

# Life-Course Socioeconomic Position and Obesity in African American Women: The Pitt County Study

Sherman A. James, PhD, Angela Fowler-Brown, MD, MPH, Trevillore E. Raghunathan, PhD, and John Van Hoewyk, PhD

Obesity is an increasingly prevalent condition in the United States, particularly among African American women, who currently have the highest prevalence of obesity of any US demographic group. According to the 1999–2002 National Health and Nutrition Examination Survey, 49% of African American women are obese, compared to 38.4% of Mexican American women and 30.7% of White women.<sup>1</sup> The development of obesity is multifactorial, resulting from an interaction between an individual's genetic makeup and his/her health behaviors (e.g., diet, physical activity, smoking), with the latter being strongly patterned by one's access to both individual and neighborhood-level socioeconomic resources over the entire life course.<sup>2–6</sup>

Indeed, a life-course perspective on the problem of adulthood obesity is receiving increased attention from public health researchers in Europe,<sup>6–9</sup> the United States,<sup>10</sup> and Latin America,<sup>11</sup> with most studies indicating that low SEP in childhood, like low SEP in adulthood, is associated with increased risk for adulthood obesity. A life-course perspective on socioeconomic conditions and obesity would seem to be especially important in the case of African American women, a group known to be at increased risk for lifelong poverty<sup>12,13</sup> as well as for adulthood obesity.<sup>1,14</sup>

To date, however, inconsistent findings characterize the handful of studies investigating the association between childhood SEP and future risk of obesity in African American women. For example, in a study from the National Longitudinal Survey of Youth,<sup>15</sup> researchers found that parental education was inversely associated with risk of adulthood obesity in African American women. Another study of African American and White adults in 4 US cities found that for White women, but not African American women, parental education was inversely associated with mean body mass index (BMI), independent of adulthood SEP.<sup>10</sup> A Philadelphia-based study that

**Objectives.** We studied obesity in African American women in relationship to their socioeconomic position (SEP) in childhood and adulthood.

**Methods.** On the basis of parents' occupation, we classified 679 women in the Pitt County (North Carolina) Study into low and high childhood SEP. Women's education, occupation, employment status, and home ownership were used to classify them into low and high adulthood SEP. Four life-course SEP categories resulted: low childhood/low adulthood, low childhood/high adulthood, high childhood/low adulthood, and high childhood/high adulthood.

**Results.** The odds of obesity were twice as high among women from low versus high childhood SEP backgrounds, and 25% higher among women of low versus high adulthood SEP. Compared to that in women of high SEP in both childhood and adulthood, the odds of obesity doubled for low/low SEP women, were 55% higher for low/high SEP women, and were comparable for high/low SEP women.

**Conclusions.** Socioeconomic deprivation in childhood was a strong predictor of adulthood obesity in this community sample of African American women. Findings are consistent with both critical period and cumulative burden models of life-course socioeconomic deprivation and long-term risk for obesity in African American women. (*Am J Public Health.* 2006;96:554–560. doi:10.2105/AJPH.2004.053447)

followed a group of African Americans from birth to young adulthood likewise failed to observe an inverse association between maternal education and adult adiposity.<sup>16</sup> Finally, although associations between intergenerational social mobility or the movement from one SEP level in childhood to another in adulthood have been studied in European populations,<sup>7,8</sup> we found no similar studies of African Americans. Given the growing public health interest in how socioeconomic deprivation over the life course might accelerate deterioration in health by early/middle adulthood and the limited research of this kind focusing specifically on the excess risk for obesity in African American women, additional studies are clearly needed.

Our aims were 2-fold: (1) examine the independent associations between childhood and adulthood SEP and risk for obesity in adulthood in a community probability sample of southern, African American women and (2) examine the degree to which the trajectories of obesity risk initiated in childhood are altered by differential changes in women's

relative access to socioeconomic resources between childhood and adulthood.

