Lifecourse Educational Status in Relation to Weight Gain in African American Women

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Objectives: Childhood disadvantage has been associated with increased risk of obesity from childhood through adulthood and those who are disadvantaged across the lifecourse are at highest risk. The effect of lifecourse socioeconomic status (SES) is particularly important for Black women due to the higher prevalence of low SES and obesity in Black compared to White women. We assessed associations of lifecourse SES, as indicated by educational status, with adult weight in African American women.

Design: We assessed the associations of parental education, current education (education of participant or her spouse), and a combination of parental and current education (lifecourse education) with weight gain among 21,457 women aged <55 years in the longitudinal Black Women's Health Study, which began in 1995.

Main Outcome Measures: We estimated the mean difference in weight gain between age 18 and age in 2009, and risk ratios for obesity in 2009, in each level of education compared to the highest level (college graduate).

Results: The age- and height-adjusted differences in mean weight gain for the lowest levels of parental and current education compared to the highest levels were 3.29 and 4.49 kg, respectively. The age-adjusted risk ratios for obesity for the lowest level of parental and current education were 1.44 (95% CI 1.32–1.57) and 1.75 (95% CI 1.57–1.95), respectively. Risk of obesity was lowest among those with current education of college graduate, regardless of parental education.

Conclusions: Educational level of college graduate may overcome the adverse effects of low parental education on weight gain and obesity risk. (*Ethn Dis.* 2012;22(2):198–206)

Key Words: Weight, Obesity, Socioeconomic Factors, African Americans, Women

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Introduction

Numerous studies have found inverse associations of childhood or adult socioeconomic status (SES) with adult body mass index (BMI), with results most consistent for female and White populations.[1–3] Recently a lifecourse approach has been taken where the independent[4–7] or cumulative[8–13] effects of childhood and adulthood SES together are assessed. Some of these studies suggest that childhood disadvantage confers a persistent increased risk of obesity from childhood through adulthood[7,9,12,13] and that those who are disadvantaged across the lifecourse are at particularly high risk of adult obesity.[12–14] The effect of lifecourse SES on weight is of particular importance for Black women due to the higher prevalence of both low SES and of obesity in Black compared to White women.[15] An adverse influence of lifecourse SES could contribute to the racial disparity in obesity in the United States.

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Most studies of lifecourse SES and weight have been conducted in European and predominantly White populations and their relevance to African American women is uncertain. However, several studies conducted in the United States have included appreciable numbers of African Americans, although only two studies, the CARDIA[16] and Pitt County[8] study, reported separately on Black participants. In the longitudinal CARDIA study, which included 1480 Black women, parental and participant education were modeled together.[16] Father's education was inversely associated with adult BMI among both Black and White women, although the association was statistically significant only among White women. There was no significant association between participants' educational attainment and BMI among Black or White women.

The Pitt County study included 1167 Black men and women aged 25–50 in 1988 and followed up in 2001.[8] Both childhood and adult SES were inversely associated with adult BMI among women at baseline, but not after 13 years of follow-up.

The National Longitudinal Study of Adolescent Health interviewed 12,940 participants (21% Black) as teenagers and again in their 20s[14] and calculated a lifecourse measure that integrated various indices of childhood and adult SES. Compared with those at the highest overall advantage at both time points (the reference group), women at persistent disadvantage over the lifecourse had three times the incidence of obesity as adults, whereas participants whose SES improved over the lifecourse had only twice the risk of obesity as the reference group. In the Monitoring the Future study,[9] approximately 11,000 US high school seniors (11% Black) were enrolled from 1976 through 2004 and followed to age 45. There were inverse associations between parental education and participant growth trajectories between ages 18 and 45. The protective effects of participants' own education were weaker than those of parental

education, and control for participant education did not alter the effects of parental education. In the Midlife Development in the United States study that included 1430 women aged 25–74 (6% Black), parental occupational prestige was inversely associated with adult BMI and with obesity prevalence.[17] Upon control for adult SES, parental SES retained its association with adult BMI but not with obesity prevalence.

