Race and Gender Differences in Overweight and Obesity Over the Life Course

Obesity has become an epidemic in the U.S. Although rates of obesity have increased for all groups in society, individuals of low socioeconomic status and African Americans are disproportionately affected. Race disparities in obesity are especially pronounced among women. In 1999, 50% of African-American women were obese, compared to 28% of White women (Flegal et al. 2002). Research also indicates that obesity changes over the adult life course in a curvilinear fashion, increasing through middle-age and then decreasing at later stages of the life course. Although life course stage forms an important context through which social structural conditions impinge on the individual well-being and health, it has rarely been investigated as a moderator of race and gender differences in obesity. The central focus of this study is to determine whether race disparities (African-Americans compared to whites) in obesity and overweight status change over the adult life course and whether life course variations in the race gap in obesity differ for men and women.

There are several reasons to expect that the race disparity in obesity will change over the life course. Research on general health disparities indicates that social disadvantage increases vulnerability to health risks that affect the general population. Thus, if rates of obesity are generally greatest for middle-aged adults (due in part to age-related metabolic changes, but also to changes in life style), we might expect to see the greatest race disparities in obesity (especially among women) at this life course stage. Second, emerging research and theory on the links between the life course perspective and the social stress model (Pearlin and Skaff 1996) suggest that life course differences in exposure and vulnerability to stress may have implications for the life course trajectory of racial disparities in obesity, especially among women.

Decades of research firmly establish the negative health consequences of stress and an established body of research in the biomedical sciences indicates that stress is associated with neuroendocrine changes that can lead to weight gain (Van Doornen et al. 1987; Frankenhauser 1983). Stress can also lead to negative health behaviors such as substance/alcohol abuse, smoking, and a lack of exercise (Steptoe et al. 1998), further increasing the risk of obesity. A central tenet of the social stress model is that socially disadvantaged individuals are more likely to encounter stressful life circumstances. Other evidence suggests that gender differences in stressful life circumstances are greatest at mid-life, with women experiencing substantially more stress at mid-life than men (Mirowsky 1996). If this is true, and similar race disparities in obesity also occur at mid-life, we would expect to see especially pronounced racial disparities in obesity at this life course stage. Thus, the second goal of this research is to explore the extent to which life course variations in Black-White differences in obesity among men and women reflect race differences in the life course trajectories of stress.

Hypotheses

1. Differences in rates of obesity and overweight between African-American and white adults are greatest at mid-life.
2. The extent to which race disparities in obesity and overweight change over the life course is especially pronounced among women.
3. Race differences in exposure to stress change over the life course. The difference is most pronounced at mid-life, especially among women.

4. Life course, race, and gender variations in exposure to stress partly explain the observed life course trajectory of race disparities in obesity among men and women.

Data and Analysis

Data are from Waves 1 through 4 of the American's Changing Lives Survey (ACL). The ACL is a nationally representative three-wave panel survey of individuals, aged 24-96 in 1986 in the contiguous United States. The survey was designed to assess issues of health, productivity, stress, and social relationships over the life course. The original sample interviewed in 1986 was obtained using multistage stratified area probability sampling with an oversample of African-Americans. Face-to-face interviews were conducted in 1986 (Total n=3,617; African-American n=1,174; non-Hispanic white n=2,323), 1989 (n=2,867), 1994 (n=2,398), and 2000 (n=1,758).

The data from the four waves are pooled to create a cross-sectional time series with up to four records per individual. Fixed- and random-effects models are used to test the central hypotheses of the study. All models are estimated using Stata 9.0 SE and standard errors are adjusted for design effects.

Measures

Obesity. The standard definition of obesity is a body mass index (BMI, which is the body weight in kilograms [kg] divided by the height in meters squared [m^2]) greater than or equal to 30 kg/m. Overweight status is defined as a BMI greater than or equal to 25 kg/m. Although we explore different models that separately predict overweight status/not obese and obesity, our final analysis employs a dichotomous measure of overweight status coded 1 if the respondent has a BMI greater than or equal to 25 kg/m (i.e., the respondent is overweight or obese). The ACL relies on self-reports of body weight and height.

