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Racial Differences Across the Lifecourse Using Socioeconomic Status

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Bachelor of Science

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A thesis submitted to the Faculty of the
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Abstract

Racial Differences Across the Lifecourse Using Socioeconomic Status

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Background

Currently, obesity impacts over 17% of children and adolescents globally. Children who are obese and overweight are at higher risk to develop poor health outcomes. Although biological factors have been found to be associated with adolescence and adulthood, social factors (e.g. stress, socioeconomic status (SES), and race) and environmental factors seem to have similar trends with obesity continuing through adulthood.

Methods

The relationship between childhood SES and obesity was explored using data collected from recruited pregnant women and offspring living in California between 1959-1967 as part of the Child Health and Development Studies (CHDS). Logistic regression analyses were conducted to assess the association between childhood SES and the odds of obesity at age 9-11, 15-17 and at 50 year follow ups adjusting for potential confounders. Gender and race were assessed as potential effect measure modifiers.

Results

In adjusted analyses, low childhood SES was statistically significantly associated with a higher odds of obesity in adolescence (OR = 2.10, (95% CI: 1.01, 4.37)). The observed inverse association was stronger among black, non-Hispanics, (OR = 2.59, (95% CI: 0.72, 9.29), albeit this was not statistically significant. Gender and other social factors did not impact the association between child SES and the odds of obesity across all time points.

Conclusion

In summary, our findings suggest that race differences were found while adjusting for demographic and/or sociodemographic factors along the association between low childhood SES and the odds of obesity in adolescence. Race should be considered in understanding the persistence of obesity across the life course. Our research suggest that the effect of the association between child SES and the odds of obesity is inconclusive due to sample size.

Racial Differences in BMI and Obesity Risk in Adulthood Using Childhood Socioeconomic Status

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I. BACKGROUND/LITERATURE REVIEW

Obesity is a continuous health concern worldwide and has rapidly increased since the 1970s (1). Currently, obesity impacts over 17% of children and adolescents globally (2, 3). Obese and overweight children are at higher risk of developing poor health outcomes, including hypertension (high blood pressure), hypercholesterolemia (high cholesterol), and Diabetes (4, 5). Such poor health outcomes have been found to be a risk factor for heart disease (6), which is one of the leading causes of premature death. As obesity continues to impact populations worldwide, researchers should strive to focus on factors that may be linked to obesity in childhood and adolescence to prevent future mortality in adulthood (3, 7-11). As biological factors have been found to be associated with obesity in adolescence and adulthood, social factors (e.g. stress, socioeconomic status (SES), and race) and environmental factors may have similar trends with obesity continuing through adulthood (2, 3).

The life course theory has been used to examine how certain factors may contribute to certain outcomes currently and over the long term. Various studies have considered the life course approach to understand what social factors may affect chronic conditions in childhood and during adulthood (9, 12-14). Evidence has found that individuals who are overweight or obese in childhood are more at risk in becoming overweight or obese as adults (7, 10, 15). However, the Juonala et al article concludes that persons who were overweight or obese during childhood, but non obese as adults were no different from persons who had a consistently normal BMI in childhood and adulthood (4).

Social factors could be contributing to population risk in becoming overweight. In addition, evidence supports that individuals who are more socioeconomically disadvantaged are more at risk for obesity (8, 16). Specifically, lower education and incomes, lower surrounding property values and shopping at lower cost stores have been found to increase the risk of obesity (17). Individuals who live near lower property values, have lower education and income may not be aware of healthier food options and are more likely to purchase more fast foods due to their environment. This presents SES as being a possible predictor linked to obesity and could help to explain BMI disparities found in adulthood.

Socioeconomic inequalities in health has been most widely applied as a theoretical framework and social theorists, Bruce Link and Jo Phelan's fundamental cause theory has provided a better understanding of the persistence of health inequalities over time. This theory describes the idea that high SES individuals possess more social factors (i.e. such as money, knowledge, prestige, stronger beneficial social connections) that may help to protect and/or improve health (18). Using the fundamental cause theory, low SES individuals are more likely to be exposed to risk factors at any given place and time, while high SES individuals are more likely to have more supportive social factors to limit their risk to such exposures. This theory helps to summarize how certain individuals experience a poor health outcome than others and why certain populations seem to be more likely to be exposed to certain risk factors than other populations (17).

