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LIFECOURSE SOCIOECONOMIC POSITION AND 16 YEAR BODY MASS INDEX TRAJECTORIES : DIFFERENCES BY RACE AND SEX

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Abstract

Objective—To evaluate the association between lifecourse socioeconomic position (SEP) and changes in body mass index (BMI), and assess disparities in these associations across racial/ethnic groups.

Methods—With longitudinal data from 4 waves of the Americans Changing Lives Study (1986–2002), we employed mixed-effects modeling to estimate BMI trajectories for 1,174 Blacks and 2,323 White adults. We also estimated associations between these trajectories and lifecourse SEP variables, including father's education, perceived childhood SEP, own education, income, wealth, and financial security.

Results—Blacks had higher baseline BMI's, and steeper increases in BMI, compared to Whites. Childhood SEP, as measured by high father's education, was associated with lower baseline BMI among Whites. High education was associated with a lower baseline BMI within both race and sex categories. Income had contrasting effects among men and women. Higher income, was associated with higher BMI only among males Associations between indicators of SEP and BMI trajectories were only found for Whites.

Conclusions—Our study demonstrates that lifecourse SEP may influence adult BMI differently within different racial and sex groups.

Keywords

Health Status Disparities; social mobility; body mass index

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INTRODUCTION

Despite widespread recognition of racial/ethnic and socioeconomic disparities in obesity, little is currently known about how race/ethnicity and socioeconomic position may be associated with long-term changes in BMI. Most reports of changes in BMI over time among adults involve the analysis of repeated cross-sectional surveys, allowing only for the examination of secular trends in obesity, weight, or BMI (1, 2). Such designs do not allow for analysis of changes in BMI within the same cohort; thus, factors associated with disparities in increases in BMI across racial/ethnic groups within the adult U.S. population have not been studied extensively.

Etiologic research into Black/White racial disparities in BMI suggests that differences in socioeconomic position (SEP) may account for disparities in obesity (2, 3). A general focus on SEP, however may be an oversimplification, as SEP is a latent concept which indicates an individual's position in a given social stratification scheme. Moreover, SEP is also known to influence health over the lifecourse, such that health status in later life is a function of a lifetime's worth of exposure to the influences of SEP. In fact, studies have shown that childhood SEP affects adult BMI status independently and in conjunction with adult SEP (4).

Objectively diverse measures of SEP—such as income, education, or wealth—may be differentially influential in specific racial-ethnic subgroups and among men and women (5). Recent literature suggests that when the exposure of interest is a social variable such as SEP, stratification by race may yield disparate associations among racial groups (6, 7).

In order to advance our understanding of the influence of SEP on adult BMI within Blacks and Whites, we adopt a lifecourse perspective by estimating individual patterns of BMI over an extended period of time (i.e. trajectories), and by assessing how these trajectories are associated with both childhood and adult SEP. In particular, the objectives of the study were to:

- **a.** estimate racial differences in BMI trajectories in US men and women;
- **b.** explore racial differences in associations between different components of lifecourse SEP and BMI trajectories among US men and women;

METHODS

Subjects

The study utilizes data from four waves of the Americans' Changing Lives (ACL) study, conducted initially in 1986 (W1), with follow-up interviews in 1989 (W2), 1994 (W3), and 2002 (W4) (8). The first wave of the ACL involved a multistage, stratified area probability sample of non-institutionalized adults aged 25 and older and collected data from 3,617 participants. Because the focus of the survey was differences between Black and White Americans in middle and late life, Blacks and people aged 60 and older were over-sampled, with a household response rate of 68% at W1. The response rates for the next three waves were 83%, 83%, and 74%, respectively, for each wave, among the surviving respondents

(Figure 1). Death rates in the ACL sample are largely equivalent to national estimates for the study period (9).

Measures

The dependent variable in this study was body mass index (BMI), a time varying continuous measure calculated by dividing self-reported weight in kilograms by self-reported height in meters squared. Time was measured in years since baseline at 1986. Covariates such as gender, age, height and number of children were reported at baseline and analyzed as potential confounders in all models:

We assessed lifecourse SEP by measuring SEP in childhood and adulthood using variables described in Table 1. Childhood SEP was assessed at W2 and consisted of two variables: respondents' father's completed education (high school or more compared to less than high school) and perceived childhood socioeconomic status (average/higher vs. low) compared with an average family in the community at the time the respondent was growing up).

Adult SEP was assessed over several waves and consisted of 4 variables including education, income, wealth and financial security. Completed education (high school or more compared to less than high school) was assessed in W1. Family income was assessed in all 4 waves (continuous, time varying). Because income was only reported as a categorical variable in W1, we used mid-points of each respective category as the respondent's income for the continuous measure for that year. To facilitate comparison across time, income was adjusted for inflation using the Consumer Price Index so that income at each time point represented value in 1986 dollars. Log transformed values were used in the regression analyses.

Wealth (continuous, time varying) was assessed in all 4 waves as a 7 category ordinal variable and was based on reported values of real estate, value of business or farm, retirement accounts, savings and investments, one or more cars, and other assets. After assessing the linearity of wealth in association with BMI in bivariate analysis, we included wealth as a continuous variable in the multivariable models. Finally, an index of financial security (continuous, time varying) was constructed from three survey questions pertaining to a subject's financial situation asked in each of the four waves: Higher scores on the resulting scale reflect more financial security (Cronbach's alpha= 0.81).