Sociodemographic Variables. *Race* is measured with a dichotomous variable coded 1 for African-American and coded 0 for Whites. Due to small sample sizes for other racial categories, the analysis is restricted to African-Americans and Whites. *Age* is measured in years and centered at age 24 (the youngest age in the sample). Quadratic and cubic transformations of age are included in some analyses to model curvilinear changes in obesity over the life course. *Gender* is measured with a dichotomous variable coded 1 for women and 0 for men.

Stress: Leading stress researchers emphasize the importance of considering stressful life events and chronic sources of stress in one measure of cumulative stress burden (Turner, et al., 1995). Our stress burden measure reflects seven recent life events and five potential sources of chronic stress in various life domains. We consider significant life events that occurred in the three years prior to Time 1 and in the periods between subsequent data collections: death of a significant other, provide or arrange care for impaired person, involuntary job loss, birth of a child, residential move, life threatening illness or injury, and death of a parent. We consider whether study participants experienced on-going stress in the following domains: parental role, finances, job, and care provider strain. In creating the stress burden measure, we first dichotomized all life event variables. These measures are coded 1 to reflect whether the life event occurred in the three years prior to the Time 1 interview or in the periods between subsequent data collections and 0 if the event did not occur during that time period. Next, we standardized the life event variables and the chronic stress variables. We then summed the standardized life event variables and the standardized chronic stress variables. Standardization ensures that the measures are weighted equally (see Turner, et al., 1995). The final adult stress burden measure is standardized and has a mean of 0 and a standard deviation of 1 at each wave.

Additional Control Variables. We control for a range of factors that may influence body weight. *Pregnancy status* is measured with a dichotomous variable that indicates whether a woman was pregnant at each interview wave. *Education* is measured as total years of education received. *Income* is measured as total annual household income in dollars. A regression procedure was used to impute missing values of income. *Employment status* is measured at each wave with a dichotomous variable that indicates whether the respondent is currently working for pay. *Marital status* is measured at each wave with a series of 5 dummy variables that compare respondents who are currently: (1) separated, (2) divorced, (3) widowed, (4) never married and cohabiting, or (5) never married and not cohabiting with the comparison group of currently married individuals.

Preliminary Results

We estimate logistic regression analyses to examine whether race disparities in overweight status differ over the life course (age). Because prior research suggests that the race disparity in obesity is especially pronounced among women, we estimate separate models by gender. Results are summarized in the left panel of Table 1 for women and in the right panel of Table 1 for men. In each panel, the base model with no interaction terms is presented in Model 1. Several functional forms of age were examined in preliminary models to determine which fit had the best fit to this model and to the model estimating the interaction of race with age in predicting overweight/obese status. A range of additional control variables were included in these models but are not shown in the table. These include income, education, parental status (the number of minor children living in the home and the number living elsewhere), employment status, pregnancy status, The results in Model 1 for women confirm prior research indicating substantial Black-White differences in body weight. African-American women are substantially more likely to be overweight or obese than their White counterparts. However, among men, we find no significant race difference in the likelihood of being overweight or obese.

In Model 2 we test the central hypothesis of the study by entering interactions terms representing the interaction of race with each component of the age variable. Different functional forms of the age variable and their interaction with race were explored before arriving at Model 2 for women. We see here that, among women, disparities between African-Americans and Whites do vary over the adult life course in a complex pattern. The interaction of race with each component of the age trajectory is significant.

To facilitate interpretation of the results in Model 2 of Table 1, we constructed a graph of the adjusted predicted probabilities of being obese and overweight at multiple ages within the range of the data for African-American and White women. The value of all control variables were set at their means. As shown in Figure 1, among both White women and African-American women, age is curvilinearly associated with the probability of being obese or overweight over the life course, with the probability increasing with advancing age at earlier stages of the life course but then declining after about mid-life. At every age, African-American women are substantially more likely to be obese or overweight than their White counterparts.