Although the complexity in SES measurement and study design methodology have made it difficult to compare across studies, SES and race are associated with obesity. Socioeconomic status (SES) has been well measured as a composite measure of income and/or occupation status and education level or a single measure of education or income (19). Research has been mixed in explaining the association between life course SES and obesity due to differences found in study designs. Studies have found an inverse relationship between SES and obesity among adolescence with SES defined as income and parental education (10); however, this relationship varies by race, and sex (20, 21). As socioeconomic factors are considered, obesity disparities occur and are influenced by income status (22) and/or poverty status (23, 24). Association between SES and obesity have been more consistently been noted among women compared to men (25).

Studies have supported the association between childhood SES and adult health. Many aspects of both physical and psychosocial stressors has not been studied greatly along the relationship between child SES and obesity. A few studies have found an association between low SES and higher levels of cortisol (26), while others found inconclusive results (27). Psychosocial stressors can elicit a certain stress response when an individual experiences stress, which results in increased cortisol levels (26). On the other hand, research has considered the role of psychosocial stressors on the development of obesity (28). Increased psychosocial stress has been associated with weight gain in prospective studies (29, 30). From previous literature reviews, additional knowledge is needed to confirm if such stress in childhood may impact the relationship between SES and obesity in adulthood and identify a critical period for intervention.

Race has been considered as a possible modifier to explain the association between SES and obesity; however, research has concluded varying results. Studies have shown an inverse association between SES, BMI and race in childhood and adulthood, with strong associations found among black, non-Hispanics (9). Baltrus et al. measured body weight over a 34 year follow up using a longitudinal population based cohort. Using socioeconomic position (SEP) as a mediator, race and weight gain was statistically significant across the life course and African Americans were found to be heavier in weight at baseline compared to whites (9).

Past studies have shown inverse differences in BMI among racial minority groups who had a lower education level and appeared to be of higher SES (31). In addition, the National Longitudinal Study of Adolescent Health found a greater obesity prevalence among black, non-Hispanic females in comparison to white, non-Hispanic females trending from adolescence to early adulthood (32). Also, using measures of life course SES, there were no statistically significant associations between SES and obesity by race even though minority groups had the highest risk of obesity across SES group profiles based on SES data in adolescence and young adulthood (14). Suggesting how using a multidimensional measure of SES can capture the development of obesity. With varying results, ethnic minorities may have the highest odds for obesity conclusively and experience a different effect than other racial groups and race should be further assessed with other social factors.

This study will assess whether child SES is associated with BMI at different points across the life course and provide insight on factors that may mediate this relationship. Race is assessed as a possible modifier of child SES and obesity association. Finally, across the life course, possible mediators (e.g. sex, stress, adulthood SES, marital status, maternal worry, and active exercise) will be assessed to clarify if the association between child SES and obesity differs by race. Additional adjusted analyses will be considered for further assessment of the child SES and obesity association. Our suggested model for the association between SES and the odds of obesity. We hypothesize that there is an association between child SES and odds of obesity in adulthood and the effect of this association differs by race.

II. METHODS

Child Health and Development Studies cohort

Data was obtained from the California-based, the Child Health and Development Study (CHDS). The longitudinal CHDS recruited (n= 19,044) pregnant women and their offspring who were born between 1959 and 1966 and were receiving prenatal care from the Kaiser Permanente Medical Care Health plan at facilities in Alameda, California (8). Well captured demographic and behavioral information were collected within this study from in person interviews with mothers during pregnancy.

The CHDS data has been maintained through the California Automated Mortality Linkage Information System, Department of Motor Vehicles (DMV), and California Department of Vital Statistics and the California Cancer Registry (33). These passive surveillance measures have been used to find participants at later life stages and identify one or more members of over 80% of CHDS families.