Statistical Analyses

We employed inference by multiple imputation to address uncertainty due to missing values caused by attrition as well as arbitrary item non-response. The underlying imputation model was a multivariable normal model with unstructured covariance matrix to preserve the longitudinal aspect of the study. SAS procedures PROC MI and PROC MI ANALYZE were used for computations (10). To assess the impact of missing data on the uncertainty measures of the substantive models, we looked at the rate of missing information (11). All models had relative efficiencies greater than 0.90, which suggests that the number of imputations was sufficient to achieve stable estimates (11). Our statistical inference employed mixed-effects models to accurately incorporate the repeated measures into the estimation of standard errors and to model change over time while estimating the individual

characteristics' impact on this change. As the longitudinal outcomes tend to be correlated with heterogeneous variation over time, mixed-effects models have been a popular tool to incorporate this structure into the inference. To compare racial differences in trajectories of BMI and predictors of such trajectories all analyses were stratified by race (Blacks and Whites). We centered time invariant variables at the mean and time varying predictors at the year of first wave of data collection to facilitate interpretation as well as to avoid bias (12, 13). We centered age at age 25 which was the minimum age at W1.

We first modeled trajectories of BMI and tested whether there is a significant variation across persons from population-level BMI trajectory over time. These models assessed a linear trend over time. We estimated BMI at each time point by sex and age separately for Blacks and Whites. The estimates from these models were plotted to show initial trajectories unadjusted for SEP. We explored other more flexible models using quadratic or cubic terms for time to allow for non-linearity of BMI trajectories over time. These alternative specifications for time were not statistically significant from the base model and did not improve model fit.

In the second step of our analyses, we further investigated how BMI trajectory is influenced by lifecourse SEP. Using the mixed effects framework, the associations between lifecourse SEP, W1 BMI and BMI change may be assessed together. The effect of each individual SEP variable on BMI at W1was assessed initially. To assess the effects of SEP on the change in BMI interaction terms with time were added for each variable. For time varying factors such as income, wealth and financial security, both the W1 value and the centered variables were entered in the models to assess the effect of the baseline value as well as change in these variables over time. The centered term for the time varying factors therefore measures a change from the baseline value.

For multivariable analyses, those SEP variables and covariates that were significant at the alpha = 0.20 level in bivariate models were included in the full model. Purposeful backward selection procedures were then used to retain those variables that were independently associated with BMI at W1 and BMI slope. We used Bayesian information criteria and directed acyclic graphs (14) for assessing goodness of fit and variable selection leading to covariate-adjusted models that included age, sex, height and number of children, as well as a random intercept and slope. Each variable was also assessed as a potential confounder when assessing the associations of the other variables. A variable was considered to be a confounder and retained in the model if the partial regression coefficient of the lead term varied by more than ten percent when the variable was deleted from the model (14). To make the models comparable between the two racial groups we retained all variables that were significant for either group at alpha=0.05 level. Finally we explored whether these associations were differential among males and females by introducing interactions with sex. To maintain statistical hierarchy, we included the main effects terms as well as the interaction terms for those variables where the interactions were statistically significant. All statistical tests were 2 sided. All statistical analysis was conducted using SAS 9.2 (Cary, NC).

RESULTS

We present the baseline (W1) distribution of BMI, lifecourse socioeconomic variables, and covariates after weighting to represent the US population in 1986in Table 2. Compared to Whites, Blacks on average had a higher baseline BMI and lower levels of SEP for indicators of childhood and adult status. Unadjusted BMI trajectories by race and sex are shown in Figure 2. Black females had the highest baseline BMI at all ages while White females consistently had the lowest baseline BMI. Because age was centered at age 25, the slope coefficients represent change over time for a subject who was 25 years old at baseline. To calculate the effect for other ages, a linear combination of the estimates for age, slope coefficients and the age*time interaction were used. At age 25 all groups showed an increasing BMI trajectory with Black females and males having steeper slopes than White females and males. Among the oldest age groups, Blacks had a somewhat steeper decline in trajectories than Whites. A cohort effect is evident in all racial groups. For example, those who were 25 years at baseline (1986) had a higher BMI at age 40 (which they reached in 2002) than those who were aged 40 in 1986. Similarly, adults aged 55 in 1986 had lower BMI at that age than adults of the same race and sex in the 40 year age group who reached 55 in 2002.

Effect of Lifecourse Socioeconomic Position in Multivariable Models

We explored how various individual socioeconomic factors during the lifecourse were associated with BMI at baseline and BMI trajectories after adjusting for other socioeconomic factors. In multivariable models adjusting for all SEP variables (Table 3), high education was associated with a lower baseline BMI among both Blacks (−1.25kg/m^2) and Whites (−0.812 kg/m^2). The inverse association between father's education and respondent's BMI was similar in magnitude for Blacks (−0.689 kg/m^2) and Whites (−0.594 kg/m^2) but only achieved statistical significance for Whites. We found that income and financial security had significant interactions with sex. A direct association between income and baseline BMI was present for men but not for women. In contrast, the interaction between baseline financial security and sex indicated that financial security was associated with lower BMI only for Black women. None of the various SEP predictors had a significant effect on slope of BMI among Blacks in the multivariable model.

Baseline characteristics that independently predicted a steeper increase or more gradual decline in BMI trajectories for Whites included being female, high perceived SES as a child and greater income but a lower sense of financial security.

