

Cohort Differences in the Relationship between Obesity and Morbidity: Is Educational Attainment Maintaining Its Protective Effect?

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Introduction and Background

Obesity in the United States has received extensive attention in recent years due to increased prevalence, as more than one third of American adults are considered obese (Ogden et al. 2012; Wang and Beydoun 2007). This statistic is alarming as obesity is a risk factor for the onset of disease and has a direct effect on health conditions (Crimmins 2004; Crimmins, Kim and Vasunilashorn 2010), including diabetes, hypertension, stroke, heart disease, arthritis, and certain cancers (Bray 2004; Calle and Thun 2004; Field et al. 2001; Krueger et al. 2004; Leveille, Wee and Iezzoni 2005; Mokdad et al. 2003; Must et al. 1999). Additionally, the obese tend to report more chronic conditions, and at least one serious illness such as cancer, diabetes, or heart disease, compared to the non-obese (Ferraro and Yu 1995). An increased risk of chronic conditions leads to an increased mortality risk, as obesity indirectly contributes to more than an estimated 100,000 additional annual deaths (Allison et al. 1999; Flegal et al. 2005). Conversely, despite increasing obesity rates and the subsequent risk of morbidity and mortality, the rates of mortality due to obesity-linked conditions have declined, except among the excessively obese (Al Snih et al. 2007; Reuser, Bonneux and Willekens 2009). Thus, it is likely that the number of years American spend living with morbid conditions is increasing.

Health in later life and its effect on society have become concerns of researchers across a variety of disciplines, as well as the medical and public health institutions. Two leading concerns regarding the health of the elderly, relevant to demographers, are the effects of increasing obesity rates and increasing levels of educational attainment compared to previous cohorts (Martin, Schoeni and Andreski 2010). While recent trends show improved health and disability among persons age 65 or older, the same improvements have not been found among the 40 to 64 population (Martin et al. 2010). Younger birth cohorts, relative to older birth cohorts, are experiencing higher rates of obesity at younger ages (Leveille et al. 2005; Reynolds and Himes 2007). Changes in obesity prevalence and its effect on the health of the current and future elderly are important to study, particularly due to compositional differences among birth cohorts.

Prior research has examined the relationship between obesity and various indicators of morbidity. However, a caveat of these previous studies is that they are difficult to compare as they measure different age groups at different time periods and do not similarly measure morbidity. Obesity is a risk factor for numerous health conditions, as previously noted in this extended abstract. Other studies have focused on the effect of obesity on subjective ratings of health status, primarily self-rated health status. The obese are less likely than the non-obese to report or rate their health status as excellent, very good, or good (Crimmins et al. 2010; Ferraro and Yu 1995; Mokdad et al. 2003). Self-rated health also tends to be highly correlated with morbid conditions (Ferraro and Yu 1995; Johnson and Wolinsky 1993).

Obesity is also linked to disability, a proxy for morbidity, as the obese are more likely to experience difficulty or limitations with various tasks than the non-obese (Al Snih et al. 2007;

Crimmins et al. 2010). Similarly, in a study of adults age 70 or older, Reynolds and McIlvane (2008) found the obese to have a greater likelihood of disability compared to the non-obese. Similar findings were reported by Reynolds, Saito, and Crimmins (2005). A cross-sectional study of adults age 55 or older conducted by Reuser, Bonneaux, and Willekens (2009) found that obesity expanded the number of years spent with disability, but did not increase the likelihood of mortality. Alley and Chang (2007) used the National Health and Nutrition Examination Survey (NHANES) to compare the effect of body mass on disability among persons aged 60-75. Their results indicated that the likelihood of disability was greatest among the obese, and the probability of disability increased among the obese between the two time points observed in their analysis (Alley and Chang 2007).