## METHODS

### Study Participants

Data for this study came from the 2001 follow-up interviews of participants in the Pitt County Study, a community-based, prospective investigation of risk factors for hypertension and related disorders in African Americans who were aged 25 to 50 years in 1988, the baseline year. Because a major objective of the Pitt County Study was to investigate differential risk for hypertension between working-class and middle-class African Americans, individuals residing in middle-class neighborhoods were oversampled. The baseline sample, the sampling strategy, and the content of the baseline household interview are described elsewhere.<sup>17,18</sup>

Of the 2225 race- and age-eligible individuals, 1773 (661 men and 1112 women), or 80%, were interviewed in 1988. In 2001, the cohort was reinterviewed to obtain information

on the individuals' social and economic resources from early childhood to the date of the interview. The goal was to link this information on socioeconomic resources to major cardiovascular disease risk factors, such as hypertension, obesity, and cigarette smoking, as recorded in 1988.

Interviews in 2001 were sought with all cohort members believed to be alive, noninstitutionalized, and residing within a 100-mile radius of Greenville, the county's principal city. Of the 1540 individuals (543 men and 997 women) meeting these criteria, 1221 (428 men and 793 women; 79%) were reinterviewed. Of these, 43 were excluded because of significant discrepancies in birth year ( $\geq 2$  years) or height ( $\geq 2$  inches) when comparing 1988 and 2001 values. These exclusions resulted in 1178 individuals (418 men and 760 women), or 77% of the 1540 targeted interviews. This report focuses on the women respondents.

### Measurement of Obesity

In 1988, trained interviewers measured weight (in pounds) with a balanced scale after study participants removed their shoes and heavy clothing. Participants' height to the nearest inch was measured with a vertical ruler; BMI was computed as weight (in kilograms) divided by height (in meters), squared.<sup>19</sup> In keeping with Centers for Disease Control and Prevention guidelines,<sup>20</sup> the following BMI cutpoints were used to characterize the sample: obese (BMI  $\geq 30.0$ ), overweight (BMI = 25.0–29.9), normal weight (BMI = 18.5–24.9), and underweight (BMI  $< 18.5$ ).

### Measurement of Childhood SEP

Data to measure childhood SEP were obtained with the assistance of a computerized Event History Calendar (EHC). This methodology enhances recall of information stored years or decades in the past by using more easily remembered events (e.g., where one lived and with whom at specific points in time) to stimulate the recall of events less easily remembered.<sup>21–23</sup> Study participants were asked to provide a brief description of the main job held by their family's primary earner during their childhood years, which, in the current study, refers to the period between birth and 13 years of age. The primary earner could be the respondent's

biological parent, grandparent, or a biologically unrelated person. Each job description was coded to fit 1 of 9 categories of the 1990 Census Occupational Classification: 1 = managerial and professional; 2 = technical, sales, and administrative support; 3 = protective services (including military); 4 = farm owners; 5 = precision production, craft, and repair; 6 = service occupations for private households; 7 = service occupations, except protective and households; 8 = operators, fabricators, assemblers, and laborers; and 9 = farm laborers. No code exists for "homemaker." In the case of 2 salaried working parents, the higher occupational rank, irrespective of gender, was used.

These 9 job categories were subsequently collapsed into 2 broad categories: skilled (codes 1–5) versus unskilled (codes 6–8) or farm laborer (code 9), and designated high and low childhood SEP, respectively. Childhood SEP could not be determined for 45 women because 27 were offspring of single mothers who had never worked outside the home (hence, homemakers) and 18 women had missing data for the primary earner variable.

### Measurement of Adulthood SEP

Our prior work<sup>18,24</sup> indicated that education and occupation, taken alone or in combination, were weak predictors of hypertension-related outcomes in the Pitt County Study population. Therefore, in the current study we sought to minimize misclassification of respondents with respect to their "true" socioeconomic standing in the community by creating an index of adulthood socioeconomic position based on 4 variables that were collected in 1988.