DISCUSSION

We analyzed data from a longitudinal study of a nationally representative sample to describe difference in predictors of BMI trajectories among Blacks and Whites. In Whites, lifecourse socioeconomic factors were associated with baseline BMI as well as change in BMI. Among Blacks, lifecourse SEP variables influenced the baseline BMI but not the change in BMI over time. Racial differences in baseline BMI were attenuated after socioeconomic adjustment but those in BMI change over time persisted even after accounting for socioeconomic differences. Higher education was associated with a lower BMI among all

groups. However, father's education, income and financial security had varying effects within demographic subgroups.

Although low father's education was initially associated with high baseline BMI and a decline in the slope coefficient among both Blacks and Whites (data not shown), the association among Blacks was no longer statistically significant after adjustment for adult SEP. These findings may reflect differences in precision related to subgroup sample size, but alternatively may suggest that childhood SEP has different pathways in influencing adult health among racial groups. An effect of both childhood SEP and adult SEP as seen in Whites supports a cumulative effects model of lifecourse theory where the total "dose" of socioeconomic adversity is important (15). On the other hand, there is a suggestion that for Blacks the sequence of adversity is relevant such that low childhood socio-economic position affects adult behaviors and broader social circumstances thus supporting the pathway model of lifecourse theory (16). These findings are supported by earlier studies which found that health behaviors and obesity among adolescents were influenced by socioeconomic position only among White adolescents but not among Black adolescents (17, 18).

In our study, lower baseline BMI was associated with high education consistently among Black and White men and women even after adjustment for income and wealth, suggesting that those with lower education may lack the knowledge of successful strategies or access to resources to combat obesity, and should therefore be a priority group for public health interventions. Our results are consistent with reports from the Atherosclerosis Risk in Communities (ARIC) and the cross-sectional National Health and Nutrition Survey (NHANES) studies exploring associations of BMI with adult socioeconomic status (19, 20).

We found that higher baseline income among men was associated with a higher baseline BMI. In the ARIC study, Black men with a higher income and education had a higher BMI but these associations were not seen in White men (19). Another cross-sectional study suggests that among men, higher income may be associated with higher BMI, while higher income women are less likely to be obese than low income women (20). The direct association between baseline income and BMI in men may reflect reduced levels of physical activity in higher income occupations. Men and women also may have strikingly different attitudes towards body weight status and have different practices for controlling body weight (21). In most Western societies, women hold a more negative attitude towards obesity than men and may be more likely to invest their resources to pursue a thinner ideal body than men (22).

Socioeconomic disadvantage has long been thought to be a 'fundamental cause' of obesity, and it has been thought that weight gain is the result of restricted knowledge of, and access to, health improvement strategies and resources among disadvantaged social groups (23). Our results for change in BMI over time suggest that even the socially advantaged may be at a high risk of obesity despite their greater access to resources. Similar findings are beginning to appear in the literature, where social advantage does not confer the expected protective effects against weight gain in Americans, especially among minorities (19, 24). High income does not translate into the same benefits for protecting against obesity – e.g., environmental,

behavioral, socio-cultural – among Blacks compared to Whites. Racial disparities in obesity may result from neighborhood environment, differential access to healthcare and psychosocial factors such as chronic stress and discrimination (25) which lead to weight gain through behavioral (e.g. coping behaviors such as over-eating and sedentariness) and biological (prolonged exposure to cortisol) pathways (26).

Study Limitations and Strengths

Our study has several strengths over previous reports on the association between lifecourse SEP and racial differences in BMI. Based on evidence that SEP measures, such as education, income and wealth, are not interchangeable and should be evaluated separately (5), we used multiple measures of lifecourse SEP for our analysis. In our study, both childhood and adult SEP are measured using a combination of more objective (education, income) and subjective (perceived childhood SEP and Financial Security in adulthood) measures. Both absolute and relative SEP are important to consider when assessing socioeconomic inequalities in health (27). We measured SEP at multiple points in the lifecourse, with retrospective measures of childhood SEP and education and prospective measurement of income, wealth and financial stress at 4 time points in adulthood spanning 16 years. Using education of parents as an indicator of childhood SEP is advantageous because parental education is less likely to change than occupation or income after young adulthood. Our use of mixed models for analyses allowed for the analyses of multiple exposures simultaneously (28). We found only modest correlations between our different measures of SEPs, and previous literature suggests that multiple socioeconomic status variables can be adjusted for in the same model without issues with collinearity (5). We used multiple imputations to address attrition which may lead to selection bias in panel studies. Although we found no significant differences between findings using the imputed datasets as compared to the complete case analysis, we present results from the multiple imputed dataset as it incorporates the added uncertainty due to missing data. Therefore, our inference is more conservative and accurate than those ignoring incomplete cases.

Our results should be interpreted in light of the study limitations. For data on early life socioeconomic circumstances, we relied on recall in adult life. However, previous research has confirmed the quality of retrospective childhood SEP reports (29, 30) and parental education has been particularly well recalled (31). The effect of childhood SEP may depend on the measure used (32). Perceived childhood socioeconomic status assesses income inequality and is a more subjective measure than education and income which measure absolute levels of SEP. The test-retest reliability of similar scales has been high (0.67–0.73) (33, 34). Previous reports have suggested that individuals who may be worse-off than community members in their neighborhood are more likely to have poor health status presumably due to limited access to social services which may be concentrated in poor neighborhoods, or due to stress resulting from social stigma and exclusion (35, 36).