CHDS Disparities Study sample

Surveys were completed by a subsample of children from the Child Health and Development Study (CHDS) Adolescent sample. Parents and their offspring were interviewed when offspring were between ages 9 and 15-17 years old and mothers were between the ages 34-61 years of age. Assessments captured included measures of anthropometric, blood pressure, cognition, behavioral, spirometry and psychosocial factors. Multiple waves of data collection were gathered for study participants at age 9-11, age 15-17.

The disparities study (DISPAR) was created as a subset from the Child Health and Development Study (CHDS) that would understand how such racial socioeconomic disparities in obesity may occur over the life course. To fully retain the time points of observation for study participants with multiple observations, a sample of 605 participants were California residents selected from (1) a 50% random sample of Black, African American male and female participants in the CHDS Adolescent Study, (2) 100% of Black, African American male and female participants in the CHDS Adolescent Study, and (3) a supplementary sample of 100% of Black, African American male and female participants in CHDS follow up studies at age 5 or ages 9-11. Eligibility requirements were extended beyond the Adolescent Study for African Americans in order to meet sampling targets. The study sample of 605 is composed of 353 White, Caucasian and 252 Black, African American participants. Multiple waves of data collection were gathered for study participants at ages 20, age 30 and around age 50. Of the 605 study participants who completed the telephone interview, 510 (84%) completed the home visit and 497 (82%) the self-administered questionnaire (8). For the purpose of this analysis, adult demographics, height and weight was captured during home visits and Computer Assisted Telephone Interviewing (CATI) and adult BMI was captured using CDC Adult Weight Status definitions. From the 605 study sample, study participants who had a childhood SES measure and who completed a home visit to obtain measurements of height and weight were used for further analysis (N= 429). A total of 271 non-Blacks subjects (77%) and 158 Black subjects (63%) had participated in the earlier adolescent wave of data collection.

Study Protocol for Data Collection

At age 50, data was collected using a 45-minute computer assisted telephone interviews, home visits and self-administered questionnaires. The telephone interview captured information in demographics, socioeconomic factors, discrimination, general health, and family structure. The home visit questionnaire included assessments in height and weight, anthropometry, lung functioning, cognition and blood pressure. A self-administered questionnaire included additional psychosocial measures that could not be included in the telephone interview.

Social Measures

Childhood SES

Maternal education at age 9-11 was categorized into 4 groups, (Less than 12th grade, High School Graduate, Some College and College Graduate). Reports of family income and parental occupation were characterized as a combined average at each of the three time points (age 5, age 9-11, and 15-17). Reports of family income and parental occupation were characterized as a combined average at each of the three time points (age 5, age 9-11, and 15-17). Childhood SES (N= 429) was defined as a composite of maternal education, family income and parental occupation. (8). Child SES was assessed as a 3 level categorical variable on a scale from low, medium and high for each time point.

Adult SES

Self-reported family income categorized into 12 levels ranging from $2,500 or below to $300,000 and education for mothers and fathers at home visits (8). Participants highest education level obtained in adulthood was categorized into 4 groups (High School or Less (N= 236, 39%), Associate/Vocational-Technical (N= 93,15%), Bachelors (N= 170, 28%), Masters, Doctorate, Professional, Other (N= 105, 17%). Adult SES was defined as a composite of income and education and characterized as a 3 level categorical variable on a scale from low, medium, and high.

Potential Mediators

Maternal Worry

During the 9-11 year follow up, mothers were asked about their recent worries. Mothers were asked: “Has employment been worrying you recently?”, “Has finances been worrying you recently?”, “Has health worrying you recently?”, and “Has marital relations been worrying you recently?” Response options were dichotomized as “yes” or “no”. Maternal worries were characterized as experiencing one or more worries versus none.

Stress

During the self-administered around age 50, mothers were asked to indicate how upsetting the listed experiences have been a current or ongoing problem that have lasted twelve months or longer. The list included items in regards to ongoing health problems, physical or emotional problems (in spouse or child), ongoing problems with alcohol or drug use in a family member, ongoing difficulties at work, ongoing housing problems, ongoing problems in a close relationship, and helping at least one sick, limited, or frail family member or friend on a regular basis. A semantic differential approach (scale points are numbered from 1 to 4 and respondents are posed with two options that are opposites for responses) was used for responses. Stress was characterized as experiencing two or more stressors versus less than two.

