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Associations Between Socioeconomic Status and Obesity in Diverse, Young Adolescents: Variation Across Race/Ethnicity and Gender

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Objective: This study examined the association between socioeconomic status (SES) and obesity risk during early adolescence, ages 10–13 years, and whether this association is present in different racial/ethnic and gender groups during 2 time points in early adolescence. ***Method:*** Data were from the Healthy Passages study, which enrolled 4,824 African American, Hispanic, and White 5th graders (ages 10–11) in a population-based, longitudinal study conducted in 3 U.S. metropolitan areas, and assessed them again 2 years later. Weight status was classified from measured body mass index using standard criteria into nonobese and obese (27% in 5th grade). SES was indexed based on highest education attainment in the household. ***Results:*** Youth in the highest SES had a significantly lower prevalence of obesity than those of lower SES at both 5th and 7th grades when disregarding race/ethnicity. Within-racial/ethnic group analyses mostly confirmed this pattern for Hispanic and White youth, but not for African American youth. When also considering gender, the SES differential in obesity risk was more pronounced among White girls and 5th-grade Hispanic boys. ***Conclusion:*** Growing up in a high SES home, marked by having a member with at least a college degree, is associated with lower risk for obesity among Hispanic and White youth. For African American youth, there appears to be no association between SES and obesity. Thus the health advantage generally attributed to higher SES does not appear consistently across racial/ethnic groups for obesity in youth. Further research should identify influences on weight status beyond SES, especially among African American youth.

Keywords: obesity, children, adolescents, socioeconomic status, race/ethnicity

Obesity prevalence among children and adolescents in the United States has tripled over the past three decades (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010), and has recently been estimated to be at 18% (Ogden, Carroll, Kit, & Flegal, 2012). However, African American and Hispanic youth experience disproportionately higher rates of obesity than their non-Hispanic White peers (Ogden et al., 2012). Much of this racial/ethnic disparity in obesity is attributed to the marked differences in socioeconomic status (SES) that exist across racial/ethnic groups (Goodman, Slap, & Huang, 2003; Larson & Halfon, 2010). Some research (Peña & Bacallao, 2002) has even suggested that income parity might reduce the existing racial/ethnic disparity in obesity (Ogden et al., 2012).

The social gradient (Marmot, Rose, Shipley, & Hamilton, 1978) describes a generalized relationship between health and social class, which favors individuals of higher compared with lower SES, not just at the extremes but at each level of SES along the gradient, on most indicators of health. The social gradient has likewise been noted between family SES and obesity risk for children and adolescents in the general population (Singh, Kogan, Van Dyck, & Siahpush, 2008; Singh, Siahpush, & Kogan, 2010a; Wang & Beydoun, 2007), where youth of higher SES (i.e., families of higher income and/or educational attainment) are at lower risk for obesity than youth of lower SES (Berkowitz & Stunkard, 2002; Braveman, 2009; Ogden, Lamb, Carroll, & Flegal, 2010).

The mechanisms underlying the relationship between SES and obesity risk in youth likely involves differences in dietary intake and physical activity patterns at different levels of SES (Singh,

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Siahpush, & Kogan, 2010b). First, parents of higher SES may possess the knowledge and means to provide a healthier diet for their children and engage them in activities that expend calories, such as organized sports. In addition, families of lower SES are more likely to reside in neighborhoods that make it difficult to maintain a healthy lifestyle. For example, poorer neighborhoods have a higher availability of fast food and convenience stores with high-caloric products, as well as a lower availability of fresh fruit and produce, compared with wealthier neighborhoods (Algert, Agrawal, & Lewis, 2006). There is also a lower availability of accessible and safe exercise environments, such as parks, and programs in poorer compared with wealthier neighborhoods (Lovasi, Hutson, Guerra, & Neckerman, 2009). The environment, therefore, for children in lower SES families may increase their risk for obesity.

Whereas this relationship of higher SES being associated with lower obesity prevalence exists within the population as a whole, an examination of racial/ethnic groups challenges its universality. Research has suggested that higher SES is associated with lower obesity in White youth, but that it is less so among Hispanic and African American youth (Gordon-Larsen, Adair, & Popkin, 2003; Ogden, Lamb, et al., 2010). In fact, one study suggested that higher SES may be a risk factor for obesity in some racial/ethnic groups (Alaimo, Olson, & Frongillo, 2001), where in a large, diverse sample, overweight prevalence increased as family SES increased in African American youth. Similarly, family SES explained approximately 31% of gap in body mass index (BMI) between Hispanic and White youth, but substantially less (10%) of the gap between African American and White youth (Powell, Wada, Krauss, & Wang, 2012). These findings suggest there may be differences in the relationship between family SES and obesity risk in youth across racial/ethnic group, challenging the universality of the social gradient in obesity.