Selected SEP indicators such as income and wealth may be sensitive and therefore result in underreporting (37). Turrell found that respondents with high incomes were more likely to not report their income and that income non-reporting was lowest among the unemployed and those receiving government support (37). Results from validation studies of other health

surveys demonstrate that there may be a modest measurement error in self-reports for income (a magnitude of approximately 900–1000$) with a larger bias in higher socioeconomic groups (38). Nevertheless, our use of multiple indicators, such as education and financial security that may be reported with more accuracy may limit the bias resulting from misreporting of some indicators. We conducted sensitivity analyses exploring alternative categorizations for childhood SEP, father's education and respondent's education. We found that the results did not vary greatly in magnitude and direction using these specifications; therefore we presented the results with simple dichotomy to ease interpretation.

We used self-reported weight and height to calculate BMI which may underestimate the true BMI. However, a previous report in this dataset found that the associations between BMI and socioeconomic factors did not change when BMI was corrected for bias due to self-report (39). The degree of adiposity associated with a given level of BMI may vary by age, sex, and racial and ethnic group (40, 41). Further, the relative risk for cardiovascular mortality associated with a given BMI level may be lower for blacks than for whites (42). However, there are significant absolute risks associated with high BMI among all racial groups to warrant investigation among all groups. In this study, selective survival over 16 years of follow-up in the initially middle-aged members of the cohort may also have affected the analysis of SEP and BMI trajectories, if mortality risk was relatively greater among low SEP individuals who had gained weight over time.

We did not have data on childhood health status and early life weight gain which have been shown to be important predictors of adult SEP and adult health.. Although there is some evidence that persistent overweight since childhood may affect some socioeconomic measures, like income, more than others, such as education and wealth (43, 44) especially in women (43, 44) the overall contribution of childhood health status to socioeconomic gradients seems to be minimal (45).

CONCLUSION

While it is important to study lifecourse influences on adult health, our study suggests that these measurements may not be equivalent by race and sex. Overall our findings suggest that a varied focus on socioeconomic factors in the prevention and management of obesity may be needed across population groups, because men and women from different racial groups may respond differently to intervention programs and policies targeting obesity tailored to socioeconomic factors.

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REFERENCES

1. Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and trends in obesity among US adults, 1999–2008. JAMA. 2010; 303(3):235–241. [PubMed: 20071471]
2. Ljungvall A, Zimmerman FJ. Bigger bodies: long-term trends and disparities in obesity and body-mass index among US adults, 1960–2008. Soc Sci Med. 2012; 75(1):109–119. [PubMed: 22551821]
3. Kahng SK. Can Racial Disparity in Health between Black and White Americans Be Attributed to Racial Disparities in Body Weight and Socioeconomic Status? Health Soc Work. 2010; 35(4):257–266. [PubMed: 21171533]
4. Giskes K, van Lenthe FJ, Turrell G, Kamphuis CB, Brug J, Mackenbach JP. Socioeconomic position at different stages of the life course and its influence on body weight and weight gain in adulthood: a longitudinal study with 13-year follow-up. Obesity (Silver Spring). 2008; 16(6):1377–1381. DOI: oby200854 [pii]10.1038/oby.2008.54. [PubMed: 18356832]
5. Braveman PA, Cubbin C, Egerter S, Chideya S, Marchi KS, Metzler M, et al. Socioeconomic status in health research: one size does not fit all. JAMA. 2005; 294(22):2879–2888. [PubMed: 16352796]
6. Kaufman J, Cooper R, McGee D. Socioeconomic status and health in blacks and whites: the problem of residual confounding and the resiliency of race. Epidemiology. 1997; 8(6):621–628. DOI: 00001648-199710000-00002 [pii]. [PubMed: 9345660]
7. Kaufman J, Cooper R. Seeking causal explanations in social epidemiology. Am J Epidemiol. 1999; 150(2):113–120. [PubMed: 10412955]
8. House, JS. Americans' Changing Lives: Waves I, II, III, and IV, 1986, 1989, 1994, and 2002. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor]; 2008.
9. Houle JN. Depressive Symptoms and All-Cause Mortality in a Nationally Representative Longitudinal Study With Time-Varying Covariates. Psychosomatic medicine. 2013; 75(3):297–304. [PubMed: 23533284]
10. Yuan Y. Multiple imputation using SAS software. Journal of Statistical Software. 2011; 45(6):1–25.
11. Rubin, DB. Multiple imputation for nonresponse in surveys. John Wiley & Sons; 2009.
12. Diggle, P.; Liang, K.; Zeger, S. Analysis of Longitudinal Data. 2nd Edition. Oxford University Press; 2002.
13. Singer, j; Willett, j. Applied Longitudinal Data Analysis:Modeling Change and Event Occurrence. New York: Oxford University Press; 2003.
14. Weng H, Hsueh Y, Messam L, Hertz-Picciotto I. Methods of covariate selection: directed acyclic graphs and the change-in-estimate procedure. Am J Epidemiol. 2009; 169(10):1182–1190. DOI: kwp035 [pii]10.1093/aje/kwp035. [PubMed: 19363102]
15. Hertzman C, Power C. Health and human development: understandings from life-course research. Dev Neuropsychol. 2003; 24(2–3):719–744. [PubMed: 14561568]
16. Ben-Shlomo Y, Kuh D. A life course approach to chronic disease epidemiology: conceptual models, empirical challenges and interdisciplinary perspectives. Int J Epidemiol. 2002; 31(2):285–293. [PubMed: 11980781]
17. Gordon-Larsen P, Adair LS, Popkin BM. The relationship of ethnicity, socioeconomic factors, and overweight in US adolescents. Obes Res. 2003; 11(1):121–129. [PubMed: 12529494]
18. Wang Y, Zhang Q. Are American children and adolescents of low socioeconomic status at increased risk of obesity? Changes in the association between overweight and family income between 1971 and 2002. Am J Clin Nutr. 2006; 84(4):707–716. [PubMed: 17023695]
19. Mujahid MS, DiezRoux AV, Borrell LN, Nieto FJ. Cross-sectional and longitudinal associations of BMI with socioeconomic characteristics. Obes Res. 2005; 13(8):1412–1421. DOI: 13/8/1412 [pii]10.1038/oby.2005.171. [PubMed: 16129724]
20. Ogden CL, Lamb MM, Carroll MD, Flegal KM. Obesity and socioeconomic status in adults: United States, 2005–2008. NCHS Data Brief. 2010; (50):1–8.
21. Sobal J, Stunkard AJ. Socioeconomic status and obesity: a review of the literature. Psychol Bull. 1989; 105(2):260–275. [PubMed: 2648443]