The first variable, education, had 4 levels: less than high school, high school, some college, and college graduate. The second variable, occupation, was based on 9 Hollingshead job prestige<sup>25</sup> scores: 1 = farm laborer/managerial service worker, 2 = unskilled worker, 3 = machine operator or semiskilled worker, 4 = skilled manual worker, 5 = clerical/sales worker, 6 = skilled technician/small business owner, 7 = manager/farm owner ( $> 150$  acres), 8 = administrator/registered nurse, and 9 = higher executive/major professional. These 9 scores were subsequently collapsed into 2

broad occupational categories: "blue collar" for Hollingshead scores from 1 to 4 and "white collar" for Hollingshead scores from 5 to 9. The third variable, employment status, had 2 levels: employed versus not employed, as did the fourth variable, homeowner: yes or no. Household income was not collected in 1988; hence, employment status and homeownership provided some indirect information on respondents' differential access to income and wealth.

Scores for the adulthood SEP index were produced with the following algorithm: education (less than high school = 0, high-school graduate but less than college = 0.5, college graduate = 1.0); occupation (blue collar = 0, white collar = 1); currently employed (no = 0, yes = 1); and home owner (no = 0, yes = 1). Hence, the highest possible score on the adulthood SEP index was 4.0. To identify a subset of individuals who could be plausibly designated "socioeconomically advantaged" relative to other cohort members, those who scored 3.0 or higher on the adulthood SEP index were categorized as "high"; those who scored less than 3.0 were categorized as "low."

### Measurement of Life-Course SEP

Life-course SEP was determined by combining information on childhood and adulthood SEP. Four nonoverlapping life-course SEP categories were created: low childhood/low adulthood, low childhood/high adulthood, high childhood/low adulthood, and high childhood/high adulthood.

### Covariates

Potential confounders, measured in 1988, included the following: age (years), marital status (currently/formerly/never married), alcohol consumption (abstainer/drinker), and cigarette smoker (yes/no). The EHC was used to collect information on a fifth potential confounder, food insecurity during childhood, was obtained in 2001. Individuals who answered "no" for any year during the first 13 years of life to the question, "Did you have enough food to eat?" were considered exposed to childhood food insecurity, theoretically a condition that could be correlated with both childhood SEP and body weight in adulthood. Data from 1988 on the following potential intervening variables

were also included in the analyses: strenuous physical activity ( $\geq 3$  times/week,  $\geq 20$  minutes per occasion, intense enough to breathe hard and perspire); daily vegetable consumption (low  $\leq 1$  serving/day); and daily fruit consumption (low  $\leq 1$  serving/day).

### Statistical Analysis

Analyses were weighted to take into account the oversampling of middle-class households in 1988 and nonresponse to both the 1988 and 2001 surveys. Multiple logistic regression was used to investigate relationships between life-course SEP and obesity status in 1988. Women in the high/high (i.e., most advantaged) life-course SEP category constituted the referent group for all comparisons. Separate tests of main effects for low versus high childhood SEP (after control for adulthood SEP) and for low versus high adulthood SEP (after control for childhood SEP) were also conducted.

Using hierarchical regression models, we added potential confounders and potential intervening variables individually or as a block to isolate their unique contribution to obesity risk. For example, the fully adjusted model describing the association between life-course SEP and obesity risk controlled for potential confounders in the following order: age (model 1), marital status (model 2), alcohol consumption and cigarette smoking (model 3), and childhood food insecurity (model 4). The 3 hypothetical intervening variables (strenuous exercise, low fruit consumption, and low vegetable consumption) were added in model 5. All analyses were performed with SAS, Version 9.12 (SAS Institute Inc, Cary, NC).<sup>26</sup> Weighted estimates of parameters, variances, and 95% confidence intervals were obtained using either linearization or Jackknife Repeated Replication techniques.<sup>27</sup> Analyses were restricted to the 679 women with no missing values on study variables.