We used data collected from 1995 through 2009 in a follow-up study of African American women to assess the relation of childhood and adult SES to weight gain after age 18 and risk of obesity in 2009. Our objective was to test the hypotheses that weight gain and obesity risk in 2009 were inversely associated with childhood SES, as indicated by parental education; with adult SES, as indicated by most recently reported highest educational level of the participant or her spouse; and with cumulative lifecourse SES, as indicated by a combination of parental and current education.

METHODS

Analytic Cohort

The Black Women's Health Study (BWHS) is a prospective cohort study established in 1995, when approximately 59,000 African-American women aged 21–69 years from across the United States filled out health questionnaires. The baseline questionnaire elicited data on demographic and lifestyle factors, reproductive history, dietary intake, and medical conditions. The cohort is followed biennially by mailed questionnaire and follow-up has averaged over 80% of the original cohort through seven questionnaire cycles. The study was approved by the Institutional Review Board of Boston University.

Potential participants in the present analyses were 23,601 women who completed the 2009 questionnaire and were aged <55 years at the end of follow-up (2009). We chose the upper age limit because almost all weight gain in BWHS participants occurred before age 55. The analytic cohort excluded women who reported pregnancy in 2009 (n=227), gastric bypass surgery on the 1999 questionnaire (n=39), and prevalent cancer at baseline in 1995 (n=125) or incident cancer during follow-up (n=742). Women with missing data on BMI for all questionnaires (n=116), missing education for both parents (n=891), or missing education for self and, if married, spouse also (n=4), were excluded, for a final population of 21,457.

Outcomes

Current weight was self-reported at baseline and updated on every questionnaire; weight at age 18 and height were self-reported in 1995. Outcomes for the present analyses included gain in weight (kg) from age 18 to 2009 and relative risk of obesity in 2009, where obesity was defined as BMI (weight in kilograms/height in meters^2 [m]) ≥30. For women missing weight in 2009 (n=353) we used the value from the previous questionnaire cycle. In a validation study conducted among 115 participants, the correlation coefficient was .97 for self-reported weight (176 pounds) with technician-measured weight (181 pounds) (P<.001) and .93 for self-reported height (64.4 inches) with technician-measured height (64.0 inches) (P<.001).[18]

Education

We operationalized childhood and current SES using parental education and education of the participant and her spouse. (Spouse includes the partner with whom the participant was living as married). Highest level of education completed as of 2009 by the participant's mother, father, other primary caregiver (if applicable) and spouse were reported in 2009; participant education was obtained at baseline and updated in 2003. We categorized parental education according to the highest education achieved by either parent (less than high school, high school graduate or GED, some college or vocational school, college graduate). The highest level of education achieved by the participant or her spouse (less than high school or high school graduate, some college, college graduate) was used to categorize the participant's current education.

To represent educational levels across the lifecourse, we created a nine-category variable that represented all combinations of parental and current educational achievement. The nine categories fell into three groups: parental and current education were the same (≤HS/≤HS, some college/some college, college graduate/college graduate); parental education was lower than current education (≤HS/some college, ≤HS/college graduate, some college/college graduate); and parental education was higher than current education (some college/≤HS, college graduate/≤HS, college graduate/some college). The reference group comprised those at the highest levels of both parental and current education (college graduate/college graduate).

Covariates

Early Life Factors

The data collected on early life factors included: whether the participant was preterm, a twin or triplet, or exposed to secondhand smoke in the home up to age 11 (ascertained in 1997); the mother's age at participant's birth, participant's region of birth, whether the participant felt danger in the home or neighborhood as a child, number of children in childhood home, participant's birth order (ascertained in 2007); and whether participant was breastfed or fed soy or regular formula (ascertained in 2009).