Because people change over time and are differentially exposed to risk over the life course, the proposed research aims to investigate cohort differences in the relationship between obesity and morbidity. Due to the expected growth in the number and proportion of persons aged 65 or older, as well as the links between age and morbidity and obesity, the focus of this research is among adults aged 51 or older. Including adults who have not yet reached age 65 captures potential risks that the future elderly might face. Using data from all ten waves of the Health and Retirement Study (HRS), this research project seeks to answer the following research questions: 1) how does obesity shape morbidity over time, net of time variant and time invariant controls?; 2) how does the relationship between obesity and morbidity vary across cohorts?; and 3) how has educational attainment altered the relationship between obesity and morbidity across cohorts?

To my knowledge, no previous study of this nature exists. This research advances the literature in three ways. First, this research uses longitudinal data to understand the relationship between obesity and morbidity. Previous studies of the relationship between obesity and morbidity tend to be cross-sectional, thus changes in the effect of obesity and other body mass categories on morbidity over time are not captured. Himes (2000), Alley and Chang (2007) and Reuser et al. (2009) specifically note the importance of a longitudinal analysis to examine age and cohort differences in the effect of obesity on morbidity, particularly due to increasing prevalence of obesity among older persons.

Second, this research seeks to understand how the relationship between obesity and morbidity differs across cohorts. Martin and colleagues (2010) note that changing trends in obesity may explain changing trends in morbidity.

Third, this research investigates if the protective effect of education on health is weakening among subsequent cohorts given the relationship between obesity and morbidity. Higher educational attainment has been linked to better self-rated health and lower levels of morbidity (Farmer and Ferraro 2005; House, Kessler and Herzog 1990; Schoeni, Freedman and Wallace 2001). Likewise, the highly educated are also less likely to become obese (Botoseneanu and Liang 2011; Ferraro and Yu 1995) and more likely to undertake positive health behaviors, such as regular physical activity or nutritionally-balanced diets (Ferraro and Yu 1995; Ross and Wu 1995). Yet, increasing levels of educational attainment may alter the effect of obesity on morbidity (Alley and Chang 2007).

Methods

Data are obtained from the Health and Retirement Survey (HRS), a nationally representative longitudinal sample of adults age 51 or older and their spouses. To date, the HRS has collected 10 waves of data, representing several birth cohorts than span the turn of the 20th

century to the middle baby boomers. Combining the various waves of the HRS allows for a longitudinal exploration for the causal effects of obesity on morbidity (Himes 2000).

There are a number of advantages in using the HRS. The HRS collects data on a number of health topics, has relatively high response rates (more than 85% across all waves and cohorts), and has relatively low attrition among living respondents. The HRS is also fairly representative of the nursing home population as some respondents moved to nursing homes after their baseline interview. These respondents have been retained in the study when possible.

Three indicators of morbidity—health conditions, disability, and self-rated health status (SRH)—are used in the analysis as body mass may differentially influence each measure. The relationship between the various indicators of morbidity is complex and not necessarily consistent. Regardless, each indicator of morbidity has been found to be a proxy for morbidity as each reflects the incidence of disease, illness, or sickness in a population. Health conditions rely on yes or no responses to a series of questions beginning with “*Has a physician ever told you...*”, followed by a checklist of specific conditions. An index of 13 health conditions will be included in the analyses. As each condition will be a separate variable coded as 1 for yes or 0 for no, the index will consist of the sum of the thirteen indicators. Index scores will range from 0 to 13.

Disability in this study will be an index of the difficulty in performing five activities of daily living (ADLs) tasks. Scores will range from 0 (indicating no difficulty in performing any of the five tasks) to 5 (indicating any difficulty in performing each of the five tasks).

SRH is based on responses to a single survey question where respondents are asked to rate their health on a five-point scale as excellent (coded as 1), very good (coded as 2), good (coded as 3), fair (coded as 4), or poor (coded as 5).

