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## The Social and Emotional Lives of Overweight, Obese, and Severely Obese Children

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### Abstract

This study examines inter- and intra-personal problems associated with being overweight among 1164 6- to 7-year-olds (49% boys) in 29 rural schools. Socio-emotional data include child self-reports, peer sociometrics, and teacher reports. Results support the hypothesis that children with weight problems struggle socially and emotionally, and extend current understanding of child obesity by demonstrating that problems appear early; are evident in a community sample; can be identified using standard sociometric methods; and are worse among children with severe obesity. Sociometric status difference between levels of obesity also were found. Whereas obese children were neglected by peers, severely obese children were rejected.

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Childhood obesity impacts bioecological systems at almost every level. At the societal level, it is a public health threat that has almost quadrupled among 6- to 11-year-olds since 1980 (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010) and that costs the U.S. government billions of dollars annually (Marder & Chang, 2006). It impacts schools, as children with obesity have elevated rates of absenteeism and academic problems. It impacts families, carrying with it high medical costs (an average of \$19,000 across the child's life; Finkelstein, Graham, & Malhotra, 2014) as well as parental stress due to concerns about child well-being (Booth, King, Pagnini, Wilkenfeld, & Booth, 2009). Obesity also impacts the children

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themselves in multiple developmental domains, including increased risk for metabolic, dental, and asthma health problems (see review by Pulgarón, 2013), as well as childhood myocardial deformation and elevations in blood pressure (Nguyen et al., 2014). Increased child adiposity also predicts later reduced child physical activity which, in turn, is linked to increased risk of childhood obesity (see review by Kellou, Sandalinas, Copin, & Simon, 2014). Additionally, there is a growing literature supporting the increased risk of socio-emotional problems for overweight and obese children (see review by Sgreci & Faith, 2011).

The current investigation adds to the developing understanding of the social and emotional lives of young obese and overweight children by examining a non-clinical sample of first graders using an inter- and intra-personal risk (IIPR) model of child obesity (Harrist et al., 2012) as a conceptual framework. This model highlights the fact that the unhealthy eating and sedentary behaviors that lead to or support obesity in children occur primarily in inter-personal contexts such as family relationships and peer groups. The model also highlights child intra-personal factors such as child negative affect and poor child self-regulation that might mediate between what is happening in the child's inter-personal contexts (e.g., home, school) and the development or maintenance of weight problems. In the current study, we explore both peer group dynamics and child intra-personal characteristics (negative affectivity) in a community sample using data collected from teachers, peers, and the children themselves.

### **Social Life: School as an Inter-Personal Context for Weight Problems**

A report from the Institute of Medicine (2012) describes school as a “gateway to healthy weights” because it is where children can learn about nutrition, eat healthy food, and exercise. Yet, for obese children, school can be an undesirable place. Obese children are more likely than other children to have poor school attendance, perhaps avoiding school because of negative feelings about it (see review by Daniels, 2008), as is the case for many children who are disliked or rejected at school.

A child who is considered “different” by the peer group is at increased risk of being rejected, and obesity is one of the most highly stigmatized forms of being different among children, more so than having a physical disability (Latner, Stunkard, & Wilson, 2005). As early as preschool, children prefer very thin to overweight figures in drawings and stories (e.g., Su & Aurelia, 2012). By elementary school, obese children report unsatisfactory peer relations, including social rejection (e.g., Gable, Krull, & Chang, 2009; Gunnarsdottir, Njardvik, Olafsdottir, Craighead, & Bjarnason, 2012). However, the great majority of studies of the association between obesity and peer relations have used either “hypothetical peers” or self-report of peer relations rather than asking the peers themselves about their feelings regarding their actual overweight classmates. Use of this methodology—assessing peer relations by asking about children's real peers—is especially rare when examining weight problems in the early years of school.

### Negative social standing.

The use of peer informants via sociometric interviews and the subsequent formation of sociometric status classifications has long been the gold standard method when studying young children's classroom-level social structure. With this method, peer nominations (responses to the questions, "Who do you like/not like to play with?") are tallied across classmates and converted to "liked most" and "liked least" scores, then to social preference ("liked most" minus "liked least") and social impact ("liked most" plus "liked least") scores, and finally five sociometric statuses (rejected, popular, neglected, controversial, and average) are computed (Coie, Dodge, & Coppotelli, 1982). Together, these statuses represent a classroom-level social hierarchy which should be useful for understanding the peer relations of obese and overweight school children. Yet, we identified no studies that have compared weight levels to sociometric status using this social classification method. This gap is likely due to the fact that: (a) peer relations scholars have not commonly assessed obesity in their sociometric status studies; and (b) a large number of schools and classrooms is necessary to provide a sample big enough to allow identification of patterns among five sociometric status categories and three or four child weight status categories. We did locate five studies (reviewed below) where peer interview methods were used, although social standing was not operationalized in the standard way (i.e., as sociometric status classifications based on peer nominations) in any of them.

Strauss, Smith, Frame, and Forehand (1985) collected sociometric data using ratings (children rated how much they liked each classmate on a 5-point scale) and nominations (detailed above) in a sample of 36 2<sup>nd</sup>-5<sup>th</sup> graders. Two groups were compared: One group who had been classified as obese by observers, and one group who had been classified as non-obese and matched to the obese group on grade, race, and sex. Strauss et al. found that the obese children received significantly lower mean "like" ratings and significantly more "like-least" nominations (but not fewer "like-most" nominations) than did the non-obese group.

