DRAFT: PLEASE DO NOT CITE WITHOUT AUTHORS' PERMISSION

A Longitudinal Analysis of Body Mass Index by Individual and Neighborhood level Race and SES Characteristics*

Erin Ruel

Georgia State University

Eric N. Reither

Utah State University

Stephanie A. Robert

University of Wisconsin-Madison

Paula M. Lantz

University of Michigan

*Paper prepared for the 2008 Population Association of America Conference, New Orleans, LA.

ABSTRACT

In this investigation, we examine changes in body mass index (BMI) over time in a sample of US adults, and also explain inter-individual changes in BMI over time as a function of individual-level race and SES and neighborhood-level race and SES. We use the Americans Changing Lives longitudinal study (1986-2002) merged with census tract data to estimate growth curve models that examine BMI trajectories over time, separately for men and women. Preliminary results show that BMI increases over a 16-year span, and that the differences in BMI increase between individuals over time for both men and women. There are no racial differences in BMI at baseline or over time for men. For women, blacks have a greater average BMI at baseline, but follow BMI trajectories that are not significantly different than whites. Individual level SES is a strong predictor of baseline BMI and growth in BMI for men, but less so for women.

INTRODUCTION

Obesity is on the rise in the United States. Obesity is a major health concern because it is linked to type 2 diabetes, cardiovascular disease, and some forms of cancers (Manson, Skerritt & Willet 2003). Also of great concern are racial and ethnic disparities in the prevalence of obesity. African Americans, particularly African American women, are more likely to be obese than whites or white women (Flegal, Carroll, Ogden & Johnson 2002; Harrell & Gore 1998). Furthermore, social and cultural factors are strongly associated with obesity, which suggests that it is possible to intervene and halt the rise in obesity. Consequently, there has been a recent wave of research examining the effects of individual level SES, neighborhood level SES, and even racial residential segregation on obesity.

However, most of these studies use cross-sectional data which means they cannot investigate intra-individual changes in obesity over time. Nor can they explain, causally, reasons for the inter-individual changes in obesity over time. In this paper we examine how obesity (as measured by body mass index or BMI) develops over time separately for men and women. We describe intra- and inter-individual changes in obesity over time, and examine causes of the growth and disparities in obesity. We are especially interested in the determinants of racial differences in the growth of BMI over time. We use four waves of the Americans Changing Lives (ACL) survey and random effects modeling (growth curve analyses) to explain the rise in BMI both within individuals and across individuals.

BACKGROUND

Robert and Reither (2006), in a cross-sectional study, demonstrate that racial disparities in obesity have both within-community variation and across-community variation. They find that disparities in obesity between black and nonblack women can be partly explained by controlling for individual-level and community-level SES attributes. However, racial disparities in obesity remain large and significant, even after controlling for health behaviors such as smoking, exercising, financial stress and social support.

Chang (2006) examines the effect of racial residential segregation on obesity and overweight. She argues that extreme levels of segregation could produce inequities in the levels and types of amenities found in white and black neighborhoods. Chang finds that the Isolation index is positively associated with BMI, net of controls, in a nationally representative cross-sectional study. This means that minority residents of more segregated neighborhoods have higher average levels of BMI.

DATA AND METHODS

We use individual-level data from the four waves of Americans' Changing Lives (ACL) surveys 1986, 1989, 1994, and 2001/2 (House 2007). The ACL is a multistage, stratified area probability sample of the non-institutionalized population age 25 years or older, including an over-sample of blacks and older adults, living in the coterminous United States, and consists of 3,617 respondents in wave 1 (House 1989). The response rate for wave 1 is 70 percent. In wave II,2, the ACL had an 82 percent response rate for surviving wave 1 respondents for an n of 2,867, Wave 3 has a response rate of approximately 81 percent for an N of 2,348. Wave IV4 has an n of 1,787 for a 76 percent response rate of among the surviving respondents.

Census tract data come from U.S. census extract files for 1980, 1990 and 2000 (Adams 1992). Census tracts, on average, contain about 4,000 residents, but can range from 2,500 to 8,000 residents. We use census tracts as proxies for neighborhoods because a geographic definition of neighborhood works well for issues of racial residential segregation. Census tracts were created originally to be homogeneous in terms of various population and socioeconomic characteristics and living conditions (US Census Bureau 2000). We matched 1980 census data with the 1986 wave, 1990 census data with waves 2 and 3 and 2000 census data with wave 4.