The relationship between SES and obesity is further complicated when gender is considered. For example, some studies have reported that higher SES was most strongly associated with lower obesity prevalence among White girls (Gordon-Larsen, Adair, & Popkin, 2003), and least strongly among African American girls (Wang & Zhang, 2006), while other research has suggested this association is strongest among White and African American girls when measured by caregiver education level, and among White girls and boys when measured by household income (Ogden, Lamb, et al., 2010). Still other research has suggested that among African American girls there is either no association between SES and obesity (Goodman, Adler, et al., 2003) or an increased prevalence of obesity associated with higher SES (Freedman et al., 2007; McNutt et al., 1997).

In summary, the majority of studies thus far have presented *separate* cases for (a) the main effect of SES on obesity (Berkowitz & Stunkard, 2002; Singh et al., 2010a), (b) racial/ethnic differences in obesity risk that disfavor African American and Hispanic youth (Ogden et al., 2012), and (c) the gender−racial interaction that favors White adolescent girls (Ogden, Lamb, et al., 2010; McNutt et al., 1997). Although several studies have examined all three of these relationships among children and adolescents (Ogden, Lamb, et al., 2010; Wang & Zhang, 2006), studies incorporating multiple assessments with diverse youth have been rare. And although one study of which we are aware has reported on the relationship between SES and obesity risk in different racial/ethnic groups (Wang & Zhang, 2006), the foremost focus of that study was on changes in the relationship between these variables across time and less so on the differences in the relationship between SES and obesity between- and within-racial/ethnic groups.

There are other issues that merit consideration as well. The first is the representation of SES, which as a latent construct is typically indexed by family income, educational level, and/or occupational class (Oakes & Rossi, 2003; Shavers, 2007). Although several studies (e.g., Babey, Hastert, Wolstein, & Diamant, 2010; Kendzor, Caughy, & Owen, 2012) have examined the SES−obesity relationship using family income as the indicator for SES, some research has pointed to parental education level as being the SES indicator more closely linked to weight status (Shrewsbury & Wardle, 2008). The second issue concerns development during childhood. Much of the existing literature on the SES−obesity relationship has examined a broad age range in a given study (e.g., 2–18, 8–16, 10–18 years), disregarding developmental trends and issues. In particular, early adolescence (10–14 years) has been pointed to as a "crucial age" at which "children are at increased risk for unnecessary weight gain" (Haerens, Vereecken, Maes, & De Bourdeaudhuij, 2010, p. 1722). Thus, this developmental period may be a particularly fruitful window for an examination of the SES−obesity relationship in youth than the broader ranges of most previous studies. Moreover, it should be useful to examine the relationship at two points in this age range to test for consistencies or changes across development.

The aim of this study, therefore, was empirically to examine the association between SES and obesity risk during early adolescence, ages 10–13, and whether this association is present in youth of different racial/ethnic and gender groups. We focused on the three largest racial/ethnic groups in the United States: African American, Hispanic, and White youth. Based on the weight of the findings from prior research, we hypothesized that: (a) there would be an inverse association of SES with obesity risk in youth when race/ethnicity is disregarded; (b) within racial/ethnic groups, however, there would be an inverse association of SES with obesity risk among White, but not among African American or Hispanic, youth; and (c) SES would have a differential relationship with obesity in African American and White girls such that SES would be (i) inversely related to obesity for White girls and (ii) positively related for African American girls. We tested these hypotheses in the same sample at two times, 2 years apart, during early adolescence to examine developmental differences in this relationship.

Method

We used data from Healthy Passages, a multisite, longitudinal community cohort study of adolescent health and health behaviors and their correlates (Schuster et al., 2012; Windle et al., 2004). Wave I data were collected from the cohort in fifth grade and Wave II data 2 years later when most were in seventh grade. Institutional review boards at each research site approved the Healthy Passages study.

Participants

Participants were recruited from public schools in: (a) 10 contiguous public school districts in and around Birmingham, Ala-