## RESULTS

As shown in Table 1, the mean age of women in 1988 was 35.4 years. Their mean BMI was 29.6, with nearly 43% classified as obese and an additional 30% classified as overweight. More than 80% of the women

**TABLE 1—Selected Characteristics of African American Women Aged 25 to 50 Years: The Pitt County, North Carolina, Study**

	N
	679
Mean age (SE)	35.4 (0.32)
Mean BMI (SE)	29.6 (0.30)
Body weight status, %	
Obese (BMI $\geq 30$ )	42.7
Overweight (BMI = 25.0–29.9)	29.9
Normal weight (BMI = 18.5–24.9)	26.2
Underweight (BMI < 18.5)	1.2
Childhood <sup>a</sup> socioeconomic position, %	
Low	83.0
High	17.0
Adulthood <sup>b</sup> socioeconomic position, %	
Low	81.3
High	18.7
Life-course <sup>c</sup> socioeconomic position, %	
Low/low	68.9
Low/high	14.1
High/low	12.4
High/high	4.6

Note. BMI = body mass index.

<sup>a</sup>Low = parent's occupation unskilled worker/farm laborer; high = skilled worker.

<sup>b</sup>Low = respondent's socioeconomic position (SEP) index score < 3; high = SEP index score  $\geq 3$ .

<sup>c</sup>Low/low = low childhood/low adulthood SEP; low/high = low childhood/high adulthood SEP; high/low = high childhood/low adulthood SEP; high/high = high childhood/high adulthood SEP.

grew up in low SEP (i.e., unskilled or farm laborer) households. In adulthood, 81.3% were in low SEP. Almost 70% (n = 487) of the women were classified as low/low SEP, or relatively disadvantaged in both childhood and adulthood; 14.1% (n = 79) were classified as low/high SEP, relatively disadvantaged in childhood but not in adulthood; 12.4% (n = 88) were classified as high/low SEP, relatively advantaged in childhood but not in adulthood; and 4.6% (n = 25) were classified as high/high SEP, relatively advantaged in both childhood and adulthood.

Table 2 contrasts selected demographic, socioeconomic, and behavioral characteristics of the sample by membership in life-course SEP categories. On average, women in the low/low SEP category were about 3 years older

than their high/high SEP counterparts. Women in the low/high and high/high SEP categories were most likely to be married (67.6% and 55.1%, respectively) and least likely to be formerly married (17.2% and 18.7%, respectively). These 2 groups of women also had the highest mean scores (36.1 and 35.3, respectively) on the Rand Corporation's Current Health Scale,<sup>28</sup> a measure of self-perceived health. Alcohol consumption varied little across life-course SEP categories; however, cigarette smoking was most prevalent among high/low SEP women (40.3%) and least prevalent among high/high SEP women (16.8%). Low consumption of fruits and vegetables was characteristic of all women.

Not surprisingly, women in the low/high and high/high SEP categories were least likely (5.0% and 1.2%, respectively) to report high levels of financial strain, defined as "very hard" to pay for food, housing, heat, and medical care. Household crowding also tended to be less common for these 2 groups of women (4.7% and 5.7%, respectively). Although childhood material deprivation as measured by food insecurity and absence of household heat, electricity, and plumbing was least common among women in the high/high SEP category, only the difference for no indoor plumbing (21.4%) was statistically significant.

To illustrate in absolute terms the differential burden of obesity in this population of African American women, Table 3 summarizes the unadjusted prevalence of obesity by childhood, adulthood, and life-course SEP. Nearly 46% of the women from low childhood SEP backgrounds were obese compared to 27.6% of women who grew up in less impoverished households. When stratified by adulthood SEP, obesity was more common among women in the low (44.2%) than in the high SEP category (36.2%). When further stratified by life-course SEP, obesity characterized 47.2% of low/low SEP women, 38.7% of low/high SEP women, 27.2% of high/low SEP women, and 28.5% of high/high SEP women.