Active Exercise

During 9-11 year follow up, offspring were asked about their physical activity and exercise. Children were asked “Do you currently participate in any organized sports or are you engaged in any intentional physical exercise?” Children were able to respond as “No, or less than once per week”, “Yes, once or twice per week”, “Yes, three or more times per week”, and “Yes, daily”. Active Exercise was characterized as exercising at least once a week versus daily.

Sociodemographic Factors

During 9-11 year follow up, parents reported their child’s race/ethnicity. Race/ethnicity was characterized as either white, non-Hispanic or black, non-Hispanic. Parents self-reported their marital status. Marital status was characterized as either married or separated/divorced/widowed/other.

<u>Outcomes</u>

Adolescent BMI

During 9-11 and 15-17 year follow up, offspring’s height and weight were gathered to calculate BMI and mean BMI measures. BMI percentiles (N= 429) and z-scores were calculated using archived CHDS data. BMI was characterized as overweight/obese if BMI values were greater than equal to the 85th percentile for sex and age using Centers for Disease Control 2000 growth charts. Adolescents scoring below 85th percentile were considered as "Underweight/Normal". https://www.cdc.gov/nccdphp/dnpao/growthcharts/resources/sas.htm

Adult BMI

Obesity (N= 429) was determined by body mass index (BMI), which is a combination measurement of a person's weight and height (34). A high BMI is used as an indicator for high body fatness. Studies have shown consistent trends in screening for obesity using BMI as a measurement for body composition (35, 36) versus (Anthropometrics, Bioelectrical impedance analysis (BIA), and Bioimpedance spectroscopy (BIS)) (37).

Measurements of participants' weights and height were conducted during 50 years of age assessment. Study participants were considered as overweight/obese if BMI values were greater than equal to the 25 using Centers for Disease Control BMI classifications. Mean BMI measures were calculated for study participants as demographics.

https://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html

Data Analysis

All analyses were conducted in SAS version 9.4 (SAS Institute, Cary NC). Each time point (age 9-11, age 15-17, and age 50) was modeled independently. Missing data was excluded for analysis. Data was analyzed based on a sample size of 429 for all variables of interest. Each time point was modeled separately age 9-11 (N = 271), age 15-17 (N = 272), and age 50 (N = 256).

Descriptive statistics were provided to determine the percent and totals of offspring during adolescence, offspring in adulthood, and mothers who completed data for social factors in question. Descriptive variables in questions were stratified by race to assess racial differences.

Logistic regression analyses were conducted to assess the association between childhood SES and obesity at points across the life course 9-11, 15-17 and around 50 year follow ups. Multivariate analyses were conducted to assess the strength of association of child SES and the odds of obesity across the life course adjusting for race and other social factors of interest.

The effect of modification between child SES and the odds of obesity at various time points were explored using logistic regression modeling. The relationship between child SES and obesity at various time points were stratified by either race and/or sex. Adjusted associations were compared to crude estimates for each time point (9-11, 15-17, and age 50).

The following model was considered for analyses,

$$\ln \frac{\left[BMI_{overweight/obese}\right]_{Adult}}{\left[BMI_{underweight/normal}\right]_{Adult}} = \alpha_1 + \beta_1 \times SES_{L,Child} + \beta_2 \times SES_{M,Child} + Covariates$$

where $SES_{L,\ Child}$ is a categorical indicator for low childhood SES for exposure; $SES_{M,\ Child}$ is an indicator for medium childhood SES; and Covariates indicate other potential mediators in question (i.e. adulthood SES, stress, maternal worry, and active exercise) and race and sex.