Race differences in these trajectories also suggest that African-American women reach their peak probability of being obese or overweight at a much earlier age (approximately age 45) compared to White women who reach a peak at about age 57. This appears to reflect the fact that the age-related rate of increase in the probability of being obese or overweight early in the life course is much more steep for African-American compared to White women. The result of these patterns is that, consistent with our hypothesis, race differences in obesity among women are greatest in mid-life, although the largest gap is seen relatively early in the mid-life period, around age 40-45.

In contrast to the results for women, we find no evidence of race differences in obesity, even after exploring a range of functional forms of the age variable and its interaction with race. Thus, although past research has indicated that race disparities in obesity are especially pronounced among women, we find that they are confined to women.

In Model 3, we enter in our measure of global stress to examine its contribution to explaining the life course pattern of race disparities in obesity and overweight among women. We do not estimate this model for men because there was no race or life course variation in obesity observed in Models 1 and 2. Controlling for stress exposure reduces the coefficients for the interaction of race with each component of the age trajectory to nonsignificance. This suggests that differences between African-American and White women in the life course trajectory of stress exposure may partly explain their different life course trajectories in the probability of being obese or overweight. An alternative is that Black and White women differ in the extent to which vulnerability to stress (i.e., its impact on obesity) changes over the life course. We are exploring these alternative explanations in our ongoing work. The final paper will include analyses of: (a) race differences in exposure to stress over the life course and (b) race differences in the effect of stress on obesity/overweight over the life course (stress*age*race). It is important to note, however, that the main effect of race on the probability of being obese or overweight is only slightly reduced and remains significant after controlling for stress exposure. Thus, although stress exposure may have utility for explaining why the life course trajectories of obesity/overweight differ for Black and White women, it offers little to the explanation of the general Black-White disparity in obesity.

DISCUSSION and LIMITATIONS to be added

Table 1. *Logistic Regression Estimates from Random Effects Models Predicting Overweight/Obesity by Gender* [a]

	Women			Men	
	Model 1	Model 2	Model 3	Model 1	Model 2
African American (White=0)	1.671	1.452	1.443	0.186	-0.388
	(0.151)***	(0.554)**	(0.565)*	(0.198)	(0.700)
Age (centered at age 24)	0.175	0.138	0.147	0.115	0.109
	(0.032)***	(0.041)***	(0.042)***	(0.040)	(0.046)*
Age-Squared	-0.003	-0.002	-0.002	-0.002	-0.002
	(0.001)**	(0.001)	(0.001)	(0.001)	(0.002)
Age-Cubed	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Interactions					
African-American X Age	---	0.111	0.099	---	0.030
	---	(0.006)*	(0.065)	---	(0.087)
African-American X Age-Squared	---	-0.004	-0.003	---	-0.000
	---	(0.002)*	(0.002)	---	(0.003)
African-American X Age-Cubed	---	0.001	0.000	---	-0.000
	---	(0.000)*	(0.000)	---	(0.000)
Global Stress Exposure			0.174		
			(0.057)**		
Constant	-1.485	-1.234	-1.290	-0.839	-0.740
	(0.442)	(0.494)*	(0.503)**	(0.516)	(0.537)
N (observations)	5,973	5,973	5,973	3,400	3,400

Notes: [a]Model also controls for the T1 values of income, education, employment status, marital status, the number of minor children the respondent has living at home, the number of minor children R has who live elsewhere, and whether a female R is currently pregnant.

****p* <= .001. ***p* <= .01. **p* <= .05 (two-tailed tests); robust standard errors in parentheses.

FIGURE 1: Predicted Probability of Being Obese or Overweight Among Women by Race and Age