The relative odds of obesity by childhood SEP, adulthood SEP, and life-course SEP are presented in Table 4. The odds ratios in the first column are adjusted for age only; those in the second column are adjusted for age

**TABLE 2—Differences in Selected Characteristics of African American Women, by Life-Course Socioeconomic Position: The Pitt County, North Carolina, Study**

	Life-Course Socioeconomic Position <sup>a</sup> (SEP)				P <sup>b</sup>
	Low/Low (n = 487)	Low/High (n = 79)	High/Low (n = 88)	High/High (n = 25)	
Mean age (SE)	35.7 (0.39)	35.8 (0.90)	34.0 (0.88)	32.9 (1.14)	.05
Marital status, %					
Currently married	39.8	67.6	31.8	55.1	<.01
Formerly married	26.6	17.2	36.4	18.7	.01
Never married	33.6	15.2	31.8	26.2	.21
Mean current health score <sup>c</sup> (SE)	31.3 (0.42)	36.1 (0.91)	32.7 (1.11)	35.3 (1.30)	<.01
Consumer of alcohol, %	33.4	37.4	42.8	42.5	.88
Cigarette smoker, %	32.3	26.6	40.3	16.8	.07
Strenuous exerciser, <sup>d</sup> %	40.1	24.7	30.9	38.5	.49
Low vegetable consumption, <sup>e</sup> %	89.2	80.8	90.4	85.3	.26
Low fruit consumption, <sup>e</sup> %	92.2	92.3	92.2	86.6	.67
Financial strain, <sup>f</sup> %					
Very hard	17.9	5.0	18.2	1.2	<.01
Somewhat hard	45.3	26.2	49.9	19.5	<.01
Not hard	36.8	68.8	31.9	79.2	<.01
Households with > 1 person/room, %	22.1	4.7	16.7	5.7	.10
Childhood food insecurity, <sup>g</sup> %	9.4	7.6	7.7	4.4	.88
No heat, <sup>h</sup> %	11.8	9.0	17.7	4.4	.20
No electricity, <sup>h</sup> %	15.1	18.6	13.2	10.0	.90
No indoor plumbing, <sup>h</sup> %	67.7	72.6	54.6	21.4	<.01

<sup>a</sup>Low/low = low childhood/low adulthood SEP; low/high = low childhood/high adulthood SEP; high/low = high childhood/low adulthood SEP; high/high = high childhood/high adulthood SEP.

<sup>b</sup>Likelihood ratio tests, two-tailed; all variables except age are age adjusted.

<sup>c</sup>Nine-item Rand Corporation Current Health Scale; highest score = 45.

<sup>d</sup>≥ 3 times/week, ≥ 20 minutes/occasion, breathe hard and perspire.

<sup>e</sup>One serving or less per day.

<sup>f</sup>How hard is it to pay for food, housing, heating, and medical care?

<sup>g</sup>Not enough food to eat for any year between birth and 13 years old.

<sup>h</sup>Did not have utility for any year between birth and 13 years old.

**TABLE 3—Unadjusted Prevalence of Obesity Among African American Women by Childhood, Adulthood, and Life-Course Socioeconomic Position: The Pitt County, North Carolina, Study**

Socioeconomic Position (SEP)	n	Percent Obese <sup>a</sup>	P <sup>b</sup>
Childhood <sup>c</sup>			
Low	566	45.8	<.001
High	113	27.6	
Adulthood <sup>d</sup>			
Low	575	44.2	<.001
High	104	36.2	
Life-course <sup>e</sup>			
Low/low	487	47.2	<.001
Low/high	79	38.7	
High/low	88	27.2	
High/high	25	28.5	

<sup>a</sup>Body mass index ≥ 30.

<sup>b</sup>Likelihood ratio tests, two-tailed.

<sup>c</sup>Low = parent's occupation unskilled worker/farm laborer; high = skilled worker.

<sup>d</sup>Low = respondent's SEP index score < 3; high = SEP index score ≥ 3.