bama, (b) 25 contiguous public school districts in Los Angeles County, California, and (c) the largest public school district in Houston, Texas. Eligible schools had an enrollment of at least 25 fifth graders, representing over 99% of students enrolled in regular classrooms in the three areas. To ensure adequate sample sizes of (non-Hispanic) African American, Hispanic, and (non-Hispanic) White youth, we took a random sample of schools using probabilities that were a function of how closely a school's racial/ethnic mix corresponded to the site's racial/ethnic target, as detailed elsewhere (Windle et al., 2004). Information was disseminated to the fifth graders in 118 selected schools. Permission to be contacted was returned by 6,663, of whom 5,147 (77%) completed both a parent and a youth assessment at Wave I. Exclusion criteria for the Healthy Passages study were not attending a regular academic classroom or having a parent who could not complete interviews in English or Spanish. Moreover youth identified by their parents (see Grouping Variables) as other than African American, Hispanic, or White were also excluded for purposes of the present study ($n = 323$, 6% of enrolled sample). This resulted in 4,824 participants for the analysis of the present study with the unweighted (weighted) distribution of 36% (30%) African American, 38% (47%) Hispanic, and 26% (23%) White, with 51% (51%) females, and a mean youth age of 11.12 years ($SD = 0.56$) at fifth grade. Other demographic information for this sample has been presented elsewhere (Schuster et al., 2012). The retention rate at the seventh grade assessment was 93%, resulting in 4,491 with mean age of 13.07 years ($SD = 0.59$) and an essentially identical distribution across race/ethnicity and gender as at fifth grade.

Procedures

The full Healthy Passages assessment protocol was completed with a child and parent, separated in private spaces at their home or a research facility, by two trained interviewers using both computer-assisted personal interview and computer-administered self-interview methods (Windle et al., 2004). The parent could choose whether materials would be presented in English or Spanish (prepared using standard back-translation methods; Bravo, Woodbury-Fariña, Canino, & Rubio-Stipec, 1993); Spanish was preferred by 32% of all parents, including 69% of Hispanic and less than 1% of African American or White parents. The same procedures were used for the seventh grade assessment. The following outcome and grouping variables were used in this study.

Outcome Variable

BMI calculations were based on weight and standing height obtained according to standard anthropometric protocols (Centers for Disease Control and Prevention, 2005) by trained interviewers. Height was measured with the participant in bare feet or socks. Two independent measurements were taken for each participant, and if the measurements differed by 0.5 cm or more for height or 0.2 kg or more for weight, a third measurement was taken. Standing height was measured to the nearest millimeter using a portable stadiometer. Weight was measured to the nearest 0.1 kg using a Tanita electronic digital scale. Calibration of the scale was checked regularly. The two measurements of height and weight that were closest in agreement were averaged and employed to calculate BMI using the Quetelet Index: weight (kg)/height (m^2). Sex-specific ratios of children's weight for height by age (months) were calculated according to Centers for Disease Control and Prevention guidelines (Kuczmarski et al., 2000) to obtain the BMI percentile, which was then dichotomized with *obese* defined as a BMI at the 95th percentile or higher and *nonobese* at less than the 95th percentile.

Grouping Variables

For race/ethnicity, the parent was asked which one or more of seven racial/ethnic categories described the child. The child was classified as Hispanic if so indicated regardless of other racial/ethnic indication. Children not categorized as Hispanic were classified as non-Hispanic African American, non-Hispanic White, or other (which, consistent with the aims, was excluded from analysis).

SES was indexed by parent report of household members' highest educational attainment because it is the most stable indicator of SES (Braveman et al., 2005; Williams & Collins, 1995). This is also considered best for use with members of racial/ethnic minority groups, who do not receive the same financial gains for equivalent years of education as do Whites (Kaufman, Cooper, & McGee, 1997; Williams, 1999). In addition, this SES index is more linked to obesity than family income (Shrewsbury & Wardle, 2008). Seven response options were provided to report the highest education completed (≤ *eighth grade*, *some high school*, *high school graduate*, *GED* [general equivalence diploma], *some college*, *4-year college degree*, >*4-year college degree*), some of which were combined to reduce categories with small prevalence such that four SES strata were differentiated in the analysis: < high school graduate, high school graduate (including GED), some college, and ≥4-year college degree household.

Data Analysis

All analyses were performed using the SPSS Complex Sampling module with weighted data to adjust for the complex survey design, which included clustered sampling of schools with unequal probability to improve the ability to estimate racial/ethnic disparities (see Schuster et al., 2012; Windle et al., 2004, for details). Crosstabs analyses were conducted separately by assessment (fifth and seventh grade), SES strata (four strata), and gender (boys and girls) as follows: (a) on the aggregate sample to test Hypothesis 1, (b) on each racial/ethnic group separately to test Hypothesis 2, and (c) on each gender within each racial/ethnic group separately to test Hypothesis 3 and explore for other gender−race/ethnicity interactions. For SES comparisons, the highest strata (≥4-year college degree household) served as the reference. Odds ratios (*OR*s) with 95th percentile confidence intervals (CIs) were calculated for each comparison through logistic regression. These analyses were then repeated when treating SES as a full multilevel variable with seven strata to examine the sensitivity of the results to the particular stratification that was applied in the main analysis. Because the results were highly consistent with those reported for the four-level stratification, they are not reported here.