III. RESULTS

Among all participants, 87% of mothers were married, 68% of mothers experienced less than one worry, 41% of mothers have a high school level education, and 44% of mothers experienced greater than 2 stressors in the past year. Of the 429 offspring, 53% were female, and 63% were white, non-Hispanics, and 42% experienced a high SES at age 9. The mean $\pm$ SD for adolescent BMI percentile value for age 9-11 year follow up was 54.7 $\pm$ 27.7 kg/m^2; mean BMI percentile value for 15-17 year follow up was 50.7 $\pm$ 28.3 kg/m^2; and mean adult BMI value at age 50 year follow up was 25.4 $\pm$ 5.81 kg/m^2 (**Table 1**).

Demographic and selected characteristics of mothers and offspring are displayed in **Table 1**. Black, non-Hispanics had greater percentages for low child SES (57%) and adulthood (at age 50) SES (53%) than white, non-Hispanics (43%, 47%), respectively. There were no racial differences found among measured adult stress and active exercise in childhood. On the contrary, measurements for mothers did differ slightly for BMI weight status and SES compared to offspring at age 9. In particular, offspring were less overweight than mothers at age 50. Among offspring, Black, non-Hispanics were found to be more obese compared to white, non-Hispanics. Black, non-Hispanics showed a higher percentage of low SES and among whites, offspring were more likely to exercise daily than their counterparts. Higher BMI (μ = 27.4) at age 50 was found among black, non-Hispanics compared to white, non-Hispanics (μ = 24.2). Overall, a mass majority of offspring are classified as normal in weight status and over time BMI weight status significantly increased by age 50.

In crude analyses, low childhood SES was associated with an almost two-fold odds of obesity in childhood (OR= 1.76 (CI: 0.92, 3.35)), a three-fold increase in odds of obesity in adolescence (OR= 2.51 (CI: 1.26, 4.99)), and no change for the odds of obesity in adulthood (OR= 1.08 (CI: 0.65, 1.80)). Selected characteristics were modeled to examine the association of obesity odds at childhood, adolescence, and adulthood and SES status in childhood with respect to low child SES (**Table 2**). Further adjustments for sex showed no differences than adjustments for race. However, adjustments for race non-statistically significantly decreased the association between low child SES and obesity odds in childhood, adolescence, and adulthood. Adjustments for demographics (race, sex, and marital status) changed the magnitude of the association for the odds of obesity and low SES slightly in childhood and adolescence. Overall, there is an association between low child SES in childhood and the odds of obesity in childhood and the odds of obesity in adolescence. No statistically significant association was found between low child SES in childhood and odds of obesity in adulthood.

The effect of low child SES on the odds of obesity were not found to differ by race. (**Table 3**). The association between low childhood SES and the odds of obesity at age 15 was statistically significant when adjusted by race and other demographics (OR = 2.10, (95% CI: 1.01, 4.37)). Associations differed for white, non-Hispanics (OR = 1.88, (95% CI: 0.75, 4.70)) compared to black, non-Hispanics at age 15 (OR = 2.59, (95% CI: 0.72, 9.29), but associations did not reach statistical significance. A similar trend was found for the association between low childhood SES and the odds of obesity in childhood. However, low childhood SES is associated with a lower odds of obesity in adulthood (OR = 0.85, (95% CI: 0.49, 1.48)), and was found not to differ by race statistically significantly. Further modifications for the association between low child SES and the odds of obesity were not found for adult SES, active exercise, or adult stress across all points of the life course.

Overall, a statistical significant association was found for low child SES and the odds of obesity at age 9 and 15. While, an inverse association was found between child SES and the odds of obesity at age 50, no statistical significance was found. In addition, the effect of race on the association of childhood SES and the odds of obesity across the time points (9-11, 15-17, and at age 50) was found at adolescence, but was did not reach statistical significance.

IV. DISCUSSION

In this California-based cohort study, research findings reveal a life course SES exposure was associated with a lower odds of obesity in adulthood, after adjustments for race, and other social factors tested. We noted increases in the odds of obesity across two (9-11, 15-17) follow ups even after excluding missing observations. Overall, the most robust finding was a significant association between low childhood SES and the odds of obesity in adolescence, which may indicate a disadvantage for children who live socioeconomically disadvantaged areas. Such social disadvantage can lead to poor health outcomes (38). This reflects recent findings from Tyson H. Brown et al (2016), which explores the multi-level influences of race, gender and SES on health inequalities through the life course by investigating between- and within-group differences in self-rated health among White, Caucasians and Black, African American participants. In support of research findings, this social disadvantage of childhood SES impacts the odds of obesity differently at each time point and seems to persist across the life course among populations. Notably, the observed odds of obesity in adolescence were stronger when adjusting for race and/or demographics compared to no adjustments. However, this stratification was not statistically significant in association.