22. Lemon SC, Rosal MC, Zapka J, Borg A, Andersen V. Contributions of weight perceptions to weight loss attempts: Differences by body mass index and gender. Body Image. 2009; 6(2):90–96. DOI: http://dx.doi.org/10.1016/j.bodyim.2008.11.004. [PubMed: 19188102]
23. Link BG, Phelan J. Social conditions as fundamental causes of disease. J Health Soc Behav. 1995; (Spec No):80–94. [PubMed: 7560851]
24. Zhang Q, Wang Y. Socioeconomic inequality of obesity in the United States: do gender, age, and ethnicity matter? Soc Sci Med. 2004; 58(6):1171–1180. [PubMed: 14723911]
25. Woolf SH, Braveman P. Where health disparities begin: the role of social and economic determinants--and why current policies may make matters worse. Health Aff (Millwood). 2011; 30(10):1852–1859. [PubMed: 21976326]
26. Dallman MF. Stress-induced obesity and the emotional nervous system. Trends Endocrinol Metab. 2010; 21(3):159–165. [PubMed: 19926299]
27. Wilkinson RG, Pickett KE. Income inequality and population health: a review and explanation of the evidence. Soc Sci Med. 2006; 62(7):1768–1784. [PubMed: 16226363]
28. Greenland S. When should epidemiologic regressions use random coefficients? Biometrics. 2000; 56(3):915–921. [PubMed: 10985237]
29. Krieger N, Okamoto A, Selby JV. Adult female twins' recall of childhood social class and father's education: a validation study for public health research. Am J Epidemiol. 1998; 147(7):704–708. [PubMed: 9554610]
30. Galobardes B, Smith GD, Lynch JW. Systematic review of the influence of childhood socioeconomic circumstances on risk for cardiovascular disease in adulthood. Ann Epidemiol. 2006; 16(2):91–104. [PubMed: 16257232]
31. Chittleborough C, Baum F, Taylor A, Hiller J. A life-course approach to measuring socioeconomic position in population health surveillance systems. J Epidemiol Community Health. 2006; 60(11): 981–992. DOI: 60/11/981 [pii]10.1136/jech.2006.048694. [PubMed: 17053288]
32. Trotter LJ, Bowen DJ, Beresford SA. Testing for racial/ethnic differences in the association between childhood socioeconomic position and adult adiposity. Am J Public Health. 2010; 100(6): 1088–1094. DOI: AJPH.2009.173492 [pii]10.2105/AJPH.2009.173492. [PubMed: 20395579]
33. Goodman E, Adler NE, Kawachi I, Frazier AL, Huang B, Colditz GA. Adolescents' perceptions of social status: development and evaluation of a new indicator. Pediatrics. 2001; 108(2):E31. [PubMed: 11483841]
34. Operario D, Adler NE, Williams DR. Subjective social status: Reliability and predictive utility for global health. Psychol Health. 2004; 19(2):237–246.
35. Winkleby M, Cubbin C, Ahn D. Effect of cross-level interaction between individual and neighborhood socioeconomic status on adult mortality rates. Am J Public Health. 2006; 96(12): 2145. [PubMed: 17077398]
36. Mulia N, Karriker-Jaffe KJ. Interactive influences of neighborhood and individual socioeconomic status on alcohol consumption and problems. Alcohol Alcohol. 2012; 47(2):178–186. [PubMed: 22262507]
37. Turrell G. Income non-reporting: implications for health inequalities research. J Epidemiol Community Health. 2000; 54(3):207–214. [PubMed: 10746115]
38. Bricker J, Engelhardt GV. Measurement error in earnings data in the health and retirement study. J Econ Soc Meas. 2008; 33(1):39–61.
39. Ailshire JA, House JS. The unequal burden of weight gain: an intersectional approach to understanding social disparities in BMI trajectories from 1986 to 2001/2002. Social Forces. 2011; 90(2):397–423.
40. Fernández JR, Heo M, Heymsfield SB, Pierson RN, Pi-Sunyer FX, Wang ZM, et al. Is percentage body fat differentially related to body mass index in Hispanic Americans, African Americans, and European Americans? Am J Clin Nutr. 2003; 77(1):71–75. [PubMed: 12499325]
41. Aloia JF, Vaswani A, Mikhail M, Flaster ER. Body Composition by Dual-Energy X-ray Absorptiometry in Black Compared with White Women. Osteoporos Int. 1999; 10(2):114–119. [PubMed: 10501790]

