelihood of being overweight. One variable that had a very large effect on the likelihood of being overweight was the lagged overweight variable. A person who was overweight in 2002 is three times more likely to be overweight in 2007 than somebody who was not overweight in 2002, holding all other factors constant.

Results are somewhat different for the obesity regression. According to the results presented on Table (3), lower income African-American and Hispanic women who did not go to college and who are married are more likely to be obese than others. African-Americans are 25 percent and Hispanics 32 percent more likely to be obese than whites. Watching TV apparently has no effect on the likelihood of being obese, but eating fruit, exercising, and getting a good night's sleep all reduce the likelihood of being obese. Smoking also reduces the chance of being obese.

Finally, being obese or overweight in 2002 greatly increases the chances that an individual will be obese now. In fact, someone who was obese in 2002 is almost 118 times more likely to be obese than somebody who wasn't obese in 2002. Likewise, an individual who was overweight in 2002 is 13 times more likely to be obese in 2007. These results suggest that combating obesity and overweight early is the best way to reduce the epidemic rise in obesity and overweight in the US.

It is important to note that the factors that are associated with overweight are not the same factors that are associated with being obese. For example, higher income persons are more likely to be overweight but are less likely to be obese. Men are more likely to be overweight but less likely to be obese. Race has no relationship to overweight, but African-Americans and Hispanics are more likely to be obese. Healthy living habits, such as exercising and eating right, are not related to overweight but are related to obesity. Hence, in crafting public policies to reduce the rates of obesity and overweight in the US, care must be taken to target the appropriate populations and to intervene in appropriate ways.

Endnotes

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References

Ali, Sadiq Mohammad and Martin Lindstrom. 2005. "Socioeconomic, Psychosocial, Behavioral, Psychological Determinants of BMI Among Young Women: Differing Patterns for Underweight and Overweight/Obesity," *European Journal of Public Health*, 16 (3), 324-330.

Costa-Font, Joan and Joan Gil. 2004. "Social Interactions and the Contemporaneous Determinants of Individuals' Weight," *Applied Economics*, 36 (20), 2253-2264.

Kruger, H. S., Christina Venter, Hester Vorster, and Barrie Margetts. 2002. "Physical Inactivity is a Major Determinant of Obesity in Black Women In the North West Province, South Africa: The THUSA Study, *Nutrition*, 18 (5), 422-427.

Moreno, L.A., C. Tomas, M. Gonzalez-Gross, G. Bueno, J.M. Perez-Gonzalez, and M. Bueno. 2004. "Micro-environmental and Socioeconomic Determinants of Childhood Obesity, " *International Journal of Obesity*, 28 (1), 16-20.

Reidpath, Daniel, Cate Burns, Jan Garrard, Mary Mahoney, and Mardie Townsend. 2002. "An Ecological Study of the Relationship Between Social and Environmental Determinants of Obesity," *Health & Place*, 8 (1), 141-145.

Singh, Gopal, Michael Kogan, Peter Van Dyck, and Mohammad Siahpush. 2008. "Racial/Ethnic, Socioeconomic, and Behavioral Determinants of Childhood and Adolescent Obesity in the United States: Analyzing Independent and Joint Associations," *Annals of Epidemiology*, 18 (9), 682-695.

Sobal, Jeffery and Albert Stunkard 1989. "Socioeconomic Status and Obesity: A Review of the Literature," *Psychological Bulletin*, 105 (2), 260-275.

Wamala, Sarah, Alicja Wolk, and Kristina Orth-Gomer. 1997. "Determinants of Obesity in Relation to Socioeconomic Status Among Middle-Aged Swedish Women," *Preventive Medicine*, 26 (5), 734-744.

Wang, Youfa and May Beydoun. 2007. "The Obesity Epidemic in the United States – Gender, Age, Socioeconomic, Racial/Ethnic, and Geographic Characteristics: A Systematic Review and Met-Regression Analysis," *Epidemiologic Reviews*, 29 (1), 6-28.

Table 1
Descriptive Statistics

Variable	Mean	Minimum	Maximum
OB	0.263	0	1
OV	0.316	0	1
BMI	27.26	11.54	69.1
INCOME	59162	0	279104
MALE	0.501	0	1
HIGH	0.52	0	1
COLLEGE	0.292	0	1
BLACK	0.245	0	1
HISP	0.202	0	1
MARR	0.246	0	1
DIVORCE	0.048	0	1
NORTH	0.156	0	1
SOUTH	0.392	0	1
WEST	0.23	0	1
URBAN	0.814	0	1
FRUIT	0.129	0	1
VEGE	0.196	0	1
EXER	2.54	0	7
TV1	0.264	0	1
TV2	0.055	0	1
SLEEP	6.85	0	24
SMOKE	0.425	0	1
OB_{t-5}	0.205	0	1
OV_{t-5}	0.247	0	1

Table 2
Logit Regression Results
Overweight

Variable	Coefficient	Test Statistics	Odds Ratio
Constant	-1.627	-7.381***	
INCOME	0.0014	2.473**	1.0014
MALE	0.474	7.092***	1.61
HIGH	0.133	1.49	
COLLEGE	0.035	0.335	
BLACK	0.0454	0.525	
HISP	0.137	1.543	
MARR	0.190	2.492**	1.21
DIVORCE	0.127	0.845	
NORTH	-0.18	-1.67*	0.835
SOUTH	-0.0846	-0.972	
WEST	-0.0701	-0.707	
URBAN	0.169	1.951*	1.18
FRUIT	-0.0256	-0.241	
VEGE	-0.1027	-1.133	
EXER	0.0257	1.812*	1.03
TV1	0.168	2.314**	1.18
TV2	-0.212	-1.40	
SLEEP	-0.0137	-0.595	
SMOKE	-0.0717	-1.049	
OV_{t-5}	1.179	16.889***	3.25

n = 4946; log-likelihood = -2878.097
Significant at 10% level = *
Significant at 5% level = **
Significant at 1% level = ***

Table 3
Logit Regression Results
Obese

Variable	Coefficient	Test Statistics	Odds Ratio
Constant	-2.183	-7.107***	
INCOME	-0.00214	-2.391**	0.998
MALE	-0.295	-3.141***	0.745
HIGH	0.0613	0.502	
COLLEGE	-0.249	-1.706*	0.78
BLACK	0.229	1.948*	1.25
HISP	0.277	2.246**	1.32
MARR	0.337	3.202***	1.4
DIVORCE	-0.374	-1.753*	0.69
NORTH	-0.0816	-0.536	
SOUTH	0.0405	0.331	
WEST	0.042	0.296	
URBAN	-0.181	-1.521	
FRUIT	-0.331	-2.18**	0.72
VEGE	-0.104	-0.825	
EXER	-0.0612	-3.019***	0.94
TV1	-0.025	-0.244	
TV2	0.316	1.622	
SLEEP	-0.055	-1.763*	0.95
SMOKE	-0.236	-2.459**	0.79
OB_{t-5}	4.77	35.602***	117.92
OV_{t-5}	2.58	23.238***	13.2

n= 4946; log-likelihood = -1811.86
Significant at 10% level = *
Significant at 5% level = **
Significant at 1% level = ***