Results

Descriptive Sample Statistics

Table 1 reports obesity prevalence by racial/ethnic group and SES strata at each assessment. Overall, 29% of youth were placed in the highest SES strata at the fifth-grade assessment, but with marked differences among racial/ethnic groups (African American = 23%, Hispanic = 10%, White = 71%), which remained essentially identical at seventh grade. Obesity prevalence for the overall sample was 27.3% and 25.0%, in fifth and seventh grades, respectively. Although not a focus of this study, when disregarding SES differences, African American and Hispanic youth overall were more than twice as likely to be obese than White youth at both grade assessments—fifth grade: African American vs. White *OR* = 2.07, 95% CI [1.47, 2.92]; Hispanic vs. White *OR* = 2.30, 95% CI [1.68, 3.15]; seventh grade: African American vs. White *OR* = 2.24, 95% CI [1.61, 3.12]; Hispanic vs. White *OR* = 2.39, 95% CI [1.75, 3.26]. There was no difference in the obesity risk between African American and Hispanic youth at either grade—fifth grade: *OR* = 0.90, 95% CI [0.75, 1.08]; seventh grade: *OR* = 0.94; 95% CI [0.77, 1.14].

Association Between SES and Obesity Overall (Hypothesis 1)

As shown in Table 2, there were significant differences in obesity prevalence associated with SES when disregarding race/ethnicity. Youth of the three lower SES strata were approximately twice as likely to be obese in both fifth and seventh grades compared with those of the highest SES, defined as living in a household where the highest educational attainment was ≥4-year college degree (fifth grade *OR*s = 1.88–2.00, seventh grade *OR*s = 1.73–2.16; see Table 2 for 95% CIs). As shown in Table 3, the significantly higher obesity risk associated with being of any SES other than the highest strata was replicated in both genders in both grades (girls *OR*s = 1.55–2.38, boys *OR*s = 1.91–2.43; see Table 3 for 95% CIs).

Association Between SES and Obesity Within Racial/Ethnic Groups (Hypothesis 2)

As also reported in Table 2 and depicted in Figure 1, White youth in the second highest SES strata had a significantly higher risk for obesity than those of the highest SES in both fifth and

Table 1
Obesity Prevalence and Mean BMI Percentile by SES Strata for Racial/Ethnic Groups and Overall at Fifth- and Seventh-Grade Assessments

SES (highest education in household)	White obesity % BMI Percentile/(*SE*) (*n*/%)	African American obesity % BMI Percentile/(*SE*) (*n*/%)	Hispanic obesity % BMI Percentile/(*SE*) (*n*/%)	Overall obesity % BMI Percentile/(*SE*) (*n*/%)
Fifth grade (M_{age} = 11.12 years)				
≥4-year college degree	14.2 63.4/(1.79) (762/71)	27.2 70.8/(1.98) (308/23)	22.4 68.4/(1.99) (208/10)	18.7 66.0/(1.23) (1,279/29)
Some college	23.1 65.7/(3.89) (191/18)	29.7 73.0/(1.19) (502/37)	33.6 76.6/(1.38) (437/21)	30.1 73.2/(1.04) (1,130/25)
High school graduate/GED	21.3 66.2/(2.96) (88/8)	32.8 76.1/(1.38) (416/31)	32.1 77.3/(1.36) (501/24)	31.5 75.8/(0.90) (1,005/22)
< High school graduate/GED	27.0 73.5/(3.50) (27/3)	21.6 73.2/(2.56) (132/10)	32.3 77.2/(1.00) (914/44)	30.9 76.6/(0.91) (1,073/24)
Overall	16.7 64.3/(1.56) (1,069/100)	29.3 73.5/(0.75) (1,358/100)	31.6 76.2/(0.72) (2,059/100)	27.3 72.5/(0.65) (4,487/100)
Seventh grade (M_{age} = 13.07 years)				
≥4-year college degree	10.6 63.2/(1.62) (682/72)	27.2 73.3/(1.32) (315/25)	21.0 70.5/(2.70) (195/11)	16.7 67.1/(1.19) (1,192/29)
Some college	19.2 65.6/(2.73) (189/20)	28.0 74.3/(1.23) (455/36)	26.1 74.3/(1.14) (412/22)	25.7 72.7/(0.87) (1,056/26)
High school graduate/GED	39.7 72.2/(5.83) (63/7)	27.2 76.3/1.40) (374/30)	31.1 77.2/(1.51) (535/29)	30.2 76.5/(1.02) (972/24)
< High school graduate/GED	20.4 69.3/(5.60) (20/2)	26.6 76.5/(2.20) (113/9)	30.5 76.1/(1.11) (724/39)	29.8 76.0/(1.04) (857/21)
Overall	14.4 64.4/(1.39) (954/100)	27.5 74.8/(0.68) (1,256/100)	28.7 75.4/(0.76) (1,867/100)	25.0 72.7/(0.64) (4,077/100)

Note. SES = socioeconomic status; BMI = Body Mass Index; *n* = cell size; GED = general equivalence diploma.