Our results are comparable to other research relating to childhood SES exposure and the odds of obesity. Recently, the California Health Interview Study, a large population-based random digit dial telephone survey cohort, showed greater racial differences in obesity prevalence among black, non-Hispanics and Asians and overall differences in obesity prevalence were greater among women than among men (21). In other studies focusing on gender disparities among women, women who were in the disadvantaged group of SES over the late adulthood group had a significantly higher BMI in compared to those who were continuously in the advantaged SES over the late adulthood group (39). Link et al. (2017) reported that there is a statistically significant association between childhood SES and adult self-reported health and seems to play a role in explaining Black/White disparities in adult self-reported health. In estimating childhood SES, studies relied on measurements of a particular point in adulthood to assess data longitudinally that seemed plausible to their research (14),(39),(40); However, studies may have relied on an earlier measure for SES to show progress of BMI disparities across the life course (8),(41) and may have had a larger sample size for comparisons. This study provides importance by using logistical regression modeling to estimate the odds of obesity in childhood and adulthood using childhood SES. Since these associations are both specific to this cohort and childhood SES measurement used in our study, this provides us with reliability and justification in our data.

In stratified analyses, we noted stronger effects among Black, non-Hispanics females than among White, non-Hispanics females. Previous studies have suggested an interaction between race, sex, and SES in adulthood. We found no significant sex difference in association between childhood SES and the odds of obesity when adjusting for sex in childhood, adolescence or adulthood. Social adversity (such as stress) was discussed above for low childhood SES (38). Although Black, non-Hispanics may have changed from low SES to high SES across the life course, capturing social adversity in adulthood may be less sensitive in regards to childhood SES in exposure and may be present persistent throughout childhood and late adulthood. Furthermore, physiologic changes that may results from the stress may allow Black, non-Hispanics more susceptible to weight gain increasing the odds of obesity in adult life

(29). The lack of an effect on the odds of obesity among White, non-Hispanics could be contributed to factors related to sex and stress. In support of the study participants used in analysis, 53% were females and 66% were White, non-Hispanics, who currently experienced less than two stressors than did the Black, non-Hispanic participants. Higher stress could contribute to racial disparities in BMI as well as influence other factors (i.e. SES, sex differences, and maternal worry), which can enhance weight gains across the life course.

V. STRENGTHS AND LIMITATIONS

Our study contains some limitations. Ideally, we would like to recruit everyone for our studies; however, there was a reduction in the sample available from the original cohort. The non-participation of study subjects may be seen as a limitation, however, we noted no differences based on race, and sex on who was measured for weight and height at respective time points and those who did not have measurements. Although we were able to adjust for a number of factors associated with childhood SES and the odds of obesity in childhood, adolescence, and adulthood, it is possible for bias to occur through residual confounding. In addition to adjusting for race, childhood SES could have been limited to individuals who were comfortable in disclosing their education and/or income, allowing us to miss individuals who were missing these values, restricting our sample size. This limited variability in the creation of this variable, childhood SES, may have reduced our sample size, but it was an added strength in our study.

Although we may have attempted to capture everyone with a childhood SES exposure from our original cohort, we may be missing exposures for individuals who actually had been unemployed recently when the study survey was administered, but may just have acquired a new position of employment right after. However, this possible misclassification of exposure would be non-differential with respect to exposure, due to its rare association found in this study. In addition, the composite measure of SES has provided us with a well round representation of socioeconomic environment of our participants and this measure indicates its importance in longitudinal studies (12, 13, 42). Other studies have shown that low childhood SES is correlated with poverty (10, 22), which provides more depth in such studies. For consideration, these studies indicate individual factors to explain why the odds of obesity has steady inclined. Nonetheless, childhood SES exposure was attempted to be captured from all study participants and is used as a predictor for the odds of obesity across this life course.