Similarly, Zeller, Reiter-Purtill, and Ramey (2008) assessed social standing in the classrooms of 90 clinically-referred 8- to 16-year-old obese patients (Body Mass Index [BMI] percentile 95<sup>th</sup> percentile) and a comparison group who were observed to be non-overweight and who matched on sex, race, and age. Classmates of participants rated how much they liked them, resulting in a mean "like" rating score. The children and adolescents also completed the Revised Class Play assessment to nominate classmates who fit the descriptions of various class roles. Zeller et al. found obese children received significantly lower "like" ratings, fewer popular-leader nominations, and more sensitive-isolated nominations than the comparison group. Cohen, Klesges, Summerville, and Meyers (1989) conducted sociometric interviews with 136 1<sup>st</sup>, 3<sup>rd</sup>, and 5<sup>th</sup> graders and, as in the other studies, analyzed data at the level of "like" and "dislike" ratings and nominations, not sociometric status. These authors found that in 1<sup>st</sup> grade, overweight boys received significantly fewer "like" (but not more "dislike") nominations than overweight girls and normal-weight classmates. In a U.K. sample of 313 9- and 10-year-old girls, Phillips and Hill (1998) developed their own peer-nomination measure of popularity (3 questions: "Which girls in your class would you most like to... play with at break time/sit next to at

lunch/take home for tea?”) and other child characteristics, and found that heavier-weight girls did not receive fewer popularity nominations than normal-weight girls (although they were less likely to be nominated as “pretty”). Finally, using a sample of 522 11<sup>th</sup> and 12<sup>th</sup> graders, Wang, Houshyar, and Prinstein (2006) computed social preference and perceived popularity scores based on responses to the respective questions (but referring to grade-mates, not class-mates): “Who do you like/not like to spend time with?” and “Who is the most popular?” They found self-reported heavier body size was associated with lower perceived popularity—in a linear fashion for girls, curvilinear for boys—but not with actual social preference.

Thus, although somewhat mixed, there is some evidence that peer informants report not liking their obese classmates as much as their non-obese classmates. However, it is not clear—if sociometric status had been assessed—which “low-liked” status (or statuses) obesity would predict: rejected status (disliked by many, liked by few), neglected status (disliked by few, liked by few), or controversial (disliked by some, liked by some). These distinctions are important given the different concurrent and future correlates associated with each status. For example, children with a rejected sociometric status in sixth grade have been found to be less prosocial and more irresponsible in eighth grade, to significantly increase in risk for poor grades and school dropout, and to have greater risk for later conduct disturbance and substance abuse. Neglected children report less peer support and are more withdrawn than their peers, while children with a controversial status have been found to have lower grades, exert less effort in learning, and have a higher risk of delinquency (see Wentzel, 2003).

It is also noteworthy that three of the available studies used preadolescents or adolescents only. Consequently their findings might not generalize to younger children. The relation between weight and peer relations may differ by age, given findings that appearance-related peer pressure and the importance of physical appearance increase significantly with age (Helfert & Warshburger, 2013). Thus, the current study fills two gaps in the child obesity literature: it extends the research on social preference and social impact to a younger age group than has been studied, and it pioneers the application of sociometric status.

### **Difficulty with friendship.**

Besides examining classroom-level peer standing, some researchers have provided evidence that school-age overweight children have fewer friendships (dyadic relationships with mutual liking) than their peers, although this has been examined more often among adolescents than younger children. Among younger children with weight problems, the likelihood of not having friends is unclear: For example, 32 clinic-referred obese 9- to 11-year-olds reported that, because of their weight, they do not have as many friends as other children (Pierce & Wardle, 1997). However, other studies (e.g., Zeller et al., 2008) have not found fewer reciprocated friendships among obese versus non-obese children. In the current study, we assess children’s perceptions of having friends or supportive relationships in the classroom and teachers’ reports of children’s skills in making and interacting with friends.

### Teasing and victimization.

We also examine peer behaviors that are known to be damaging for the social and emotional lives of obese and overweight children. A large group of studies show that children with obesity are at increased risk for being targets of weight-related teasing (see review by Gray, Kahhan, & Janicke, 2009), non-weight related teasing and bullying (e.g., Gunnarsdottir et al., 2012) and other forms of victimization (e.g., physical and relational aggression; Hayden-Wade et al., 2005). In fact, a recent cross-national study of almost 3000 adults (Puhl et al., 2015) found that they consider weight-related bullying to be the most prevalent type of bullying among youth. These victimization phenomena clearly take place during adolescence: For example, in a large school-based study ( $n = 4,746$ ), approximately 43% of overweight-or-obese adolescents reported being teased by peers (Van den Berg, Neumark-Sztainer, Eisenberg, & Haines, 2008). However, relatively few studies have examined teasing in the early elementary years (e.g., kindergarten through 2nd grade). Three exceptions include Davison and Birch's (2002) prospective study using a community sample of 192 girls, in which they found BMI was unrelated to teasing at age 5 but became marginally related by age 7; Williams et al.'s (2013) study, where authors reported that, among 5- to 7-year-old urban children, heavier weight was linked to more victimization for girls; and recently, Qualter et al.'s (2015) population study of 3–10 year olds that showed that, for girls over 6 but not boys, higher BMI was associated with greater victimization. The current study extends this literature by assessing teasing and victimization among our sample of 1<sup>st</sup> graders based on reports of peers, teachers, and the children themselves.

### Hypotheses.

Although there is a popular perception that obese children are stigmatized and oppressed by peers, relatively few large multiple-method studies have examined actual social relations. We hypothesize that, according to children, their teachers, and their peers: Overweight and obese children will have lower levels of peer preference (like minus dislike nominations), higher rates of classification of sociometric rejection and/or neglect, poorer sense of relationship support and friendship in the class, and higher levels of peer teasing when compared to non-overweight children. We also examine the relation between child weight and social impact and controversial status, but due to lack of past research, do not hypothesize about how the relations might differ by weight level. We include sex and ethnicity as covariates in our analyses. Because this is the first study to examine social relations as a function of weight status groupings ranging from healthy weight to severely obese, we view the current study as a necessary precursor to the generation of hypotheses about how sex or ethnicity might moderate main effects of weight status.

## Emotional Life: Intra-Personal Characteristics of Children with Weight

### Problems

As proposed in the IIPR model, child obesity not only impacts and is impacted by negative peer experiences, but it also has implications for the obese child's intra-personal or psychological and emotional well-being. Therefore, in addition to the exploration of the

social, inter-personal lives of obese children in the current study, we examine their emotional, intra-personal lives, as well.

One group of intra-personal factors identified in the IIPR model is negative affective mediators such as low self-esteem and body-esteem, depression and loneliness, and social avoidance (Harrist et al., 2012). There are hundreds of papers examining self- and body-esteem among obese children. Here we focus on other aspects of negative affectivity including loneliness, anxiety, and depressive symptoms. We do so in our analytic model by including self- and teacher-report, given that teachers and 1<sup>st</sup> grade children have been shown to be reliable informants about children's emotional experiences (see Varni, Limbers, & Burwinkle, 2007).