Table 2
Odds Ratios Comparing Obesity Prevalence by SES Strata Within Racial/Ethnic Groups and Overall Sample

SES strata	White *OR* [95% CI]	African American *OR* [95% CI]	Hispanic *OR* [95% CI]	Overall *OR* [95% CI]
Fifth grade (M_{age} = 11.12 years)				
≥4-year college degree[a]	1.00	1.00	1.00	1.00
Some college	**1.82 [1.10, 3.01]**	1.13 [0.79, 1.63]	**1.76 [1.22, 2.52]**	**1.88 [1.52, 2.33]**
High school graduate	1.64 [0.87, 3.07]	1.31 [0.90, 1.89]	**1.64 [1.11, 2.41]**	**2.00 [1.58, 2.54]**
< High school graduate	2.24 [0.54, 9.24]	0.74 [0.42, 1.31]	**1.66 [1.15, 2.39]**	**1.95 [1.53, 2.48]**
Seventh grade (M_{age} = 13.07 years)				
≥4-year college degree[a]	1.00	1.00	1.00	1.00
Some college	**2.01 [1.25, 3.25]**	1.04 [0.74, 1.46]	1.33 [0.91, 1.94]	**1.73 [1.37, 2.18]**
High school graduate	**5.56 [2.33, 13.27]**	1.00 [0.73, 1.37]	**1.70 [1.12, 2.58]**	**2.16 [1.64, 2.84]**
< High school graduate	2.17 [0.50, 9.56]	0.97 [0.62, 1.52]	**1.65 [1.14, 2.40]**	**2.12 [1.64, 2.73]**

Note. Boldface indicates a significant *OR* at $p < .05$. SES = socioeconomic status; *OR* = odds ratio; CI = confidence interval.
[a] Reference group for comparisons between SES strata = highest household education ≥4-year college degree.

seventh grades (*OR*s = 1.82 and 2.01, respectively; see Table 2 for the 95% CIs associated with all *OR*s reported in this subsection). In seventh (*OR* = 5.56), but not in fifth (*OR* = 1.64), grade, White youth of the second lowest SES strata were also at significantly higher risk for obesity than those of the highest SES. White youth of the lowest SES did not evidence an obesity risk that differed significantly from those in the highest SES in either fifth or seventh grade (*OR*s = 2.24 and 2.17, respectively). There were no significant differences in obesity risk for different SES strata for African American youth at either grade assessment (*OR*s = 0.97–1.31). In fifth grade, Hispanic youth from all three lower SES strata were at significantly higher risk for obesity than those of the highest SES strata (*OR*s = 1.64–1.76). These significant differences remained in seventh grade (*OR*s = 1.65–1.70), except that the obesity risk for youth of the second highest SES strata did not differ significantly from those of the highest SES strata (*OR* = 1.33).

Association Between SES and Obesity Within Gender and Racial/Ethnic Groups (Hypothesis 3)

As shown in Table 3 and Figure 2, comparing within gender, White girls of lower SES strata generally were at significantly higher risk of obesity than those of the highest SES in both fifth and seventh grades (*OR*s = 1.97–7.14; see Table 3 for the 95% CIs associated with all ORs reported in this subsection), except for those in the second lowest SES strata in fifth grade (*OR* = 2.48). There were no significant differences in obesity risk for different

Table 3
Odds Ratios Comparing Obesity Prevalence by SES Strata Within Gender and Racial/Ethnic Groups and Overall Sample