Adult Factors

Information on participant's alcohol consumption, smoking status, and hours/week of vigorous exercise and walking for

exercise was obtained on every questionnaire. Energy intake and the Recommended Food Score (RFS)[19] were calculated from responses to a 68-item food frequency questionnaire[20] (included in the 2001 questionnaire) and were available for 73% of participants.

Statistical Analyses

We assessed weight change in relation to parental education, current education, and lifecourse education. We used linear regression models to estimate the mean difference in weight change between age 18 and age in 2009 for categories of each educational variable compared to its reference group (the highest level). We used three models: model 1 was adjusted for age and height; model 2 added early life factors that could confound or mediate the observed associations (as listed above); model 3 added adult factors that may have mediated any associations between the education variables and adult weight (as listed above). We assessed the mediating role of the covariates by examining how adjustment for the covariates influenced the relationship between the education variables and the outcomes. We used log-binomial regression models to calculate risk ratios for obesity (BMI≥30) among women with BMI<30 at age 18 for categories of parental, current, and lifecourse education as described above. Model 1 was adjusted for age; models 2 and 3 added the variables as described above. Proc Genmod in SAS version 9.1 was used to conduct all regression analyses.

To assess the independent associations of parental and adult education with the outcomes, we included parental and adult education variables together in the models. To assess the cumulative effect of lifecourse education, we used the nine-category lifecourse variable.

We stratified the analyses by age in 1995 and tested for age interaction using the Wald chi-squared test to compare models with and without interaction terms. We also assessed possible interaction with marital status and geographic region of birth.

RESULTS

The distribution of highest educational level of participants' parents was: less than high school, 16.1%; high school graduate, 28.8%; some college or vocational training, 26.9%; and college graduate, 28.3%. Parental education was positively associated with the participant being preterm, alcohol consumption, vigorous exercise, healthier diet as indicated by a higher RFS score, and participant and spouse education (Table 1). Parental education was inversely associated with being born in the southern United States, current smoking, weight in 2009, and weight gain between age 18 and 2009.

The highest educational levels of the participants or their spouses (current education) were: less than or equal to high school graduate, 6.6%; some college or vocational training, 24.1%; and college graduate, 69.3%. Current education was positively associated with the participant being preterm, being breastfed, exposure to passive smoke as a child, vigorous exercise, and RFS score (Table 1). Current education was inversely associated with current smoking, weight in 2009, and weight change between age 18 and 2009.

Table 2 shows the associations of parental and current education, modeled separately and together, with weight change from age 18 to 2009. When modeled separately, the model 1 differences in mean weight change for the lowest levels of parental and current education compared to the highest levels were 3.29 and 4.49 kg, respectively. When modeled together, these estimates were reduced by 30% and 10%, respectively. Adjusting for early life factors (model 2) reduced these estimates (modeled separately or together) by ≤11%. Additional control for adult factors (model 3) had a larger effect, reducing the model 2 estimates for the lowest categories of parental and adult education by 19%.

The model 1 risk ratios (RR) for obesity for the lowest levels of parental and current education, when modeled separately, were 1.44 (95% CI 1.32–1.57) and 1.75 (95% CI 1.57–1.95), respectively (Table 3). When modeled together, the estimate for parental education was attenuated by 10%, whereas the estimate for current education was increased slightly. The addition of childhood factors (model 2) changed the model 1 estimates by no more than 2% and the addition of adult factors (model 3) changed the model 2 estimates by up to 8%.

Table 4 shows model 3 estimates for the difference in mean weight gain and relative risk of obesity for categories of lifecourse education relative to the highest level of education (college graduate/college graduate) across the lifecourse. The greatest relative weight gains generally occurred among women for whom current educational level was less than a college graduate, regardless of the level of parental education (eg, the relative gain for some college/some college was 4.60 kg and the relative gain for college graduate/some college was 4.56 kg). For current level of education equal to college graduate, regardless of the level of education of the parents, relative weight gains were appreciably smaller (eg, the gain for ≤HS/college graduate was 1.54 kg). Similarly, the relative risk of obesity was appreciably lower for women whose current level of education was college graduate regardless of level of parental education (eg, the relative risk for ≤HS/college graduate was 1.06 [95% CI 0.96 to 1.18]). On the other hand, the relative risk of obesity was appreciably increased for women whose current education was less than college graduate, regardless of parental education (eg, the relative risk was 1.52 [95% CI 1.28–1.81] for college graduate/some college).