### **Loneliness.**

Community-based research among school children indicates that, relative to peers, children who are overweight and obese experience significantly elevated levels of loneliness and negative affectivity (e.g., Gable et al., 2009). Rejection and teasing of children has been correlated with loneliness, as well (see review by Storch & Ledley, 2005), providing potential indirect evidence linking overweight and loneliness. In the current study, both self- and teacher-reports of loneliness and negative feelings are assessed.

### **Anxiety.**

Although obese children have been found to be at increased risk for both externalizing and internalizing problems (e.g., Braet, Mervielde, & Vandereycken, 1997), more research finds internalizing problems than externalizing. In particular, children with obesity have been found to be more anxious and withdrawn than their non-overweight peers (e.g., Young-Hyman et al., 2006). In the current study, we include measures of anxiety and difficulties with regulation of social anxiety as reported by teachers and the children themselves.

### **Hypothesis.**

In the current study, overweight and obese children are hypothesized to have elevated rates of negative affectivity (loneliness, anxiety, depressive symptoms) relative to non-overweight children.

## **Levels of Obesity and the Severely Obese Child**

Finally, in the current study, we are interested in examining whether degree (or level) of weight problem is related to degree of social and emotional problems. Research has suggested the importance of different BMI percentiles as indicators of physical health comorbidities in children. Harrington, Staiano, Broyles, Gupta, and Katzmarzyk (2013) found support for the 94<sup>th</sup> to 96<sup>th</sup> percentiles as predictors of elevated cardiometabolic risk, visceral adipose tissue, and fat mass among children and adolescents; whereas Freedman, Mei, Srinivasan, Berensen, and Dietz (2007) found that children and adolescents with BMI 99<sup>th</sup> percentile had more abnormalities in insulin, lipids, and blood pressure than children and adolescents with BMI 95<sup>th</sup> percentile. Halfon, Larson, and Slusser (2013) investigated the incidence of multiple general health (e.g., missed school days), physical health (e.g.,



activity restrictions), and psychosocial (e.g., conduct disorder) comorbidities for children classified as obese (< 95<sup>th</sup> percentile) or overweight (85<sup>th</sup> to < 95<sup>th</sup> percentile) compared to children and adolescents of normal weight. While normal weight children had a 10% prevalence of three or more comorbidities, overweight children had a 13% prevalence and obese children had an 18% prevalence, suggesting obese children were at greater risk. Turer, Lin, and Flores (2013, a study with  $n = 17,224$ ) reported more psychiatric referrals for obese children than both overweight and normal weight children and adolescents. In the current study, we assess whether socio-emotional factors differ significantly for obese versus overweight children. Additionally, and importantly, we are able to differentiate severely obese from other obese children. Thus, we are able to compare four groups of children, those who are severely obese, obese, overweight, and non-overweight.

Children with severe (or “morbid”) obesity comprise between 4% and 6% percent of the current U.S. youth population (Kelly et al., 2013). The prevalence of severe obesity among children and adolescents is growing, increasing by more than 300% since 1976 and over 70% since 1994 (Skelton, Cook, Auinger, Klein, & Barlow, 2009). Yet children with severe obesity have not been the focus of much research, especially research examining socio-emotional correlates of obesity. Two exceptions are a study of 96 8- to 17-year-olds with severe obesity whose self-reported victimization was related to loneliness and depression (Lim et al., 2011) and a qualitative study of 20 severely obese Mexican-American female adolescents who reported problems with peer relations, including self-isolation (Taylor et al., 2013).

Our reading of the literature is that most studies of severely obese children are medically oriented, examining health consequences or discussing bariatric surgery; in both cases, the samples are almost all clinical rather than community samples, and they are typically studies of adolescents. Because our sample is large enough to include 61 severely obese children, we have the rare opportunity to develop a socio-emotional profile of them, and compare it to the profiles of obese, overweight, and non-overweight children.

### **Hypothesis.**

Whether severely obese, obese, and overweight groups differ from each other, or differ only from non-overweight children, is an exploratory question. However, because a few studies have examined BMI as a continuous variable (e.g., using BMI  $Z$ -scores) and found a linear association between adiposity and level of psychosocial distress (e.g., Gibson et al, 2008), we anticipate a linear (or step-function) trend, where the greater the level of weight, the greater the socio-emotional problems.

### **The Current Study**

The nature of the sample for the current study adds to an understanding of childhood obesity for several reasons. First, ours is a community rather than a clinical sample. Second, the sample was gathered from rural elementary schools with a relatively large proportion of American Indian students, both risk factors for obesity (Kumanyika, 1993). Third, we use multiple informants (teachers, classmates, and the children themselves) and ask children directly about their peers rather than assessing stereotypes or hypothetical relationships.

Finally, because our sample is large, we have enough children to compare socio-emotional factors among those in severely obese, obese, and overweight categories, something that, to our knowledge, has not been done.

## Method

### Participants.

Data were gathered as the first wave in the Families and Schools for Health (FiSH) Project, a longitudinal study of two cohorts of children at 29 schools in 20 towns in eight counties with adult obesity rates from 28 to 41%, placing children in those communities at elevated risk for obesity, the focus of the current project. Counties and adult obesity rates from 2005–2009 were Creek (31.3%), Kay (31.7%), Lincoln (28.4%), Logan (31.7%), Noble (40.5%), Pawnee (32.6), Payne (28.9), and Pottawatomie (34.4%; Oklahoma State Department of Health, 2013). Cohort 1 wave 1 data collection took place in Fall 2005 and early Spring 2006; cohort 2 wave 1 data collection took place in Fall 2006 and early Spring 2007. All families with a first grade child were asked to participate in the interview and anthropometric parts of the study. Participation in the FiSH Project averaged 55.6% per first grade class (SD = 18.7%). In total, 1171 students were interviewed; 1186 children completed anthropometric assessments. The schools were rural, with all but two of the 20 towns having a population < 10,000 (2004 to 2006 populations of the two larger towns were between 20,000 and 30,000). The average proportion of children on free or reduced price lunch—a proxy for poverty at the school-level—was 65%. April 1, 2010, United States census data for the eight counties indicate countywide percentages for race or ethnic groups ranged from 74.4% to 84.6% white non-Hispanic, 3.3% to 12.9% American Indian, 2.0% to 6.4% Hispanic or Latino, and 0.5% to 9.1% African American, with the range of individuals reporting multiracial or multiethnic identity being 4.1% to 6.6%. In 2006, the Oklahoma state poverty rate was 23.5%; county poverty rates for the eight counties with schools participating in the project ranged from 19.1% to 26.1% with four counties above the state poverty rate and four below it.