42. Abell JE, Egan BM, Wilson PWF, Lipsitz S, Woolson RF, Lackland DT. Differences in cardiovascular disease mortality associated with body mass between black and white persons. Am J Public Health. 2008; 98(1):63–66. [PubMed: 18048799]

43. Clarke P, O'Malley P, Schulenberg J, Johnston L. Midlife Health and Socioeconomic Consequences of Persistent Overweight Across Early Adulthood: Findings From a National Survey of American Adults (1986–2008). Am J Epidemiol. 2010; 172(5):540–548. DOI: kwq156 [pii] 10.1093/aje/kwq156. [PubMed: 20610468]

44. Gortmaker S, Must A, Perrin J, Sobol A, Dietz W. Social and economic consequences of overweight in adolescence and young adulthood. N Engl J Med. 1993; 329(14):1008–1012. [PubMed: 8366901]

45. Lynch JW, Kaplan GA, Shema SJ. Cumulative impact of sustained economic hardship on physical, cognitive, psychological, and social functioning. N Engl J Med. 1997; 337(26):1889–1895. [PubMed: 9407157]

- Longitudinal Data from the Americans Changing Lives Study (1986–2002) was used
- Lifecourse socioeconomic predictors of BMI trajectories were analyzed
- High father's education, was associated with lower baseline BMI among Whites
- High education was consistently associated with a lower BMI.
- Higher income was associated with higher BMI only among males

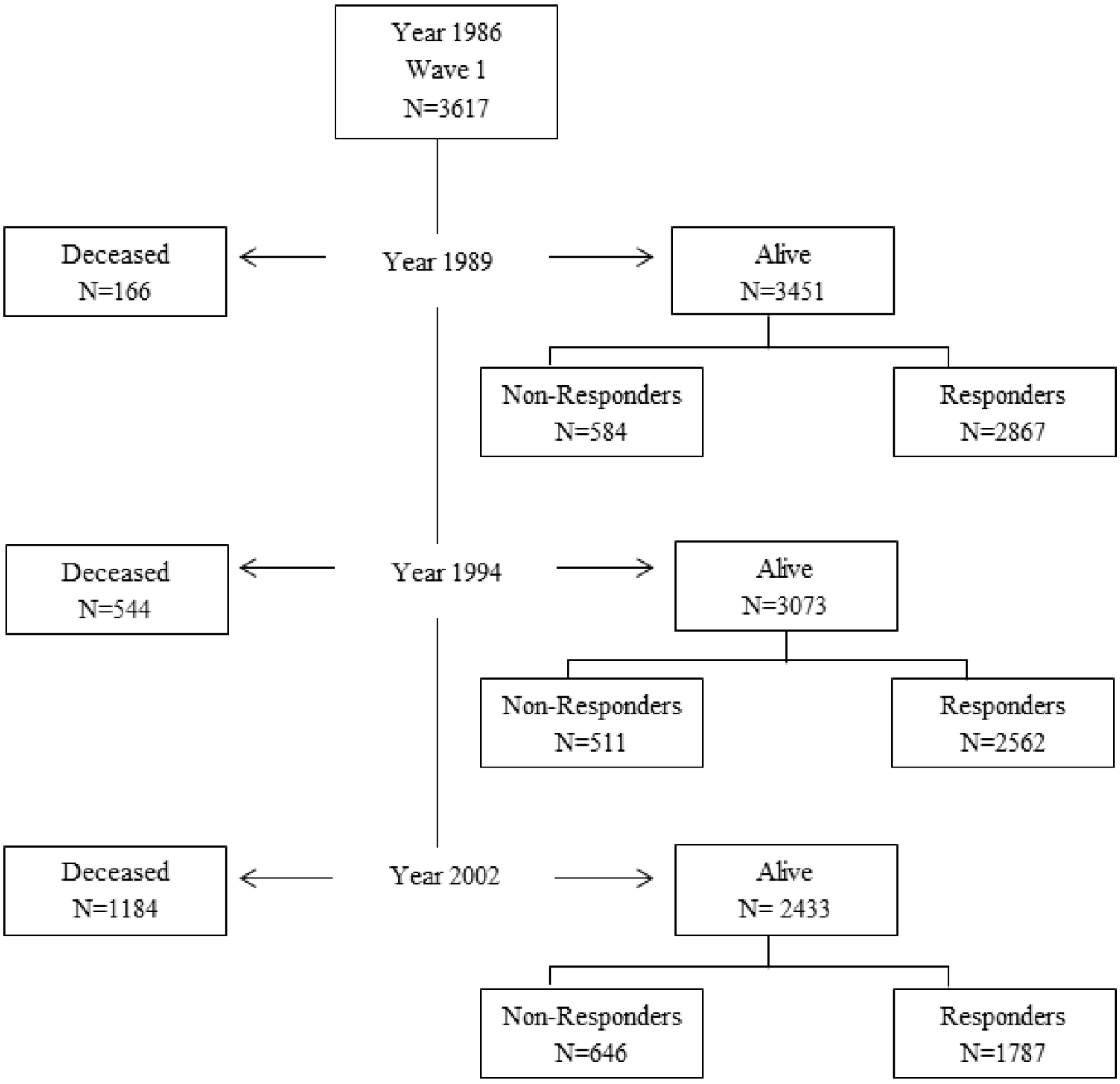

Figure 1.
Americans' Changing Lives Study (1986–2002) - Survey Design and Response Rates