Individual body mass is assessed by the body mass index (BMI) statistic, measured as the weight in kilograms divided by the square of height in meters. Cut-off points of BMI primarily differentiate between four weight groups—underweight (BMI<18.5), normal weight (18.5-24.9), overweight (25.0-29.9), and obese (≥ 30.0). Beyond these four classifications, obese may be further differentiated to identify extreme obesity. This research will further differentiate obese into three weight groups—obesity I (30.0-34.9); obesity II (35.0-39.9); and extreme obesity (≥ 40.0). It is important to examine the differences in the effects of these obesity classifications on morbidity as previous research has indicated that extreme obesity is more strongly associated with poor health and health outcomes (Sturm and Wells 2001).

A number of demographic, socioeconomic, psychosocial, and health behavior covariates will be included in the analysis, as these variables indicate differences in associated risks of high BMI and morbidity. Demographic factors include age, sex, and race/ethnicity. Socioeconomic factors include years of schooling, household income, home ownership, employment status, and occupation. These variables, except years of schooling, will be treated as time variant in the analysis. Psychosocial factors include marital status, number of living children, living alone, and frequency of religious attendance. Two health behaviors—smoking and physical activity—are included in the analysis. The psychosocial factors and health behaviors included in the analysis will be treated as time variant in the analysis.

The analytical strategy consists of a longitudinal analysis of the effect of obesity on morbidity. Specifically, I investigate how the effect of obesity on morbidity changes over time, how the effect differs by birth cohort, and how the effect differs by birth cohort as stratified by educational attainment. To address the aims of this study, latent growth curve modeling (LCGM), a type of structural equation model, will be used. There are several benefits of using

LCGM. First, LCGM allows the simultaneous analysis of multiple waves of data (Bollen and Curran 2006). Second, it allows for the study of change over time within and between individuals and groups, thus analyzing change that occurred between survey administrations (Bollen and Curran 2006). Finally, the assumptions regarding linearity found in regression analyses are not required (Bollen and Curran 2006).

To examine age-specific cohort differences on the relationship between obesity and morbidity, the data will be restructured to make age, rather than wave of data, the time variable. Cohort dummy variables will be created to allow for testing of cohort differences. Due to differences in age at the time of inclusion in the survey, three cohorts included in the HRS (i.e., the original HRS cohort, the War Baby cohort, and the Early Baby Boomer cohort) will be analyzed between the ages of 51 and 62, and three cohorts (i.e., the original HRS cohort, the AHEAD cohort, and the children of the Depression Age cohort) will be analyzed between the ages of 70 and 80.

Another test for group differences involves stratifying the sample by educational attainment in order to assess how differing levels of education shape the mean levels and rates of changes for obesity and morbidity. Four education groups will be assessed: less than a high school degree or less than 12 years of formal education; a high school degree or 12 years of formal education; some college or 13 to 15 years of formal education; and bachelor's degree or greater or 16 or more years of formal education.

Implications

The results of this research offer several potential theoretical implications of aging, health behaviors, health conditions, and health disparities. First, as the prevalence of obesity increases among younger cohorts, the effect of obesity on health outcomes may be similar to that of overweight and normal weight, particularly for the moderately obese. Second, despite higher levels of educational attainment among younger cohorts relative to older cohorts, increases in the prevalence of obesity may reduce the protective effect of education on health over time. Trajectories of morbidity for the highly educated obese may be similar to those of the highly educated normal weight and overweight. Third, increases in the prevalence of obesity may imply changing social norms regarding body weight, while higher mean levels of morbidity and changing trajectories of morbidity may suggest changing social norms regarding illness, sickness and disability. Methodological implications include the enrichment of research methodologies regarding obesity and morbidity, particularly due to the use of time varying measures in the analysis. Policy implications of the results may suggest that younger cohorts possess better knowledge regarding the social and behavioral links to health outcomes in order to develop appropriately targeted interventions. Additionally, the results may also have implications for the potential need of health care resources and increases in health care expenditures, particularly as the American population ages.

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