### Procedures

**Data collection.**—Prior to data collection researchers met with each school principal individually to obtain permission for school involvement. After obtaining consent from school administration, families of first-grade children were recruited from 20 elementary schools in north-central Oklahoma. All rural schools within a 90-mile radius of the university were targeted. If the superintendent had given approval, any principal agreeing was accepted into the study. Superintendents provided verbal approval of the project; principals, teachers, and parents provided written informed consent; and children provided assent before participating in the study.

Parents were recruited at kindergarten graduation (spring), first-grade registration (fall), and back-to-school (fall) events, as well as via send-home letters in children's backpacks. In late fall or early spring of the children's first grade year, trained project research assistants (graduate or undergraduate students) completed anthropometric assessments in the elementary school gymnasium and conducted one-on-one interviews in private areas of the



school building (e.g., in the library or at the end of a quiet hall). Teachers completed questionnaires during the same period and were financially compensated.

Data collection of covariates occurred as follows: Child sex and ethnicity data were collected on parent questionnaires. If parents did not respond to the child ethnicity question or did not return questionnaires, a graduate student traveled to each school with a form to obtain the child ethnicity data, bringing information on parent provision of consent for demographic data, and obtained the ethnicity data from the school office. Because 58% of parents did not complete the parent questionnaire packet, information on child sex was recorded by research assistants during the one-on-one child interviews.

**Data management.**—The current report is based solely on data from the first wave of data collection. Data management of the first wave (as approved by the Oklahoma State University Institutional Review Board) included multiple components. Raw data were stored in locked file cabinets in the project lab and signed consent forms in the primary PI's office. De-identified computer versions of the data were stored on a password-protected drive with a back-up version of the de-identified data stored in a separate co-PI's office. When student research assistants brought data from the schools to the lab, they locked it in a special cabinet and checked off identification numbers and status of data. The project data manager received the incoming data forms, de-identified them, and readied the data for processing.

### Weight Classification

Anthropometric assessments were conducted by trained research assistants at the children's schools, usually during physical education class the same day as the child interview, or soon thereafter. Children's height and weight were measured in order to calculate BMI-for-age percentile using Epi Info software (CDC, 2008). Measurements of height were taken two times during the same visit using a portable board to measure each child's height to the nearest 0.2 cm. If the height was not within  $\pm 0.3$  cm then it was measured a third time. The average of the height measurements was the value used in analysis. Weight was determined to the nearest  $\pm 0.2$  pounds using a portable digital scale (Tanita Electronic Scale, BWB-800).

BMI-for-age percentile (BMI%ile) was used to group children into four weight groups (CDC, 2007: severely obese (BMI 99%ile), obese (95%ile BMI < 99%ile), overweight (85%ile BMI < 95%ile), and non-overweight (5%ile BMI < 85%ile). Children who were underweight (i.e., BMI < 5%ile) were excluded from analyses due to their different health and peer experience profiles compared to both normal-weight and overweight or obese children in past studies and because our focus was on overweight and obese children.

### Inter-Personal Characteristics

**Child measures.**—Child measures of inter-personal experiences were assessed with four measures. These (including measure names and abbreviations) are summarized in Table 1. Briefly, the Loneliness and Social Dissatisfaction Questionnaire (LSDQ) assesses children's perception of what their peer relationships at school are like (including friendships and group dynamics) as well as feelings of loneliness at school. The Weight-Related Teasing

subscale of the Perception of Peer Teasing Survey (POTS) assesses children's perception of being teased about their weight (e.g., "Kids pointed at you because you were overweight"). The Harter Pictorial Scale of Perceived Competence and Social Acceptance for Young Children (PCSA) assesses child self-perception by having children identify with a set of hand-drawn figures and has four subscales, including one focused on perceived peer acceptance (e.g., "This girl has lots of friends to play with").

**Peer measures.**—Peer measures of Inter-Personal Factors included sociometric nominations and ratings. Because children were not necessarily all accurate readers, individual rather than group interviews were conducted, and photographs of participating classmates were used rather than written rosters. Selecting from the photographs of their classmates in a one-on-one interview, children were asked to point to the photographs of three people whom they liked the most and three children they liked the least. Social preference and social impact scores were created from these nominations in accordance with the procedure outlined by Coie et al. (1982). Each of these scores ("liked most" nominations, "liked least" nominations, social preference, and social impact) was standardized by classroom. Using social preference and social impact scores, sociometric statuses were created with children designated as popular (standardized social preference > 1, standardized "liked most" > 0 and standardized "liked least" < 0), average (standardized social preference and social impact values between -0.5 and 0.5), rejected (standardized social impact < -1, standardized "liked most" < 0, and standardized "liked least" > 0), neglected (standardized social impact < -1, = "liked most" = 0), or controversial (standardized social impact > 1, standardized "liked most" > 0 and standardized "liked least" > 0).

During the peer ratings portion of the sociometric interview, children also were asked to pick from among the photographs three children in their class who fit a series of social descriptions (e.g., "Which of the people in your class gets made fun of?"). The number of classmates who nominated each child was tallied for each description and, for comparison across different sized classes, the tallies were standardized as *Z*-scores.

**Teacher measures.**—Teachers completed two measures for each child which are included in the Table 1 summary. The perceived peer status measure included three descriptions of a child in the class: "This child is well-liked by his or her peers;" "This child is disliked by his peers;" and "This child is picked on by other kids, and teased by them." On the Behavior Assessment System for Children (BASC-2), teachers responded to a series of short descriptions of student behavior and attitudes (e.g., "Says, 'Nobody likes me'"). In the current study, the Child Withdrawal sub-scale was included with the inter-personal variables model.

### Intra-personal Characteristics

**Child measures.**—A modified version of the Child Depression Inventory (CDI, Kovacs, 1985) was used to assess children's depressive thoughts. On this modified measure (M-CDI), children were asked to rate the frequency of the most severe response from the original CDI (e.g., "Terrible things will happen to me"). Of the original 26 items, 4 were

selected as most indicative of the low efficacy, low esteem, and anhedonia aspects of the CDI (Steele et al., 2006) and combined into a single scale. A confirmatory factor analysis with robust maximum likelihood estimation was conducted to verify the proposed scale as indicative of an underlying construct. The Root Mean Square Error of Approximation (RMSEA) for the measurement model was 0.03 (CI = .00; .05); the Standardized Root Mean Square Residual (SRMR) was .03; and the Comparative Fit Index (CFI) was .99. The model chi-square ( $\chi^2_{(5)} = 9.27, p = .10$ ) was non-significant ( $\chi^2_{(38)} = 50.15, p = .09$ ). Thus, this model exhibited adequate fit (Hu & Bentler, 1999). Standardized factor loadings ranged from .50 to .57 and were all significant.