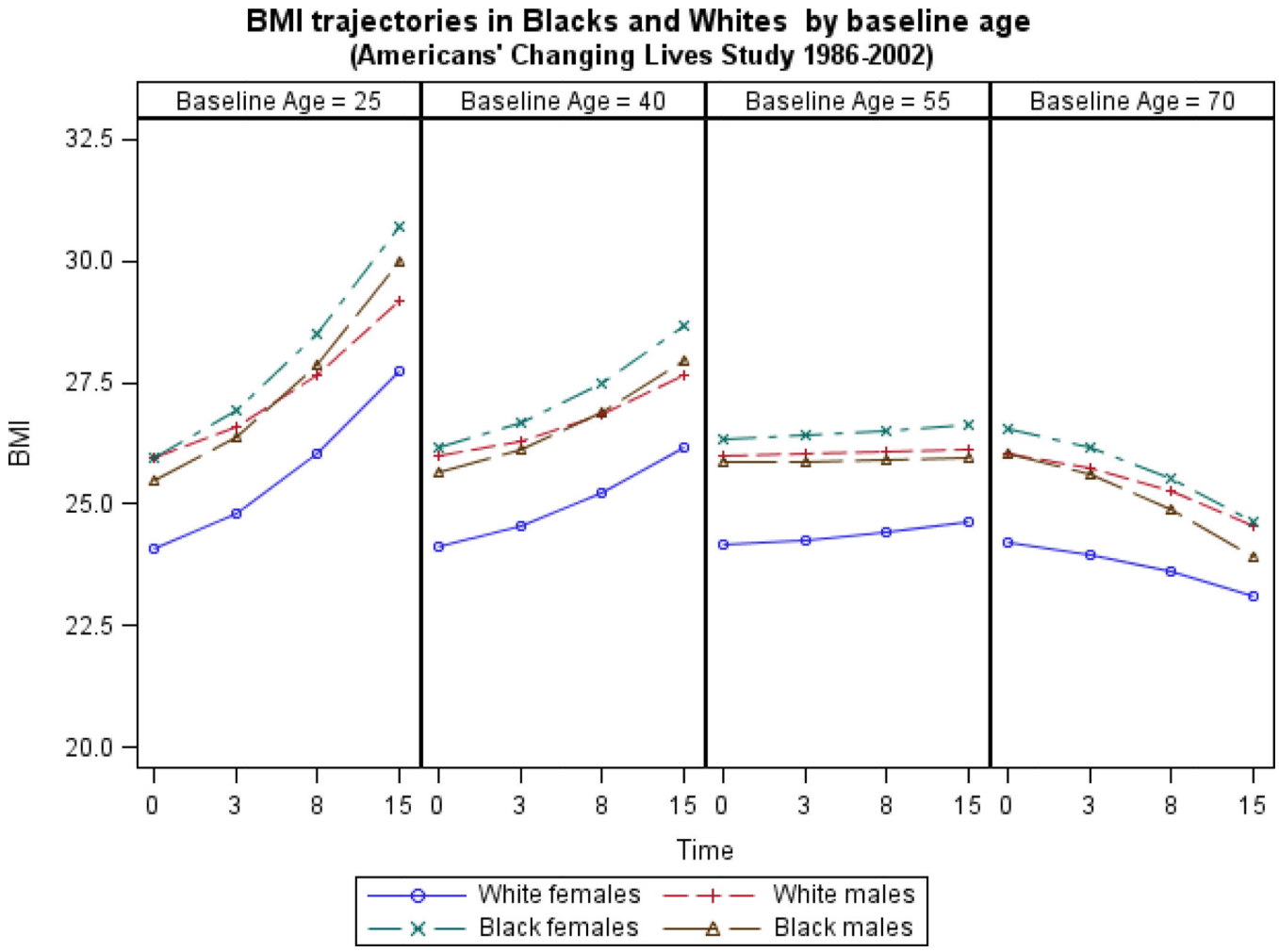

Figure 2.

Unadjusted BMI trajectories by Race and Sex in the Americans' Changing Lives Study (1986–2002)

BMI=Body Mass Index, Time in years since wave 1

Table 1

Lifecourse Socioeconomic Position variables in the Americans Changing Lives Survey 1986–2002