Measures

Our dependent variable is Quetelet body mass index (BMI) which is calculated by dividing self-reported weight by self-reported height squared (kg/m^2). BMI is measured at all four waves. Time is measured as 0 for 1986 to establish our baseline; subsequent waves are measured as deviations from baseline in years. Thus, the 1989 wave is captured by time=3, the 1994 wave is captured by time=8, and the 2006 wave is captured by time=16. We create time squared in order to capture nonlinear growth in BMI. We include age, centered on its mean as a non-time-varying covariate. Its purpose is to capture the differences in BMI due to age differences among the sample at baseline. We create three race dummy variables for white (reference category), black, and other race. Education is measured at baseline as years of educational attainment. Family income is measured as a time varying covariate, and is log transformed. Assets are measured as a set of time-varying dummy variables for having assets, not having assets (the reference category) and missing on assets. Marital status is measured by a dummy variable for married (1) versus not married (0) and is allowed to vary over time.

Our neighborhood SES and racial composition variables are all time-varying except that we map 1990 census variables to both the 1989 and the 1994 waves of ACL data. Research has

shown neighborhoods do change over time and 1980 is much more distal to 1989 than is 1990. We replicate Chang's (2006) cross-sectional study by examining racial residential segregation using the Isolation index. The Isolation index measures the probability that a minority group member will come into contact with a majority group member. Based on work by Robert and Ruel (2006) and Ruel and Robert (under review), we believe that neighborhood racial composition is a more important measure of segregation in the multilevel context and thus we include tract-level percent black as a time varying covariate.

Neighborhood level SES is constructed as a neighborhood disadvantage scale, which sums the percent of households receiving public assistance, percent adult unemployment, and median household income (reversed).

RESULTS

Preliminary results show that BMI increases over a 16-year span, and that the differences in BMI increase between individuals over time for both men and women. There are no racial differences in BMI at baseline or over time for men. For women, blacks have a greater average BMI at baseline, and a slightly lower level of increase in BMI over time but the increase is not significant. Individual level SES is a strong predictor of baseline BMI and growth in BMI for men, but less so for women. Our next stage is to model our neighborhood-level variables as well. Although this research is in its formative stages, we are intrigued by the initial results. Also, while we have only produced preliminary work to date, we are confident of our ability to complete this investigation well in advance of the PAA meetings.

REFERENCES

Adams, T. K. (1992). *Census of population and housing, 1980 (United States): Extract data*. Ann Arbor, MI: Economic Behavior Program, Survey Research Center, University of Michigan; distributed by ICPSR, Ann Arbor, MI.

Chang, Virginia W. 2006. "Racial Residential Segregation and Weight Status among US Adults." *Social Science & Medicine* 63:1289-1303.

Flegal, K. M., M.D. Carroll, L. Ogden, and C.L. Johnson. 2002. "Prevalence and Trends in Obesity among US Adults." *JAMA*, 288 1723-1727.

Glass, Thomas A., Meghan D. Rasmussen, and Brian S. Schwartz. 2006. "Neighborhoods and Obesity in Older Adults: The Baltimore Memory Study." *American Journal of Preventive Medicine*, 31:455-463.

Harrell, J.S. and S.V. Gore. 1998. "Cardiovascular Risk Factors and Socioeconomic Status in African American and Caucasian Women." *Research in Nursing and Health*, 21:285-295.

House, James S. **Americans Changing Lives: Waves I, II, III, and IV**, 1986, 1989, 1994 and 2006. [Computer file]. ICPSR04690-v2. Ann Arbor, MI University of Michigan, Institute for Social Research, Survey Research Center [producer], 2006. Ann Arbor, MI: Inter-University Consortium for Political and Social Research [distributor], 2007-04-12.

Manson, J.E., P.J. Skerrett, and W.C. Willett. 2002. "Epidemiology of Health Risks Associated with Obesity." In C. G. Fairburn and K.D. Brownell (Eds.), *Eating Disorders and Obesity: A Comprehensive Handbook* (2nd. Edition) (pp422-432). New York: The Guildford Press.

Robert, Stephanie, A. and Eric N. Reither. 2004. “A Multilevel Analysis of Race, Community Disadvantage, and Body Mass Index Among Adults in the US.” *Social Science & Medicine* 59:2421-2434.

Robert, S.A. & Ruel E. (2006). “Racial Segregation and Health Disparities Between Black and White Older Adults.” *Journal of Gerontology.*

World Health Organization. 2000. “Obesity: Preventing and Managing the Global Epidemic.” Report of a WHO Consultation. *Technical Report Series 894*.