**Teacher measures.**—Subscales reflecting teacher perception of Child Somatization and Child Depression were used from the BASC-2. These scales were developed to indicate internalizing problems for children.

### Analytic Approach

Analyses were conducted to reflect the inter-personal and intra-personal socio-emotional experiences of children in the sample. Multiple informants' (viz., child, peer, and teacher) reports on constructs of interest were then included in MANOVA analyses for inter-personal and intra-personal constructs to determine whether socio-emotional experiences differed across weight groups.

A MANOVA approach was selected to account for the inherent inter-correlations of the variables between and within informants. MANOVA analyses create a combined vector of the dependent variables that allows for a test of group differences on the set of dependent variables as a whole before examination of individual dependent variables. This allows for removal of the shared correlation between dependent variables (i.e., error) and greater ability to detect valid, significant findings. Pairwise multivariate ANOVAs with covariates were conducted as follow-up analyses when omnibus group differences were at statistically significant levels. Cohen's *d* is reported as an indicator of effect size when group differences were observed. These values were calculated using the corrected mean square error from the omnibus analyses. When homogeneity between groups was not a tenable assumption as tested by Box's Test of Equality of Covariance matrices, Pillai's Trace values for examining significance were used (Olson, 1974). Wilks' lambda values were used when homogeneity between groups was satisfied. Models included sex (0 = female, 1 = male) and ethnicity as controls. Ethnicity was dummy coded to compare American Indian and other races to a European American referent group.

In addition to the two MANOVAs, a chi-square test of independence was conducted to determine whether the distribution of weight groups was independent from, or related to, sociometric status groups. Significant chi-squares were interpreted based on standardized residual scores for each cell. This determined the contributing sources of significance. Observed values with *Z*-score beyond  $\pm 1.96$  were interpreted as significantly different from the expected values at the 95% confidence level. This serves as a secondary representation of inter-personal social experience and potentially adds to the literature by using a categorical rather than continuous peer-preference measure. A significance level

of .05 was adopted for all analyses. Data were cleaned and analyzed in SPSS Version 19 (IBM Corp, 2010).

All available cases with complete data were included in each model (i.e., listwise deletion). In total, 963 cases had complete data for the model with inter-personal variables; teacher-rated child withdrawal had the greatest proportion missing ( $n = 1,035$ ). For the intra-personal model, 1,101 had complete data for the model with intra-personal variables. Teacher-rated child somatization had the greatest missingness in this model ( $n = 1,131$ ).

## RESULTS

### Participant Demographics

Children were 49% male and 51% female with a mean age of 6.88 years ( $SD = .42$ ). Children were 72.6% European American, 18.8% American Indian, 2.1% Multiethnic, and 6.5% “other” race or ethnicity. In comparison to the ethnicity distributions of the eight counties from which our child sample was drawn, we had a higher participation rate by American Indian children and a slightly lower participation rate by children from all other racial groups. Distribution among weight groups was as follows: severely obese,  $n = 67$ ; obese,  $n = 125$ ; overweight,  $n = 204$ ; and non-overweight,  $n = 768$ . Among the total sample, 22 underweight children were identified and excluded.

### Inter-Personal Characteristics

**Three-informant multivariate analysis.**—For the MANOVA model representative of inter-personal social experience, a significant omnibus effect for weight groups was found suggesting that weight groups significantly differed on the set of independent variables, controlling for sex and ethnicity (Pillai’s Trace = .09,  $F = 2.49$ ,  $p < .001$ ). Sex was a significant covariate (Pillai’s Trace = .09,  $F = 7.97$ ,  $p < .001$ ), but ethnicity was not significant as a covariate. Pairwise multivariate tests revealed that normal weight and overweight groups were not different on the set of dependent variables; overweight and obese groups were also not different on the set of dependent variables.

However, normal weight and obese groups were significantly different on the set of dependent variables while controlling for ethnicity and sex (Wilks’  $\lambda = .97$ ,  $F = 2.23$ ,  $p = .009$ ). Specifically, social preference ( $F = 7.41$ ,  $p = .007$ ) and social impact ( $F = 11.28$ ,  $p = .001$ ) values were significantly higher for normal weight children than obese children (Cohen’s  $d$ s = .10 and .15, respectively).

Normal weight and severely obese children also differed on the set of dependent variables with sex and ethnicity as controls (Pillai’s Trace = .08,  $F = 5.14$ ,  $p < .001$ ). Several specific significant differences were found between these groups: perceptions of peer teasing ( $F = 16.87$ ,  $p < .001$ ), social preference ( $F = 17.56$ ,  $p < .001$ ), social impact ( $F = 7.07$ ,  $p = .008$ ), gets made fun of ( $F = 5.02$ ,  $p = .03$ ), teacher-rated liking ( $F = 13.64$ ,  $p < .001$ ), teacher-rated disliking ( $F = 18.14$ ,  $p < .001$ ), teacher-rated being picked on or teased ( $F = 14.32$ ,  $p < .001$ ), and teacher-rated withdrawal ( $F = 11.77$ ,  $p = .001$ ). For each measure, normal weight children’s scores indicated more positive inter-personal experiences than severely obese children’s. Cohen’s  $d$  ranged in absolute value from .10 (teacher-rated withdrawal) to .23

(perceptions of peer teasing, being made fun of, and teacher-rated disliking) for these mean differences.