To assess age and cohort effects, we repeated the analyses within the youngest

Table 1. Characteristics of Black Women's Health Study participants by parental and current educational status

Characteristics of Participant, %[a]	Parental Education				Current Education		
	<High School (*n*=3446)	High School (*n*=6173)	Some College (*n*=5765)	College Graduate (*n*=6073)	≤High School (*n*=1424)	Some College (*n*=5168)	College Graduate (*n*=14,865)
Early life influences							
Preterm as infant	4.2	5.8	7.2	8.0	4.8	6.2	6.8
Breastfed as infant	30.3	21.5	23.1	29.3	17.4	21.5	27.8
Mother smoked during pregnancy	13.3	12.9	13.7	11.8	12.3	13.3	12.8
Passive smoke in childhood home	47.0	49.7	50.6	45.9	43.9	48.1	49.0
Felt danger in childhood home ≥4 times	8.2	7.6	8.1	7.2	6.7	8.2	7.6
Felt danger in childhood neighborhood ≥4 times	5.3	4.2	4.8	4.5	3.5	4.4	4.8
Born in the southern USA	39.5	30.9	24.6	26.0	31.1	29.6	28.9
Mother aged <20 at birth	11.3	15.1	14.6	11.2	13.5	15.0	12.6
Adult characteristics							
Alcohol consumption ≥1 drink/week	39.0	41.4	43.4	46.9	41.7	41.9	43.7
Current smoker	11.4	10.0	9.4	7.8	21.1	14.5	6.6
≥3 hrs/week vigorous exercise	16.5	18.4	19.0	22.6	8.7	14.1	22.3
≥3 hrs/week walk for exercise	29.7	29.0	28.6	27.4	26.4	29.8	28.3
Highest quintile Recommended Food Score	11.4	12.2	13.5	14.9	6.7	10.2	14.8
Participant education							
<HS	1.9	.8	.5	.3	9.1	.5	.1
HS	16.2	13.1	6.3	3.9	90.5	8.2	1.7
Some college	33.5	30.6	28.1	19.4	-	91.2	7.6
College graduate	48.4	55.4	65.1	76.4	-	-	90.7
Spouse education among women married/living as married							
<HS	7.0	3.9	3.0	1.6	17.4	6.4	1.8
HS	19.9	21.2	12.6	8.6	62.2	24.5	9.4
Some college	31.6	31.1	32.6	27.3	-	59.1	24.0
College graduate	34.2	37.6	43.5	56.4	-	-	59.5
Mean (SD) (range) of characteristic[b]							
Age in 1995[c]	33.7 (4.9)	32.2 (5.2)	30.9 (5.4)	30.3 (5.3)	32.4 (5.3)	32.0 (5.3)	31.3 (5.4)
Weight, kg at age 18	59.5 (12.6) (38.6–63.3)	59.4 (12.2) (36.3–147.4)	59.6 (12.3) (36.3–180.5)	59.9 (12.2) (33.6–152.0)	61.0 (13.5) (36.3–138.3)	60.0 (12.6) (36.3–145.1)	59.3 (12.1) (33.6–180.5)
Weight, kg in 2009	86.7 (21.2) (−45.8–123.1)	84.9 (21.0) (38.6–249.7)	84.5 (20.8) (40.4–204.3)	82.8 (21.1) (41.8–199.8)	89.1 (23.2) (41.8–202.0)	87.9 (22.1) (40.9–249.7)	82.9 (20.3) (38.6–193.4)
Weight change, kg, between age 18 and in 2009	27.1 (16.8) (−45.8–123.1)	25.5 (16.3) (−60.3–124.0)	24.8 (16.6) (−93.4–126.3)	22.9 (16.7) (−50.7–120.4)	28.1 (18.5) (−60.3–126.3)	27.8 (17.4) (−45.3–124.0)	23.6 (16.0) (−93.4–123.1)