In summary, our findings suggest that race differences were found for BMI in adolescence and low childhood SES association. Our suggestive reasoning for these differences were conclusive in regards to our data and provides insight for future research. In understanding obesity across the life course, future studies should consider the use of multiple time points in data collection to drive research forward and consider other social stressors (including discrimination) in justifying this association for intervention. Although additional interventions and other factors should be considered, socioeconomic status surrounding children could be supportive in providing additional housing or educational resources in hopes to limit increasing obesity trends in adulthood.

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VII. TABLES, FIGURES, AND FIGURE LEGENDS

Table 1. Participant Characteristics of CHDS DISPAR Study Sample by Race, N= 429 (Offspring and Mothers)

		White, Non-Hispanic (N= 271)		**Black, Non-Hispanic** (N= 158)		**Total** [24] N= 429	
		N (Mean)	SD or %	N (Mean)	SD or %	N (Mean)	SD or %
Gender, (%)							
	Male	135	67%	66	33%	201	47%
	Female	136	60%	92	40%	228	53%
SES [child], (%)*							
	Low	69	43.13%	91	56.88 %	160	37.30 %
	Medium	177	73.75%	63	26.25 %	240	55.94 %
	High	25	86.21%	4	13.79 %	29	6.76%
Marital Status, (%)*							
	Married	251	66.93%	124	33.07 %	375	87.41 %
	Separated /Divorced/Widowed/Other	20	37.04%	34	62.96 %	54	12.59 %
SES [adult], (%) *							
	Low	43	46.74%	49	53.26 %	92	23.29 %
	Medium	88	63.77%	50	36.23 %	138	34.94 %
	High	125	75.76%	40	24.24 %	165	41.77 %

Stress [adult], (%)								
	> 2 stressors	Yes	109	64.88%	59	35.12 %	168	43.52 %
	< 2 stressors	No	144	66.06%	74	33.94 %	218	56.48 %
Maternal Worry, (%)*								
	≥1 worry		72	54.14%	61	45.86 %	133	32.44 %
	no worry		186	67.15%	91	32.85 %	277	67.56 %
Active Exercise at age 9, (%)*								
	At least once a week		122	71.35%	49	28.65 %	171	50.00 %
	Yes, Daily		127	74.27%	44	25.73 %	171	50.00 %
Adolescent BMI Weight Status								
Adolescent BMI values, Mean*								
	Ages 9-11 years		271 (52.57)	26.84	158 (58.44)	28.93	429 (54.73)	27.74
	Ages 15-17 years		270 (48.53)	27.5	96 (56.75)	29.59	366 (50.69)	28.26
BMI Weight Status Categories (Age 9-11), %								

	Underweight/Normal	234	66.29%	119	33.71%	353	82.28%
	Overweight/Obese	37	48.68%	39	51.32%	76	17.72%
BMI Weight Status Categories (Age 15-17), %							
	Underweight/Normal	238	76.77%	72	23.23%	310	84.70%
	Overweight/Obese	32	57.14%	24	42.86%	56	15.30%
Adult BMI Weight Status							
Adult BMI values, Mean							
	50 years	271 (24.21)	5.22	158 (27.38)	6.23	429 (25.38)	5.81
BMI Weight Status Categories (age 50), %							
	Underweight/Normal	164	73.54%	59	26.46%	223	51.10%
	Overweight/Obese	107	52.20%	98	47.80%	205	47.90%

Note: Values are frequencies or mean ± SD

*$\rho \leq 0.05$ for statistical significant difference between the two racial groups

Adolescents: Overweight in adolescents defined as BMI ≥ 85th and < 95th percentile; Obesity in adolescents defined as BMI ≥ 95th percentile (assuming same age and sex)

Adults: Overweight defined as BMI ≥25 and < 30; Obesity defined as BMI ≥ 30

SES [adult] defined as composite measure of self-reported family income and education status of parents; SES [child] defined as a composite measure of maternal education at age 9-11 year follow up with reports of family income and parental occupation at age 5, 9-11, 15-17 year follow ups