The overweight group differed significantly from the severely obese group on the set of dependent variables adjusting for sex and ethnicity (Wilks'  $\lambda = .84$ ,  $F = 3.10$ ,  $p < .001$ ). Specifically, differences were observed on one self-reported measure, one peer report measure, and all teacher-report measures: perceptions of peer teasing ( $F = 6.76$ ,  $p = .01$ ), social preference ( $F = 10.62$ ,  $p = .001$ ), teacher-rated liking ( $F = 13.58$ ,  $p < .001$ ), teacher-rated disliking ( $F = 16.38$ ,  $p < .001$ ), teacher-rated being picked on or teased ( $F = 10.90$ ,  $p = .001$ ), and teacher-rated withdrawal ( $F = 10.20$ ,  $p = .002$ ). Severely obese children fared worse than overweight children in each of these inter-personal areas. For group differences on these measures, Cohen's  $d$  ranged in absolute value from .11 (teacher-rated withdrawal) to .25 (teacher-rated liking and disliking).

Finally, obese and severely obese groups were significantly different on the set of dependent variables with sex and ethnicity covariates (Wilks'  $\lambda = .83$ ,  $F = 2.66$ ,  $p = .003$ ). Specifically, severely obese children had greater perceptions of peer teasing ( $F = 4.80$ ,  $p = .03$ ), higher ratings of peer acceptance ( $F = 6.47$ ,  $p = .01$ ), and poorer ratings on every teacher measure: liking ( $F = 6.55$ ,  $p = .01$ ), disliking ( $F = 11.31$ ,  $p = .001$ ), picked on or teased ( $F = 11.05$ ,  $p = .001$ ), and withdrawal ( $F = 6.69$ ,  $p = .01$ ). Cohen's  $d$  values for these significant differences ranged in absolute value from .09 (teacher-rated withdrawal) to .25 (child-reported peer acceptance). Adjusted means by weight group and results of post hoc pairwise comparisons are presented in Table 2.

**Sociometric analysis.**—Findings from the chi-square test of independence further suggest that children's sociometric status was not independent of weight classification,  $\chi^2(1, n = 1079) = 44.99$ ,  $p < .000$  (see Table 3). Children with severe obesity were significantly more likely to experience rejection from their peers ( $Z = 3.0$ ) compared to other weight groups and also were significantly less likely to be popular ( $Z = -2.0$ ). Children at the obese weight status were significantly more likely to be neglected by their peers ( $Z = 4.2$ ).

### Intra-Personal Characteristics

For the MANOVA model representative of intra-personal factors, the omnibus effect adjusting for sex and ethnicity was significant, suggesting that weight groups differed on the set of intra-personal factors (Pillai's Trace = .02,  $F = 2.66$ ,  $p = .005$ ). Sex, but not ethnicity, was significant as a covariate (Pillai's Trace = .05,  $F = 20.35$ ,  $p < .001$ ). Findings from subsequent pairwise multivariate tests suggest that normal weight children were not different on the set of dependent variables from overweight or obese children.

Normal weight children were significantly different than severely obese children on the set of dependent variables adjusting for sex and ethnicity (Wilks'  $\lambda = .98$ ,  $F = 3.96$ ,  $p = .008$ ). Specifically, severely obese children had higher teacher-rated depression ( $F = 9.91$ ,  $p = .002$ ), a mean difference corresponding to a Cohen's  $d$  of .22.

Overweight and obese children were significantly different on the set of dependent variables with sex and ethnicity as covariates (Pillai's Trace = .04,  $F = 3.62$ ,  $p = .01$ ). The source of

this effect was due to a significant difference on teacher-rated somatization ( $F= 8.47, p = .004$ ), with obese children having higher scores (Cohen's  $d = .19$ ).

Overweight children also were significantly different from severely obese children on the set of measures (Wilks'  $\lambda = .96, F= 3.09, p=.03$ ). Both teacher-rated measures were significantly different between these groups with severely obese children having higher scores on teacher-rated somatization ( $F= 6.01, p = .02$ ) and teacher-rated depression ( $F= 5.59, p = .02$ ). Cohen's  $d$  effect sizes were .19 and .22 for these measures, respectively.

Finally, obese children and severely obese children differed significantly on this set of dependent variables with sex and ethnicity covariates (Pillai's Trace = .05,  $F= 2.83, p=.04$ ). The child self-reported M-CDI score ( $F= 4.89, p = .03$ ) and teacher-rated depression measure ( $F= 3.93, p = .049$ ) were different between groups with severely obese children having greater indication of intra-personal problems. Cohen's  $d$  effect sizes for these respective measures were .26 and .19. Means by weight level and results of post hoc pairwise comparisons are presented in Table 4.

## Discussion

The results of the current study offer a clear and consistent message: The socio-emotional lives of children with weight problems differ from those of non-overweight children, even as early as first grade. This finding emerged whether looking at child, peer, or teacher reports, and when looking at social (inter-personal) as well as emotional (intra-personal) variables. While popular-press media has recently been educating the public about the psychosocial consequences of obesity, so far these consequences have not been well-studied empirically. Past studies have tended to focus on self-esteem and body-esteem or clinical-type behavior problems, and have focused mostly on adolescents and older children. Studies that have focused on the social and emotional lives of young school-age children tend not to use multiple informants and often do not ask about actual peer relationships, but rather assess bias or prejudice at the abstract or hypothetical level.

Using multiple informants, we found a good deal of consensus that the children with weight problems are not well-liked and not well-treated, that they struggle with friendships, and that they exhibit somatic complaints and depressive symptoms at higher rates than lesser-weight peers. In general, the higher the weight status, the worse children were doing (the step-wise pattern we tentatively hypothesized), although often obese and severely obese children did not differ. Interestingly, it was teachers who seemed to report distinctions between the obese and severely obese children. It could be that teachers are identifying subtle differences in the treatment of children with different levels of obesity, or the teachers might be biased against severely obese children and therefore their perceptions are skewed by that bias (see, e.g., Lynagh, Cliff, & Morgan, 2015, for evidence of anti-fat attitudes among teachers).

Perhaps the most striking result of the current study is the compelling pattern of social and emotional difficulties being experienced by the severely obese children in our study. Severe obesity is a clear psychosocial risk for children, even as early as six years old. In the past, studies that have found psychosocial risk among obese versus non-overweight children have



not analyzed the severely obese and the obese groups separately; it may be that findings from these studies were actually driven by the severely obese group, as were many of our findings. Some researchers studying psychosocial correlates of obesity among adults have found the same trend, for example finding that the link between obesity and depression or anxiety is mostly accounted for by the severely obese portion of an obese sample (e.g., Onyike, Crum, Lee, Lyketsos, & Eaton, 2003). Our findings suggest that this pattern begins in early childhood. The self-perceptions of these obese and severely obese children—who were neglected and rejected by peers—may worsen as they children age: Gable et al. (2009) point out that, across the elementary school years, children’s social-cognitive development results in a more and more sophisticated understanding of stereotypes, and at some point children realize that stereotypes are being applied to them by their peers and by society at large.