[a] *P* from chi-squared tests are <.001 for all variables with the exception of walked 3+hrs/week for exercise by both parental and current education, for which *P*>.05.
[b] *P* from ANOVA are <.001 for all variables with exception of weight at age 18 by parental education for which *P*>.05.
[c] Range of age in all categories = 20–40 years.

women (age 20–24 at baseline in 1995, born 1972–1976) and the oldest women (age 38–40 at baseline, born 1955–1957) (data not shown). The patterns were similar in the two strata, and there was no statistically significant interaction between the education variables and age. There was also no interaction with marital status or region of birth (data not shown).

We conducted analyses that considered only the participant's own education,

Table 2. Difference in mean weight change between age 18 and 2009 by parental, current, and lifecourse education

		Mean Difference in Weight, kg (95% CI)		
	n	Model 1[a]	Model 2[b]	Model 3[c]
Parental and Current Education Modeled Separately				
Parental education				
<HS	3446	3.29 (2.59–3.99)	2.88 (2.14–3.61)	2.34 (1.62–3.06)
HS	6173	2.10 (1.52–2.69)	1.89 (1.29–2.49)	1.55 (.96–2.14)
Some college or voc.	5765	1.78 (1.19–2.37)	1.63 (1.03–2.22)	1.35 (.77–1.93)
College graduate	6073	Ref	Ref	Ref
Current education				
<HS,HS	1621	4.49 (3.64–5.33)	4.37 (3.51–5.23)	3.54 (2.69–4.39)
Some college	5457	4.11 (3.60–4.62)	3.96 (3.45–4.48)	3.45 (2.94–3.96)
College graduate	15270	Ref	Ref	Ref
Parental and Current Education Modeled Together				
Parental education				
<HS	3446	2.31 (1.60–3.02)	2.04 (1.30–2.78)	1.63 (.90–2.36)
HS	6173	1.35 (.76–1.94)	1.24 (.64–1.84)	.95 (.36–1.54)
Some college or voc.	5765	1.37 (.78–1.96)	1.30 (.70–1.89)	1.03 (.45–1.61)
College graduate	6073	Ref	Ref	Ref.
Current education				
<HS, HS	1621	4.02 (3.16–4.88)	4.00 (3.05–4.88)	3.47 (2.56–4.37)
Some college	5457	3.85 (3.33–4.36)	3.73 (3.21–4.27)	3.41 (2.88–3.93)
College graduate	15270	Ref	Ref	Ref

[a] Model 1 adjusted for age and height.

[b] Model 2 additionally adjusted for childhood factors: mother's age at birth (<20, 20–24, 25–29, 30–34, 35–39, 40+, missing), prematurity (yes, no, unknown), twin or triplet (yes, no, unknown), breastfed (yes, no, unknown), fed soy formula (yes, no, unknown), number of children in the home, birth order (youngest, middle, oldest), mother smoked when pregnant (yes, no, unknown), exposure to secondhand smoke in the home as a child (up to age 11) (yes, no), felt danger in the home as a child (<4, 4+ times), felt danger in the neighborhood as a child (<4, 4+ times), and region of birth (Northeast, South, West, Midwest, Other).