Stress [adult] is a composite measure of ongoing stressors occurring currently in adulthood; totals range from 0 to 7
Maternal worry defined as composite measure of the mother's anxiety at child's 9-11 year follow; totals range from 0 to 3
Maternal status was defined for parents at child's 9-11 year follow up
Active Exercise defined at child's 9-11 year follow up; two level categorical level

Table 2: Multivariable Analysis of Potential Factors for Low Socioeconomic Status at age 9 to Obesity Odds at ages 9, 15, & 50 year follow ups

Model	**Model 1 (N= 272) Obesity Odds at Age 9**	**Model 2 (N= 271) Obesity Odds at Age 15**	**Model 3 (N= 256) Obesity Odds at Age 50**
	OR (95% CI)	OR (95%CI)	OR (95%CI)
Low Child SES[A]	1.76 (0.92, 3.35)	2.51 (1.26, 4.99)*	1.08 (0.65, 1.80)
Low Child SES[B]	1.40 (0.71, 2.77)	2.04 (0.99, 4.21)*	0.87 (0.51, 1.51)
Low Child SES[C]	1.42 (0.71, 2.82)	2.10 (1.01, 4.37)*	0.85 (0.49, 1.48)
Low Child SES[D]			0.87 (0.50, 1.52)
Low Child SES[E]			0.81 (0.46, 1.42)

* $p \leq 0.05$; OR- Odds Ratio; CI- Confidence interval

Data on the association between low child SES and the odds of obesity at ages 9, 15, 50 while adjusting for questionable predictors

Low Child SES defined as having a low maternal education and/or low family income/parental occupation average for SES [child]

A Univariate (includes low SES [Childhood])

B Model adjusts for race

C Model adjusts for race, sex, marital status[a]

D Model adjusts for race, maternal worry[b], active exercise[c], stress [adult][d]

E Model adjusts for race, maternal worry[b], active exercise[c], stress [adult][d], SES [adult]

a Marital status defined as parental relationship at child's 9-11 year follow

b Maternal worrisome defined as having 1 or more worries/anxieties when child is age 9

c Active exercise defined as current exercise activity when child is age

d Stress [adult] defined as having two or more stressors of current/onging experiences that have lasted ≥ 12 months

Table 3: Obesity Odds at Ages 9, 15, and 50 and Low Child SES at age 9 by Race

Models	**A**			**B**			**C**		
	White, Non-Hispanic	***Black, Non-Hispanic***	***Total (Adjusted)***	***White, Non-Hispanic***	***Black, Non-Hispanic***	***Total (Adjusted)***	***White, Non-Hispanic***	***Black, Non-Hispanic***	***Total (Adjusted)***
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Model 1 (N= 272) Obesity Odds at Age 9	1.68 (0.71, 3.98)	1.07 (0.36, 3.22)	1.41 (0.71, 2.82)	1.65 (0.69, 3.95)	1.11 (0.36, 3.40)	1.49 (0.73, 3.04)			
Model 2 (N= 271) Obesity Odds at Age 15	1.88 (0.75, 4.70)	2.59 (0.72, 9.29)	2.10 (1.01, 4.37)*	1.88 (0.75, 4.71)	2.76 (0.78, 9.76)	2.07 (0.97, 4.44)			
Model 3 (N= 256) Obesity Odds at Age 50	0.70 (0.36, 1.35)	1.37 (0.50, 3.78)	0.85 (0.49, 1.48)	0.75 (0.39, 1.44)	1.29 (0.47, 3.52)	0.86 (0.49, 1.50)	0.71 (0.36, 1.39)	1.12 (0.40, 3.11)	0.79 (0.45, 1.41)

* $p \leq 0.05$; OR- Odds Ratio; CI- Confidence interval
Data on race specific and adjusted associations between the odds of obesity and low child SES at childhood, adolescence, and adulthood

A All models adjusts for demographics (race, sex, and marital status)
B All models adjusts for race, maternal worry, active exercise
C All models adjusts for race, maternal worry, active exercise, stress, SES (Adulthood)