SES (highest education in household)	White *OR* [95% CI]	Afr Am *OR* [95% CI]	Hispanic *OR* [95% CI]	Overall *OR* [95% CI]
Girls fifth grade				
≥4-year college degree[a]	1.00	1.00	1.00	1.00
Some college	**1.97 [1.02, 3.79]**	1.00 [0.63, 1.61]	1.56 [0.90, 2.71]	**1.75 [1.33, 2.31]**
High school graduate	2.48 [0.98, 6.25]	1.31 [0.83, 2.06]	1.67 [0.93, 2.99]	**2.09 [1.55, 2.81]**
< High school graduate	**4.64 [1.17, 18.35]**	0.59 [0.31, 1.13]	1.56 [0.99, 2.46]	**1.54 [1.16, 2.04]**
Boys fifth grade				
≥4-year college degree[a]	1.00	1.00	1.00	1.00
Some college	1.72 [0.95, 3.10]	1.26 [0.74, 2.14]	**2.14 [1.39, 3.29]**	**2.02 [1.50, 2.72]**
High school graduate	1.18 [0.41, 3.37]	1.26 [0.67, 2.34]	**1.75 [1.08, 2.84]**	**1.94 [1.37, 2.75]**
< High school graduate	0.34 [0.04, 3.41]	0.92 [0.43, 1.98]	**1.88 [1.13, 3.14]**	**2.43 [1.68, 3.53]**
Girls seventh grade				
≥4-year college degree[a]	1.00	1.00	1.00	1.00
Some college	**2.37 [1.06, 5.29]**	0.86 [0.54, 1.36]	1.42 [0.80, 2.50]	**1.55 [1.11, 2.18]**
High school graduate	**7.14 [2.18, 23.34]**	1.03 [0.64, 1.65]	**2.67 [1.42, 5.05]**	**2.38 [1.69, 3.36]**
< High school graduate	**4.26 [1.12, 16.24]**	0.91 [0.48, 1.71]	**2.48 [1.34, 4.62]**	**2.04 [1.39, 3.00]**
Boys seventh grade				
≥4-year college degree[a]	1.00	1.00	1.00	1.00
Some college	1.73 [0.93, 3.22]	1.23 [0.75, 2.02]	1.35 [0.81, 2.24]	**1.91 [1.38, 2.66]**
High school graduate	**4.36 [1.49, 12.75]**	0.92 [0.51, 1.67]	1.24 [0.70, 2.19]	**1.94 [1.33, 2.84]**
< High school graduate	0.59 [0.05, 6.67]	1.03 [0.46, 2.31]	1.26 [0.75, 2.14]	**2.20 [1.53, 3.14]**

Note. Boldface indicates a significant *OR* at $p < .05$. SES = socioeconomic status; *OR* = odds ratio; CI = confidence interval; Afr Am = African American.
[a] Reference group: Highest SES (household education ≥ college degree) is reference group for comparisons between SES levels.

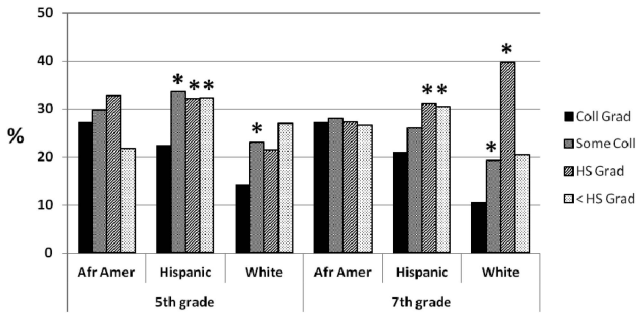

Figure 1. Obesity prevalence by race/ethnicity and socioeconomic status (SES) at fifth- and seventh-grade assessments. Afr Amer = African American; Coll Grad = ≥4-year college degree; Coll = college; HS= high school; Grad = graduate. * Significant difference ($p < .05$) within racial/ethnic group for indicated SES strata compared with reference category college graduate based on odds ratio (see Table 2).

SES strata for African American girls at either grade assessment (*OR*s = 0.86–1.31). Whereas Hispanic girls in the two lower SES strata in seventh grade had a significantly higher risk of obesity than those in the highest SES strata (*OR*s = 2.48 and 2.67), there were no differences associated with SES for Hispanic girls in fifth grade.

For White boys, there were generally no significant differences in obesity risk for different SES strata at either grade assessment (*OR*s = 0.34–1.73), except for those in seventh grade in the second lowest compared with the highest SES strata (*OR* = 4.36). There were no significant differences in obesity risk for different SES strata for African American boys at either grade assessment (*OR*s = 0.92–1.26). In fifth grade, Hispanic boys in all three lower SES strata evidenced a significantly higher risk for obesity than those in the highest SES strata (*OR*s = 1.88–2.14). However, there were no significant differences in obesity risk for different SES strata for Hispanic boys in seventh grade (*OR*s = 0.93–1.23).

Discussion

These results indicate that, consistent with Hypothesis 1, there is an inverse relationship between SES and obesity risk in early adolescence, when disregarding race/ethnicity. However, this relationship varies across racial/ethnic groups; that is, it is present most strongly among Hispanic and to a lesser extent White youth, but not at all among African American youth, which is partially consistent with Hypothesis 2. When further considering gender, the inverse relationship between SES and obesity risk is most consistent in White girls at both assessments, whereas for Hispanic girls and boys it is present only at one assessment time (girls in seventh grade, boys in fifth grade). These findings are partially consistent with Hypothesis 3. Striking was the absence of a relationship between SES and obesity risk among African American youth of either gender at either grade assessment, suggesting that, for this group, obesity risk is independent of SES.