Our study advances the current understanding of the social and emotional experiences of overweight and obese children by utilizing a non-clinical sample of young elementary school-aged children. The fact that we used a community sample, not a clinical sample, adds much needed information to the field, given that the predominance of research about severe obesity in childhood has been based on small clinical samples, and has been primarily focused on physical health rather than socio-emotional well-being (see Boschemail, Stradmeijer, & Seidell, 2004, for discussion of clinical vs. community samples and preventative vs. curative approaches). While rates of child obesity are stabilizing somewhat in the U.S., severe obesity is becoming increasingly prevalent, with approximately one in 20 children in the U.S. currently classified as severely obese (Kelly et al., 2013). This may suggest that recent intervention efforts are effective for children at-risk for obesity or with non-morbid obesity, but may not be effective for severely obese children. If true, this is a serious concern, given our evidence of children’s painful experiences with severe obesity, and findings such as increased risk of suicide among populations of severely obese adults (e.g., Chen et al., 2012). The theme that emerged in our data about severely obese children being rejected, made fun of, teased, picked on, and disliked, suggests that interventions aimed at change in the peer group’s behavior (e.g., Harrist & Bradley, 2003) might be necessary to improve severely obese children’s quality of life; these changes might ultimately improve their physical health, as well (see Swindle et al., 2014). Interventions that facilitate friendship formation might also be effective, given that some studies (e.g., Reiter-Purtill, Ridell, Jordan, & Zeller, 2010) have found that an obese child’s having just one friend in a class can buffer the negative effect of poor treatment by peers.

Our findings on weight status and peer rejection and neglect are particularly noteworthy given the evidence that ostracism, a concept that has been used in reference to being both ignored (neglected) and actively excluded (rejected), has an even greater negative effect on children than bullying (Saylor et al., 2013). When examining our sociometric findings, it is interesting to note that severely obese children were significantly more likely to be rejected than their peers, but obese children were significantly more likely to be neglected. To our knowledge, ours is the first study to be able to make this important distinction. Rejected and neglected children are both unpopular, but they have different profiles and outcomes. Rejected children are actively disliked, while neglected children just do not have many friends. Rejected children are more likely to retaliate against peer rebuffs and are more likely

to be lonely, depressed, and aggressive than neglected children, who are likely to become increasingly withdrawn when rebuffed by peers (Juvonen & Gross, 2005) and rejected children are more at-risk for future problems such as school drop-out and delinquency (see review by Gifford-Smith & Brownell, 2003). Because of this, intervening with obese children in an effort to prevent a move into the severely obese group might be a worthwhile goal of future interventions.

A limitation of the current study is its correlational nature. Although the participants in our study were young, it is not clear whether weight problems are creating socio-emotional problems, or vice versa. It is probably true that they impact each other in a “vicious cycle” over time. While it seems unlikely that a 6-year-old could have developed severe obesity solely in reaction to peer maltreatment, it is possible to imagine an overweight child withdrawing, engaging in less play and physical activity, and eating for emotional reasons in response to peer teasing, thereby increasing the weight problem.

Another limitation of the current study is the fact that we did not explore the impact of demographic factors. Future research might explore sex as a possible moderator of the link between children’s weight level and socio-emotional characteristics. One study (Griffiths, Wolke, Page, & Horwood, 2006) found, for example, that for some boys (but not girls), obesity can lead to peer popularity, perhaps because it allows them to be physically dominant; that type of dominance may not be as valued (or even tolerated) among girls. Two recent studies suggest that overweight and obese girls’ body esteem (Shriver, Hubbs-Tait, Harrist, Topham, & Page, 2015) and psychosocial functioning (Davison, Schmalz, Young, & Birch, 2008) may be particularly negatively affected by even apparently benign parenting practices such as maternal monitoring. These findings emphasize the need for future research to test how weight-related teasing and other forms of peer exclusion interact with sex in influencing child negative affect.

Socioeconomic status and ethnicity might also interact with weight to predict different socio-emotional outcomes. Ethnic groups may view weight differently and this might impact the peer relations of overweight children. Given our finding of highest risk among severely obese children, it is also noteworthy that severe obesity is not increasing at equal rates among all ethnic groups; among women in the U.S., for example, severe obesity is increasing most rapidly among non-Hispanic blacks and Mexican Americans (Ogden, Carroll, Kit, & Flegal, 2012). Similarly, family socioeconomic status is related to childhood obesity in multiple complex ways (e.g., Paeratakul, White, Williamson, Ryan, & Bray, 2002), and therefore might impact the associations among weight, social factors, and emotional experiences of children. Future studies with samples sizes large enough to analyze children with severe obesity as a separate weight classification are encouraged to examine such demographic factors.

When designing intervention programs targeting severely obese children, we encourage researchers and practitioners to start when children are young; behavioral treatments that have not worked for severely obese adolescents have been found to be effective for younger children (e.g., Danielsson, Kowalski, Ekblom, & Marcus, 2012). Also, we encourage interventionists to consider targeting the peer group. Social science experiments (e.g., Tang

& Richardson, 2103) find that the “pain of exclusion” can be ameliorated by inclusion experiences if they follow the exclusion; teachers might be able to facilitate this process. Teasing of children with weight problems was noted in our study by teachers, peers, and self-reporting children. Some researchers (e.g., Allen, Byrne, Blair, & Davis, 2006) suggest that teasing about weight—not weight per se—is the cause of overweight children’s socio-emotional difficulties. Given the findings of our study, we endorse strongly the statement made in a recent American Psychological Association publication (Puhl & Peterson, 2014, p. 183), that weight stigma should be “a social justice issue and a public health priority.”