<sup>e</sup>Low/low = low childhood/low adulthood SEP; low/high = low childhood/high adulthood SEP; high/low = high childhood/low adulthood SEP; high/high = high childhood/high adulthood SEP.

plus the indicated covariates. For parsimony's sake, odds ratios describing associations between obesity and the potential confounders, as well as the potential behavioral mediators, are not shown. Before and after multivariable adjustment, women from low childhood SEP backgrounds had a 2-fold greater odds of obesity (multivariable adjusted OR=2.21; 95% CI=1.32, 3.68) than women who grew up in less disadvantaged households. These increased odds were not diminished when adulthood SEP was added to the model. Nor was there any evidence of mediation by strenuous physical exercise or fruit/vegetable consumption.

As shown in Table 4, women in the low adulthood SEP category had a nonsignificant

25% greater odds of obesity (multivariable adjusted OR=1.25; 95% CI=0.74, 2.11) than did their high SEP counterparts. Nonsmokers and formerly married women (in contrast to those never married) were also more likely to be obese (data not shown). Neither self-reported fruit/vegetable consumption nor strenuous physical exercise mediated these results.

For all life-course SEP comparisons, these associations between obesity and potential confounders on the one hand, and potential mediators on the other, remained unchanged from the main effects models. Therefore, in the interest of parsimony, only findings from the life-course SEP comparisons will be summarized here. As shown in Table 4, for both

age-adjusted and multivariable adjusted models, women in the low/low SEP category had a 2-fold but not statistically significant greater odds of obesity (multivariable adjusted OR=2.12; 95% CI=0.75, 6.00) than their counterparts in the high/high SEP category.

Whereas women in the low/high SEP category had a 55% greater odds of obesity (multivariable adjusted OR=1.55; 95% CI=0.50, 4.83) than women in the high/high SEP category, those in the high/low SEP category had a non-statistically significant 14% lower odds of obesity (multivariable adjusted OR=0.86; 95% CI=0.27, 2.70).

## DISCUSSION

For African American women in the Pitt County Study who grew up in the most economically disadvantaged households, the odds of obesity in adulthood were twice as high as were those for women from less impoverished backgrounds. This association was



**TABLE 4—Relative Odds of Obesity Among African American Women by Childhood, Adulthood, and Life-Course Socioeconomic Position: The Pitt County, North Carolina, Study**

Socioeconomic Position (SEP)	Odds Ratios (95% Confidence Interval)	
	Age-Adjusted	Multivariable-Adjusted <sup>a</sup>
Childhood <sup>b</sup>		
Low	2.09 (1.27, 3.46)	2.21 <sup>c</sup> (1.32, 3.68)
High	Referent	Referent
Adulthood <sup>d</sup>		
Low	1.38 (0.84, 2.28)	1.25 <sup>e</sup> (0.74, 2.11)
High	Referent	Referent
Life-course <sup>f</sup>		
Low/low	2.06 (0.74, 5.72)	2.12 (0.75, 6.00)
Low/high	1.44 (0.46, 4.46)	1.55 (0.50, 4.83)
High/low	0.90 (0.29, 2.77)	0.86 (0.27, 2.70)
High/high	Referent	Referent

<sup>a</sup>Adjusted for age, marital status, alcohol, smoking, childhood food insecurity, fruit/vegetable consumption, strenuous exercise.

<sup>b</sup>Low = parent's occupation unskilled worker/farm laborer; high = skilled worker.

<sup>c</sup>Also adjusted for adulthood SEP.

<sup>d</sup>Low = respondent's SEP index score < 3; high = SEP index score ≥ 3.

<sup>e</sup>Also adjusted for childhood SEP.