Consequently, the association between SES and obesity risk is not consistently present, but depends on race/ethnicity, gender, and age in early adolescence. In particular, there appears to be no benefit for obesity associated with higher SES for African American youth, where young adolescents in higher and lower SES families have an obesity risk that does not differ, a risk that is also higher than that for the U.S. population as a whole (Ogden et al., 2012). This is in contrast to Hispanic youth, who although also experiencing a higher obesity prevalence than the U.S population (Ogden et al., 2012), appear to benefit from higher SES with a reduction of obesity risk. Obesity is influenced by a complex interaction of factors (Haerens et al., 2010; Nguyen & El-Serag, 2010), of which dietary intake and energy expenditures are considered the proximal factors (Singh et al., 2008). This leads to the hypothesis that diet and activity patterns in higher and lower SES African American youth are not substantially different whereas in Hispanic and White youth they are, which needs to be tested in future research. For example, are college-educated Hispanic and White parents providing a diet for their children that is healthier than parents with lesser education, but which African American parents do not? If so, why is this? Pubertal development is an additional factor that may influence the differential obesity risk at the targeted age range in this study, because onset of menarche varies across racial/ethnic groups (Himes et al., 2004; Morrison et al., 1994). It may be that African American youth carry additional adiposity due to being at a more advanced pubertal stage in this early adolescent age range than the other groups, irrespective of SES level, which may overwhelm the effect SES may otherwise have on obesity. This hypothesis also needs to be tested in future research.

In addition, there may be differences among racial/ethnic groups in the value associated with different body sizes, which may influence obesity prevalence. Several studies have reported that larger body size, as measured by BMI, is associated with a more negative body perception in early as well as late adolescence (Eisenberg, Neumark-Sztainer, & Paxton, 2006; McCabe & Ricciardelli, 2003; Neumark-Sztainer, Paxton, Hannan, Haines, & Story, 2006). We have recently confirmed that this relationship exists for all three racial/ethnic groups in the current sample in fifth grade (Epperson et al., 2014). However, we found that larger body size was associated with more reported attempts to lose weight among Hispanic and White, but not African American fifth grade youth (Epperson et al., 2014). Rather, previous studies have suggested that, for African American youth, attempts to lose weight may be more influenced by social−contextual factors such as body size and weight loss behaviors of peers and family members compared with White youth (Chandler-Laney et al., 2009; Neff, Sargent, McKeown, Jackson, & Valois, 1997). None of these studies has examined differences in the meaning of different body sizes at different SES levels in the different racial/ethnic groups, pointing to a potentially fruitful direction for future research.

Among limitations of this study that need be acknowledged is that, as with all correlational studies, we cannot examine causality. At the same time, it seems less likely that childhood obesity affects the sociodemographic factors examined herein, including household educational attainment, than the reverse. As discussed, a range of other variables not assessed here can be expected to mediate the relationship between sociodemographic status and obesity, for example, diet, activity, and pubertal status. Also, because participants were sampled from three geographic regions, findings might not generalize to other regions in the United States.