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**Table 1.**

Summary of Measures

Measure	Source	Reporter	Scales Used	Validity	Reliability	Scale
Loneliness and Social Dissatisfaction Questionnaire (LSDQ)	Asher, Hymel, & Renshaw, 1984	Child	Full 16 item	Convergence with teacher reported peer problems (Cassidy & Asher, 1992)	$\alpha = .80$	1 (Not true about you) to 3 (True about you)
Weight-Related Teasing subscale of the Perception of Peer Teasing Survey (POTS)	Thompson, Cattarin, Fowler, & Fisher, 1995	Child	Full 4 item	Predictive of body image (Thompson et al., 1995)	$\alpha = .79$	1 (Never) to 3 (Very often)
Pictorial Scale of Perceived Competence and Social Acceptance (PCSA)	Harter & Pike, 1984	Child	Perceived Peer Acceptance, 6 items	Convergence with actual performance (Harter & Pike, 1984)	$\alpha = .79$	1 (Most negative) to 4 (Most positive)
Sociometric Nominations	Coie, Dodge, & Coppotelli 1982	Peer	Social Preference, Social Impact, & Social Descriptors	Prediction of later peer status (McKown, Gumbiner, & Johnson, 2011)	NA	NA
Perceived Peer Status	Andrade, Waschbusch, King, Thurston, McNutt, & Terrio, 2005	Teacher	3 ratings: Well-liked, disliked, teased	Convergence with peer ratings (Andrade et al., 2005)	NA	NA
Behavior Assessment System for Children, 2 <sup>nd</sup> edition (BASC-2)	Reynolds & Kamphaus, 1992	Teacher	Child Withdrawal (8 items), Child Somatization (9 items), & Child Depression (11 items)	Convergence with similar measures (Reynolds & Kamphaus, 2004).	$\alpha = .82$ $\alpha = .88$ $\alpha = .83$	1 (Never) to 4 (Almost Always)
Modified Child Depression Inventory (M-CDI)	Modified from Kovacs, 1985	Child	4 items	Good model fit statistics of CFA	$\alpha = .62$	1 (No, not true of you); 2 (Sometimes this is true and sometimes not); 3 (Yes, it is true for you)

Note. Reported reliability coefficients are calculated for the current sample.

**Table 2.** Inter-Personal Characteristic Differences by Weight Classification: Pairwise Multivariate Comp

Obese	Normal weight	Overweight	Obese	Severely
<u>Child Report</u>				
LSDQ	1.59 (.02) <sup>a</sup>	1.60 (.03) <sup>a</sup>	1.62 (.04) <sup>a</sup>	1.56 (.05) <sup>a</sup>
POTS	1.26 (.02) <sup>a</sup>	1.32 (.04) <sup>a</sup>	1.34 (.05) <sup>a</sup>	1.55 (.07) <sup>b</sup>
PCSA Peer Acceptance	2.96 (.03) <sup>a,b</sup>	3.08 (.06) <sup>a,b</sup>	2.87 (.07) <sup>b</sup>	3.15 (.10) <sup>a</sup>
<u>Peer Report</u>				
Social preference	.08 (.04) <sup>b</sup>	.05 (.08) <sup>bc</sup>	-.19 (.09) <sup>ac</sup>	-.46 (.12) <sup>a</sup>
Social impact	.07 (.04) <sup>b</sup>	-.03 (.08) <sup>ab</sup>	-.26 (.09) <sup>a</sup>	-.28 (.12) <sup>a</sup>
Gets made fun of	-.02 (.04) <sup>a</sup>	-.03 (.08) <sup>a,b</sup>	.05 (.09) <sup>a,b</sup>	.26 (.12) <sup>b</sup>
Kids do mean things to	-.02 (.04) <sup>a</sup>	-.05 (.07) <sup>a</sup>	.07 (.09) <sup>a</sup>	.22 (.12) <sup>a</sup>
Gets called names by other kids	-.003 (.04) <sup>a</sup>	.04 (.08) <sup>a</sup>	-.15 (.09) <sup>a</sup>	.10 (.13) <sup>a</sup>
<u>Teacher Report</u>				
This child is well-liked by his/her peers.	3.41 (.03) <sup>a</sup>	3.44 (.07) <sup>a</sup>	3.32 (.08) <sup>a</sup>	2.98 (.11) <sup>b</sup>
This child is disliked by his/her peers.	1.89 (.04) <sup>a</sup>	1.87 (.08) <sup>a</sup>	1.92 (.09) <sup>a</sup>	2.48 (.13) <sup>b</sup>
This child is picked on by other kids & teased by them	1.64 (.03) <sup>a</sup>	1.65 (.07) <sup>a</sup>	1.65 (.08) <sup>a</sup>	2.10 (.11) <sup>b</sup>
BASC Withdrawal	1.54 (.02) <sup>a</sup>	1.50 (.04) <sup>a</sup>	1.55 (.04) <sup>a</sup>	1.74 (.06) <sup>b</sup>

Notes: Estimated Marginal Means (SEs) in columns adjusted for sex and ethnicity. Homogeneous groups are indicated by superscripts based on pairwise multivariate post-hoc comparisons. That is, significantly different groups have different superscripts.

**Table 3.** Chi-Square Test of Independence: Standardized Residuals of Weight groups by Sociometric Status

	Rejected	Neglected	Controversial	Average	Popular
Normal Weight	-1.2	-1.9	1.1	.1	1.1
Overweight	.4	.1	.1	.1	-.7
Obese	.3	4.2*	-1.8	-.3	-.5
Severely obese	3.0*	.6	-1.5	-1.	-2.0*

\*  $p < .05$

**Table 4.**  
 Intra-Personal Characteristic Differences by Weight Level: Pairwise Multivariate Comparisons

	Normal weight ( <i>n</i> = 729)	Overweight ( <i>n</i> = 191)	Obese ( <i>n</i> = 117)	Severely Obese ( <i>n</i> = 64)
<u>Child Report</u>				
Modified CDI	1.55 (.02) <sup>ab</sup>	1.56 (.04) <sup>ab</sup>	1.46 (.05) <sup>a</sup>	1.66 (.07) <sup>b</sup>
<u>Teacher Report</u>				
BASC Somatization	1.32 (.01) <sup>ab</sup>	1.25 (.03) <sup>b</sup>	1.38 (.04) <sup>a</sup>	1.39 (.05) <sup>a</sup>
BASC Depression	1.30 (.01) <sup>a</sup>	1.30 (.02) <sup>a</sup>	1.34 (.03) <sup>a</sup>	1.43 (.04) <sup>b</sup>

Notes: Estimated Marginal Means (SEs) in columns adjusted for sex and ethnicity. Homogeneous groups are indicated by Superscripts based on pairwise multivariate post-hoc comparisons. That is, significantly different groups have different superscripts.