<sup>f</sup>Low/low = low childhood/low adulthood SEP; low/high = low childhood/high adulthood SEP; high/low = high childhood/low adulthood SEP; high/high = high childhood/high adulthood SEP.

independent of the SEP women had attained in adulthood. The association was also independent of the woman's marital status and health behaviors such as smoking, alcohol consumption, strenuous exercise, and fruit and vegetable consumption. Lower SEP in adulthood, however, was associated with only a 25% greater odds of obesity after control for childhood SEP, marital status, and health behaviors.

When the data were analyzed from a life-course perspective, women who were relatively disadvantaged in both childhood and adulthood had twice the odds of obesity as women who were relatively advantaged at both points in time. Upwardly mobile women—those who were relatively disadvantaged in childhood but not in adulthood—had a 55% greater odds of obesity than women who were relatively advantaged across the life course. Finally, women who were relatively advantaged in childhood, but not in adulthood, had a slightly lower odds (14%) of obesity than women who maintained their relatively advantaged position from childhood into adulthood. Because of small numbers in some of the life-course SEP categories

(especially high/high SEP), the 95% confidence intervals for all life-course comparisons included the null value.

The findings for childhood SEP were especially robust. They conform with findings from a nationally representative study that reported a strong, inverse relationship between parental education and adult obesity in African American women,<sup>15</sup> but they contrast with null findings from 2 other studies.<sup>10,16</sup> Differences across regions, data collection periods, and other methodologies (e.g., the choice of parental occupation vs. education, use of EHC vs. conventional questionnaire methods) for ascertaining childhood SEP may have contributed to these inconsistent results.

There are several potential pathways through which socioeconomic deprivation in childhood could increase the odds of obesity in adulthood, independent of adulthood SEP. First, it has been suggested that adverse intrauterine conditions or adverse early postnatal physiological disturbances, both socially patterned by maternal SEP, can predispose the developing fetus/child to an array of health difficulties (some of which are obesity-mediated) later in life.<sup>29,30</sup> Second, a growing

number of studies suggest that individuals who experience socioeconomic deprivation in childhood are more likely to engage in detrimental health-related behaviors, such as poor nutrition and low levels of physical activity in both childhood<sup>31–34</sup> and adulthood.<sup>35,36</sup> Though we included measures of adulthood physical activity and fruit/vegetable consumption, measurement error in these variables plus lack of data on physical activity and nutrient intake at earlier points in the life cycle make it impossible to completely rule out an explanatory role for these behavioral pathways.

An inverse relationship between adulthood SEP and obesity is a common finding in studies of European<sup>7–9,37,38</sup> and White American women;<sup>10,39</sup> however, findings for African American women are more mixed.<sup>10,19</sup> The inconsistent findings for African American women could be attributable to differences in geographical settings, differences in how SEP is measured across studies, or, as suggested by this study, intergenerational social mobility dynamics that effectively determine whether the inverse relationship between adulthood SEP and obesity will be large, small, or nonexistent.

In the current study, for example, the modest 25% excess odds of obesity for women in the low, compared with high, adulthood SEP category seems largely attributable to intergenerational social mobility dynamics. As shown in Table 3, upwardly mobile women (low/high SEP) had a lower prevalence of obesity than did women who remained relatively disadvantaged over their life course (low/low SEP). In contrast to this pattern of diverging risks over time, women who grew up in relatively advantaged households had roughly comparable odds of obesity in adulthood regardless of their childhood SEP. Hence, for women in the Pitt County Study, upward mobility mattered, but not enough to wholly negate the long reach of childhood socioeconomic disadvantage on the odds of obesity in adulthood. Of course, the degree to which weak versus strong intergenerational social mobility effects underlie the mixed findings in the literature concerning adulthood SEP and obesity in African American women is an empirical question that only additional research can answer.

Though small numbers in the referent category for the current study prevented the associations between life-course SEP and odds for obesity from reaching conventional levels of statistical significance, the associations nonetheless followed a plausible gradient of risk. Women who were relatively disadvantaged in both childhood and adulthood had the greatest odds for obesity, followed by upwardly mobile women, and then by women who grew up in relatively advantaged households, irrespective of their adulthood SEP.