[c] Model 3 additionally adjusted for adult factors: alcohol consumption (<1, 1–6, 7–13, 14+ drinks/wk, missing), smoking status (current, ex, never), vigorous exercise (<3, 3+hrs/wk), walking for exercise (<3, 3+ hrs/week), energy intake (quintiles) and Recommended Food Score (quintiles).

rather than the highest level of the participant or her spouse. The associations of weight gain and obesity with the participant's educational status were similar to, but weaker than, the associations with current education. Model 1 estimates for mean weight gain among women whose own education was ≤HS and some college, compared to college graduate, were 3.68 kg (95% CI 2.93–4.43) and 3.76 kg (95% CI 3.25–4.26), respectively, and RRs for obesity were 1.57 (95% CI 1.42–1.73) and 1.46 (95% CI 1.37–1.55). Current educational level was reported in 1995 and 2003, and 18% of women increased their education level during that interval. Among women whose level was unchanged, the model 1 mean difference in weight gain for some college compared to college graduate was 4.45 kg (95% CI 3.97–5.15) and the IRR for obesity was 1.56 (95% CI 1.45–1.68).

DISCUSSION

In this population of African American women, both parental education and current education were inversely associated with adult weight gain and with risk of obesity in adulthood. Current education had a stronger effect than parental education, indicated by the fact that when parental and current education were modeled together, effect estimates associated with parental education were more attenuated than the estimates associated with current education. Lifecourse analyses indicated that women were able to overcome the adverse effects of low parental education on weight gain and obesity risk by improving their current educational level to college graduate. Improvement of educational current level only to some college had little effect on weight gain and obesity risk.

Control for childhood influences in the analyses resulted in little change in the relative weight gain estimates, suggesting that they had little mediating or confounding influence on the associations of parental, current, and lifecourse education with weight gain. On the other hand, the addition of adult factors to the models attenuated the effects of education on weight gain, suggesting that the adult behaviors are part of the pathway by which childhood and current education influence weight gain. The relative risks of obesity were less altered by covariate control.

Participant education had the same pattern of effects on weight gain and obesity risk as did current (self/spouse) education, but the magnitudes of the effects were smaller, suggesting that a variable that selects highest level of self/spouse education better captures the

Table 3. Risk ratios for obesity in 2009 by parental, current, and lifecourse education

	Prevalence of Obesity, %	Risk Ratio (95% CI)		
		Model 1[a]	Model 2[b]	Model 3[c]
Parental and Current Education Modeled Separately				
Parental education				
<HS	51.0	1.44 (1.32–1.57)	1.41 (1.29–1.55)	1.37 (1.25–1.50)
HS	46.6	1.25 (1.16–1.35)	1.23 (1.14–1.33)	1.21 (1.12–1.30)
Some college or voc.	44.8	1.19 (1.10–1.28)	1.17 (1.08–1.26)	1.15 (1.06–1.24)
College graduate	40.3	1.0	1.0	1.0
Current education				
<HS, HS	56.3	1.75 (1.57–1.95)	1.76 (1.58–1.97)	1.67 (1.50–1.87)
Some college	52.9	1.58 (1.48–1.68)	1.57 (1.47–1.67)	1.49 (1.39–1.59)
College graduate	41.2	1.0	1.0	1.0
Parental and Current Education Modeled Together				
Parental education				
<HS	51.0	1.29 (1.18–1.41)	1.29 (1.17–1.41)	1.23 (1.12–1.35)
HS	46.6	1.14 (1.06–1.23)	1.15 (1.07–1.24)	1.12 (1.04–1.21)
Some college or voc.	44.8	1.13 (1.05–1.22)	1.13 (1.05–1.21)	1.10 (1.02–1.18)
College graduate	40.3	1.0	1.0	1.0
Current education				
<HS, HS	56.3	1.80 (1.53–2.63)	1.81 (1.62–2.03)	1.66 (1.48–1.87)
Some college	52.9	1.54 (1.44–1.64)	1.55 (1.45–1.66)	1.48 (1.38–1.58)
College graduate	41.2	1.0	1.0	1.0

[a,b,c] See Table 2 for model structures.

educational and socioeconomic environment of the adult woman.