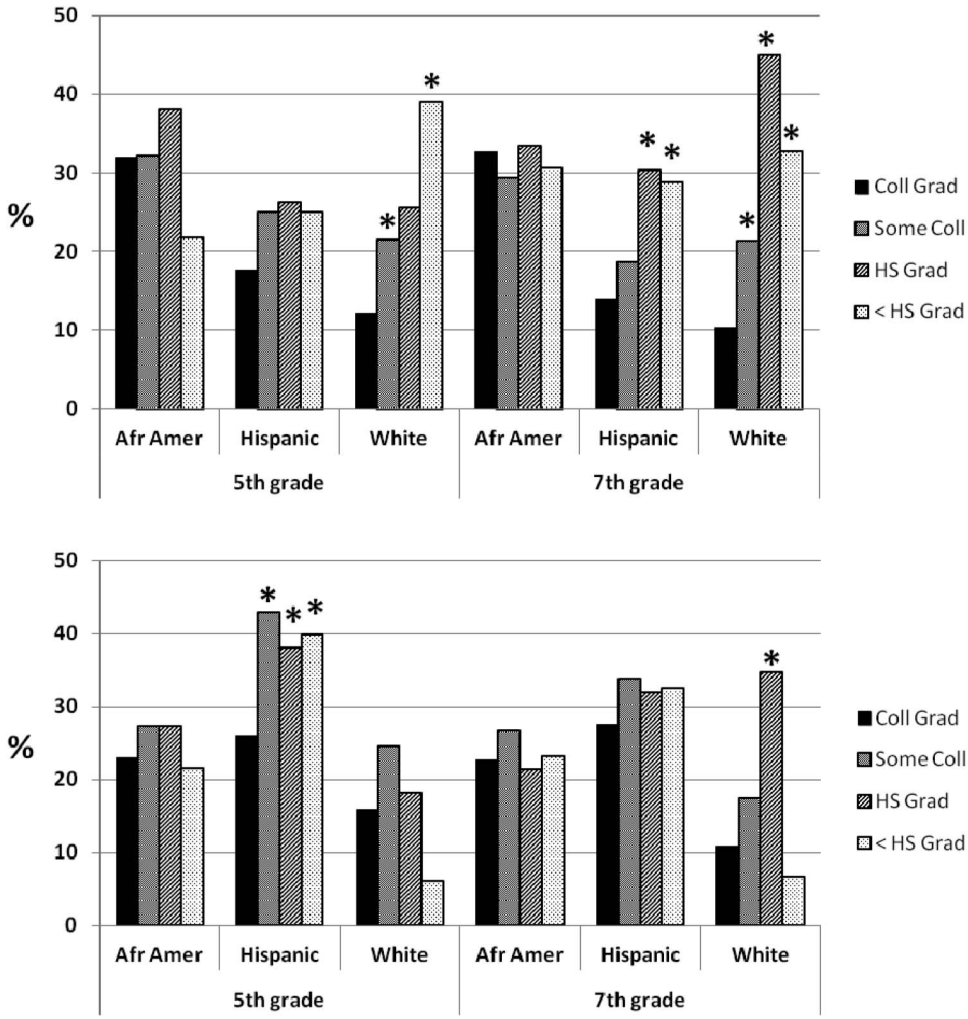

Figure 2. Obesity prevalence by gender (girls in upper panel, boys in lower panel), race/ethnicity, and socioeconomic status (SES) at fifth- and seventh-grade assessments. Afr Amer = African American; Coll Grad = ≥4-year college degree; Coll = college; HS = high school; Grad = graduate. * Significant difference ($p < .05$) within-racial/ethnic group for indicated SES strata compared with reference category college graduate based on odds ratio (see Table 3).

Further, because the Hispanic portion of the sample has familial roots primarily in Mexico and Central America, and because of its within-group heterogeneity, caution must be exercised in generalizing to Hispanic groups with other origins. When forming groups defined by racial/ethnic and SES-level membership, a few cells were quite small (e.g., White youth in the lowest SES strata), resulting in unstable effect estimates.

These limitations notwithstanding, this research addresses childhood health disparities by integrating both between- and within-groups analyses of a racially/ethnically balanced, large sample. This research furthermore integrates a developmental context by examining these relationships at two ages in the early adolescent period, generally in the range 10–13 years. This approach provides a comprehensive picture of the interactions with obesity of SES, race/ethnicity, and gender across this developmental period. We believe that this type of integrated analysis is valuable for advancing knowledge of various health advantages and disadvantages beyond obesity in childhood that is specific to different demographic subgroups in the United States. This research moves beyond the more traditional approach of considering just race/ethnicity, or just SES, or just gender, or possibly an interaction of two of these sociodemographic variables. This integrated approach should be encouraged, not only to enhance understanding of childhood obesity, but also for other health threats.

Several intriguing questions are raised for future research based on the findings of this study. Foremost are: (a) Why is higher SES associated with lower obesity prevalence among White and Hispanic youth but not among African American youth? And (b) what factors are associated with the social gradient in obesity among White and Hispanic youth, but not at all, or to a lesser extent, among African American youth? Variables to examine should include both proximal determinants of weight status—dietary intake and physical activity—keeping in mind how lower SES

compromises the potential health benefits of these variables through the built environment (e.g., lower availability of fresh produce and safe outdoor exercise facilities in poorer neighborhoods; Algert, Agrawal, & Lewis, 2006; Lovasi et al., 2009). In addition, more distal influences should be examined, including: parental adiposity, pubertal development, family structure, meal frequency, body image, and values associated with different body sizes. Answers to these first two questions will provide groundwork for the broader questions: In what ways do the determinants of weight status vary across the social gradient within race/ethnicity? Because the results of this study suggest contextual influences on childhood obesity may differ among demographic groups, a further question is how best should prevention and treatment efforts be tailored to address, at least in part, different racial/ethnic groups at different SES strata?

Because the health threat of obesity affects children across racial/ethnic groups, we have the obligation to learn about its mechanism within divergent U.S. cultures and not assume that it is universal. While this proposition is challenging, there is no other course. Moreover, because the United States is composed of a wide range of races and ethnicities and sociocultural experiences, research would likely do better when assuming differences between groups in the behavioral, social, and cultural processes that define the population when examining health issues, including obesity in childhood.

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