This particular gradient of risk is consistent with both cumulative burden and critical period explanatory models of adult chronic diseases,<sup>39</sup> here extended to the study of obesity in African American women. Some manifestations of a cumulative burden model, which emphasizes the health-damaging effects of the accumulation of risks over the life course, can be seen in the generally elevated pattern of material and psychosocial disadvantages to which women in the low/low SEP group were exposed during both childhood and adulthood (Table 2). Likewise, some manifestations of a critical period model, which emphasizes the long-lasting effects on adult health of environmental exposures encountered during developmentally sensitive epochs, can be seen in the contrasting childhood material and psychosocial advantages for low/low SEP women compared to their high/high SEP counterparts (Table 2). The contrasts in childhood material life conditions were less sharp between low/low and high/low SEP women, suggesting that other unmeasured childhood advantages underlie the lower odds of obesity observed for the latter group of women.

Our decision to require study participants to possess 3 out of 4 key socioeconomic resources to qualify for membership in the high adulthood SEP category very likely minimized misclassification on this exposure. However, this decision also reduced statistical power for the life-course SEP comparisons because it severely limited the number of women who could be considered “relatively advantaged” in both childhood and adulthood. We believe that our decision to use multiple indicators of adulthood SEP and to set a fairly high threshold for membership in the high adulthood SEP category was justified on 4 grounds. First, as already noted,

education and occupation were weak predictors of 1988 hypertension outcomes<sup>18,24</sup> in this population. Second, SEP is a multidimensional construct and multiple indicators are being used increasingly in epidemiological studies in order to better capture its multiple facets.<sup>40</sup> Third, setting the threshold at 3.0 isolated a subset of individuals who possessed conventional “middle-class” credentials, adding credence to our labeling the low/high SEP women in this study “upwardly mobile.” Fourth, lowering the threshold from 3.0 to 2.5 points (the median) increased the number in the referent category by only 9 women, with essentially no changes in study findings.

Finally, our study findings are potentially subject to both recall and loss-to-follow-up bias. Childhood SEP was assessed retrospectively in 2001; hence, recall bias would inflate estimates of the association between low childhood SEP and obesity if women classified as obese differentially (and incorrectly) reported that their parents were farm laborers or unskilled workers. Though possible, such differential overreporting seems unlikely. Loss-to-follow-up bias would exist if the observed associations between exposures and outcomes for the 679 women comprising the analysis sample differ greatly from what would have been observed had all 1112 women in the 1988 baseline survey been studied. Since analyses in the current study were weighted both for oversampling of middle-class individuals in 1988 and for nonresponse to the 1988 and 2001 surveys, our findings can be generalized to the entire 1988 cohort. That said, future advances in life-course research into the social determinants of obesity in African American women, or any other population at high risk for this condition, will require prospective study designs, adequate sample sizes, and high quality information on both personal and neighborhood-level resources<sup>41,42</sup> known or suspected to influence dietary practices and physical activity across the life course. ■

#### About the Authors

At the time this research was conducted, Sherman A. James was with the School of Public Health at the University of Michigan, Ann Arbor. Angela Fowler-Brown is with the Department of Medicine at the University of North Carolina,

Chapel Hill. Trivellore E. Raghunathan and John Van Hoewyk are with the Institute for Social Research at the University of Michigan, Ann Arbor.

Requests for reprints should be sent to Sherman A. James, Terry Sanford Institute for Public Policy, Duke University, PO Box 90245, Durham, NC 27708 (email: sjames@duke.edu).

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#### Contributors

S.A. James originated the study and led the writing. A. Fowler-Brown conducted the literature review and assisted with the writing. T.E. Raghunathan supervised the data analysis. J. Van Hoewyk constructed the study variables and conducted the data analyses.

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#### Human Participant Protection

This study satisfied all criteria for the ethical treatment of human participants and was approved by the University of Michigan’s human subjects institutional review board.

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