Studies of lifecourse SES and weight vary widely in terms of study population, study design, classification of childhood and adult SES, and quantification of weight outcomes, making direct comparison difficult. Our results are consistent with several studies that show a deleterious influence of low childhood SES and of low adult SES on weight and obesity later in life.[1–3] Most studies that considered childhood and adult SES together found that childhood SES had a stronger influence on

Table 4. Difference in mean weight change between age 18 and 2009 and risk ratios for obesity by lifecourse education

Lifecourse Education (parental/current education)	Mean Difference in Weight Gain		Relative Risk of Obesity	
	N (%)	Kg (95% CI)[a]	% Obese	RR (95% CI)[a]
Parental and current education the same (34.6%)				
College grad/college grad	4977 (23.2)	0 (reference)	37.7	1.0 (reference)
≤HS/≤HS	1020 (4.8)	4.53 (3.40–5.65)	57.8	1.86 (1.60–2.16)
Some college/some college	1405 (6.6)	4.60 (3.63–5.55)	51.4	1.57 (1.38–1.78)
Parental education lower than current education (59.1%)				
≤HS/some college	2821 (13.1)	3.99 (3.21–4.77)	53.8	1.61 (1.43–1.81)
≤HS/college grad	5778 (26.9)	1.54 (.91–2.18)	43.8	1.06 (.96–1.18)
Some college/college grad	4110 (19.1)	1.13 (.47–1.80)	42.0	1.04 (.93–1.16)
Parental education higher than current education (6.3%)				
College grad/≤HS	154 (.7)	1.63 (−.96–4.22)	53.9	1.63 (1.16–2.28)
Some college/≤HS	250 (1.2)	4.34 (2.29–6.38)	56.4	1.75 (1.33–2.30)
College grad/some college	942 (4.4)	4.56 (3.44–5.68)	52.6	1.52 (1.28–1.81)

[a] Adjusted for age, mother's age at birth (<20, 20–24, 25–29, 30–34, 35–39, 40+, missing), prematurity (yes, no, unknown), twin or triplet (yes, no, unknown), breastfed (yes, no, unknown), fed soy formula (yes, no, unknown), number of children in the home, birth order (youngest, middle, oldest), mother smoked when pregnant (yes, no, unknown), exposure to secondhand smoke in the home as a child (up to age 11) (yes, no), felt danger in the home as a child (<4, 4+ times), felt danger in the neighborhood as a child (<4, 4+ times), and region of birth (Northeast, South, West, Midwest, Other), alcohol consumption (<1, 1–6, 2–13, 14+ drinks/wk, missing), smoking status (current, ex, never), vigorous exercise (<3, 3+hrs/wk), walking for exercise (<3, 3+ hrs/week), energy intake (quintiles) and Recommended Food Score (quintiles). Weight change additionally adjusted for height.

adult weight. These include the British Whitehall II study,[21,22] the Australian Longitudinal Study on Women' s Health,[13] and the Helsinki Health study.[7] However, the European studies had few if any Black participants and results are of uncertain relevance to African American women.

Several US studies have included Black and White participants but have reported only combined results. In the Monitoring the Future study,[9] childhood SES had a stronger influence on weight gain than current education. In that study, however, the highest level of education considered was high school graduate. In the National Longitudinal Study of Adolescent Health,[14] improvement in SES, even to the highest level, overcame some, but not all, of the disadvantage conferred by low childhood SES. In contrast, in BWHS, improvement in education to the level of college graduate appeared to obviate the effects of low parental education. In the former study, the metrics of childhood and adult SES included information on household income, use of public assistance, social capital, and other variables in addition to education and thus was a more sensitive measure of SES. Our findings are consistent with those from the Midlife Development in the United States study, where association between childhood SES and adult obesity were accounted for entirely by adult SES.[17]

Two studies of African Americans specifically have yielded inconsistent results. In the CARDIA study, there was no association between father or participant education with adult BMI among Black women.[16] The population differed appreciably from BWHS in that they were younger (aged 18–30) and had lower educational attainment (mean years=13.1). In the Pitt County study, parental and adult SES, when modeled together, were inversely associated with adult BMI at baseline among women.[8] However, unexpectedly, after 13 years of follow-up, women with higher SES, whether in childhood or adulthood, gained more weight. Like the CARDIA population, the level of adult education in the Pitt County study was much lower than in BWHS, with 30% of women not having graduated from high school.