Variable	Survey Question	Wave collected	Categories
Father's education	How many years of school did your father finish?	Wave 2	0= <12 year 1= >=12years
Perceived Childhood SEP	Compared with the average family in your community at the time you were growing up, was your family BETTER OFF financially, ABOUT AVERAGE, OR WORSE OFF?	Wave 2	0=Poor childhood SEP 1=Not poor
Education	What is the highest grade of school or year of college you have COMPLETED?	Wave 1	0= <12 year 1= >=12years
Income	Taking into consideration all sources of income, what was your (and your (husband's/wife's)) total income before taxes in the last 12 months?	All waves	Continuous
Wealth	Suppose you needed money quickly, and you cashed in all of your (and your (husband's/wife's)) checking and savings accounts, and any stocks and bonds, and real estate (other than your principal home). If you added up what you would get, **1** LESS THAN $10,000 **2** $10,000 TO $19,999 **3** $20,000 TO $49,999 **4** $50,000 TO $99,999 **5** $100,000 TO $199,999 **6** $200,000 TO $499,999 **7** GREATER THAN OR EQUAL TO $500,000	All waves	Continuous
Financial security	**1** How satisfied are you with (your/your family's) present financial situation -- COMPLETELY, VERY, SOMEWHAT, NOT VERY OR NOT AT ALL satisfied? **2** How difficult is it for (you/your family) to meet the monthly payments on your (family's) bills? Is it EXTREMELY DIFFICULT, VERY DIFFICULT, SOMEWHAT DIFFICULT, SLIGHTLY DIFFICULT, OR NOT DIFFICULT AT ALL? **3** In general, how do your (family's) finances usually work out at the end of the month -- do you find that you usually end up with SOME MONEY left over, JUST ENOUGH MONEY to make ends meet OR NOT ENOUGH MONEY to make ends meet?	All waves	Continuous. This index was constructed by taking the arithmetic mean of the three items used and standardized using Wave 1 means and standard deviations. High values indicate a higher level of Financial Security (indicating a higher SEP)

Table 2

Descriptive Statistics for the American Changing Lives Cohort (n=3497) 1986–2002

	All (n=3497)		Blacks (n=1174)		Whites (n=2323)	
Variables	**Mean**	**Std.dev**	**Mean[a]**	**Std.dev[a]**	**Mean[a]**	**Std.dev[a]**
BMI	25.58	4.62	26.93*	3.02	25.40	5.21
Income	28597.84	20077.22	20923.31*	10179.94	29606.37	23305.81
Financial Security	0.01	0.98	−0.33*	0.59	0.05	1.12
Wealth	1.37	1.63	0.62*	0.66	1.46	1.92
Missing (n,%)	259.00	7.41				
Age	47.55	16.38	46.21*	9.02	47.73	19.04
	N	**Percent[a]**	**N**	**Percent[a]**	**N**	**Percent[a]**
Sex						
Females	2194	53	778	57.1	1416	52.46
Males	1303	47	396	42.9	907	47.54
Childhood Socioeconomic status						
High	2404	71.39	749	64.25*	1655	72.33
Low	370	10.38	121	11.07*	249	10.29
Missing	723	18.23	304	24.68	419	17.38
Father's education						
>=12yrs	903	36.47	176	19.09*	727	38.76
<12yrs	1454	38.64	484	42.84*	970	38.09
Missing	1140	24.89	514	38.06	626	23.16
Education						
<12 years	1302	25.26	571	39.89*	699	23.34
>=12 years	2195	74.74	603	60.11*	1624	76.66

[a] weighted using final central weights

* signficantly different from Whites

Table 3

Results from Multivariable Mixed Models for the effect of Lifecourse SEP variables on BMI at baseline and change in BMI in Blacks (n=1174) and Whites (n=2323) in the American Changing Lives cohort 1986–2002: Interactions by sex

	Blacks		Whites	
	Estimate	**95% CI**	**Estimate**	**95% CI**
Interecept(BMI at age 25)	**23.122**	**(18.299, 27.944)**	**25.277**	**(21.914, 28.640)**
Males (Ref) vs females	**−11.177**	**(−18.074, −4.279)**	**−7.932**	**(−12.60, −3.263)**
Father's education > =12 years vs. <12 yr(Ref)	−0.689	(−1.635,0.257)	**−0.594**	**(−1.057, −0.131)**
Childhood SES Better off/average vs worse(Ref)	0.547	(−0.242, 1.337)	0.249	(−0.260, 0.758)
Education> =12 years vs. <12 yr (Ref)	**−1.250**	**(−2.009, −0.490)**	**−0.812**	**(−1.296,−0.329)**
Baseline income (females)	0.150	(−0.334, 0.634)	−0.170	(−0.496, 0.155)
Baseline income(males)	**1.307**	**(0.695, 1.942)**	**0.809**	**(0.397, 1.221)**
Baseline financial security(females)	**−0.541**	**(−0.915, −0.167)**	−0.109	(−0.368, 0.150)
Baseline financial security(males)	0.386	(−0.153, 0.926)	−0.262	(−0.585, 0.060)
Time (Change in BMI/year)	**0.324**	**(0.041, 0.608)**	−0.002	(−0.190 0.186)
Time*Males (Ref) vs females	−0.017	(−0.062, 0.028)	**−0.029**	**(−0.052, 0.006)**
Time Childhood SES* Better off/average vs. worse(Ref)	−0.012	(−0.063, 0.039)	**0.036**	**(0.003, 0.069)**
Time baseline income*	0.000	(−0.027, 0.028)	**0.021**	**(0.003, 0.038)**
Time baseline financial security*	−0.001	(−0.023, 0.021)	**−0.018**	**(−0.032, −0.004)**

[a] All models adjusted for age, sex, sex*time, age*time height and number of children BMI=Body Mass Index, SEP= Socioeconomic Position, 95% CI=95% Confidence Interval Bold numbers represent statistical significance at 0.05 level

To make the models comparable between the two racial groups we retained all variables that were significant for either of the two groups at alpha=0.05 level. Main effect of childhood SES was included because the interaction between childhood SES and time was significant for Whites.