Most studies did not explicitly assess the mediating role of variables like adult physical activity and diet. The CARDIA[16] and Pitt County[8] studies adjusted for adult physical activity, smoking, and other factors, but did not compare estimates of effect for the SES measures with and without adjustment. The Monitoring the Future study,[9] the National Longitudinal Study of Adolescent Health,[14] and the Midlife Development in the United States study[17] did not account for adult behavioral variables.

Our study contributes the first data on the relation of lifecourse education with adult weight in a large population of African American women. Despite high educational attainment among BWHS participants themselves, an appreciable proportion had parents who did not graduate from high school or college, allowing informative assessment of lifecourse education. We controlled for various potential mediators between education and weight, providing some insight as to mechanism of effect. The correlation between self-reported and technician-measured current weight in BWHS was very high. However, we did not have validation data on weight at age 18, which was self-reported in 1995 when the participants were aged 21–40 years. In the Nurses' Health Study II, weight at age 18 reported when participants were aged 30–55 years was validated by comparison with weight at age 18 recorded on school records.[23] The correlation between recalled and recorded weights was .87; participants tended to overreport weight at age 18, with a mean difference of 1.4 kg (reported minus recorded weights). While validity of recall may be different among BWHS participants, the correlation between self-report and measured current weight in the BWHS was the same as that found in the Nurse's Health Study II.[24]

Parental education in the BWHS was reported in 2009 and represented education achieved by the parent as of 2009. It may not represent parental education during a participant's childhood if parental education increased after the participant left home. In addition, reporting of parental education may be subject to recall bias. In one small (n=57) study, there was 66% agreement between older adults' reports of fathers' occupation during childhood and historical data.[25] In a study of over 6000 Scottish men and women, responses during middle age about father's occupation were compared to occupational class reported during childhood: weighted kappas between the responses were of moderate agreement (.47–.56).[26] Associations of parental SES with two health outcomes associated with parental SES, birth weight and IQ, were weaker based on adult retrospective report than on contemporaneous reports, but were in the expected direction. Furthermore, a review concluded that studies that used contemporaneous reports of childhood SES more consistently reported inverse associations with adult obesity than did studies that used retrospective reporting.[2] These observations suggest that any reporting bias in the present study would lead to underestimation of the association.

Another limitation of the present data is that, for some women, weight gain may have preceded achieving the level of education reported in 2003. However, among the 88% of the BWHS population whose education did not increase between 1995 and 2003, the relationships between the participant's education and the outcomes were similar to those among all women.

Education has been shown to be a good indicator of SES among African Americans.[27] In addition, it is one of the most widely used measure of SES in the obesity literature since it is easy to

obtain and applies to those not in the workforce.[28] However, education has a narrower range than other measures, and there are cohort effects.[28,29] One review found the most consistent evidence for an inverse association between adult SES and weight came from studies where occupation was the SES measure, followed by education; income was not a consistent predictor of weight.[1] Studies of childhood SES have mostly used father's occupation, particularly those conducted in Europe.[2] Most studies that have used parental education have found inverse associations with adult weight among women.[7–9,12,13,30]

In conclusion, our results suggest that while parental disadvantage, represented by low education, has adverse effects on adult weight, these effects can be largely overcome by high current education, specifically by educational level of college graduate. Having a college degree may result in better understanding of the importance of healthy weight and knowledge of weight control practices, including a healthy diet and adequate exercise. In addition, the increased earnings associated with having a college degree[31] may increase access to healthy foods and the ability to maintain physical fitness.

Our results suggest that while parental disadvantage, represented by low education, has adverse effects on adult weight, these effects can be largely overcome by high current education, specifically by educational level of college graduate

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