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Race/ethnicity, obesity, and the risk of being verbally bullied: A national multilevel study

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Abstract

Objective: To examine the effects of obese/overweight status and race/ethnicity on the risk for being verbally bullied among second grade children, and to investigate if the relationship between weight status and verbal bullying varies based on race/ethnicity.

Design: Data on second graders from the Early Childhood Longitudinal Study, Kindergarten Class of 2010–11 (Children=18,130; Schools=2,419) were analyzed. Hierarchical generalized logistic modeling was used to address the objectives.

Results: Independent of the child's sex, age, academic performance, family socioeconomic status, and school characteristics, obese/overweight children (relative to non-obese/overweight children) and Black children (relative to White children) were more likely to be verbally bullied. Hispanic and Asian children were less likely to be verbally bullied relative to White children. Hispanic obese/overweight children experienced less verbal bullying than White obese/overweight children.

Conclusions: This study documented disproportionate risks of being verbally bullied for obese/overweight US second graders. The risk of being verbally bullied was significantly greater for obese/overweight White children vs. obese/overweight Hispanic children.

Implications: Findings can inform the development of strategies to reduce verbal bullying of obese/overweight children in US elementary schools.

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COMPLIANCE WITH ETHICAL STANDARDS

Conflict of Interest: Danielle X. Morales declares that she has no conflict of interest. Nathalie Prieto declares that she has no conflict of interest. Sara E. Grineski declares that she has no conflict of interest. Timothy W. Collins declares that he has no conflict of interest.

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

Keywords

Childhood Obesity; Race/Ethnicity; Bullying; Verbal Bullying

INTRODUCTION

As childhood obesity continues to be a public health crisis in the US [1, 2], the need to examine the bullying of obese children remains critical. Children from minority racial/ethnic backgrounds may be disproportionately affected by this weight-related bullying, which could have long term consequences for their mental and physical health. They also may suffer doubly from weight- and race-related discrimination. Both are serious concerns as national estimates indicate that weight discrimination is comparable to rates of racial discrimination [3]. Among children, weight discrimination and stigma can be experienced as pervasive bullying and victimization in school [4]. Verbal bullying is considered the most psychologically harmful type of peer victimization [5] and has been associated with multiple negative outcomes, such as low self-esteem, depressive symptoms, and problematic eating behaviors [6]. Although many children are verbally bullied on occasion, obese children have a higher likelihood of being targets for chronic verbal bullying [7] and are more likely to experience depression, anxiety, and loneliness [8, 9]. Parents of obese children have rated bullying as their top child health concern [10]. Although previous studies have shown a positive relationship between weight and peer victimization in children [11, 12], those studies have not focused on the age range (6 to 8 years) when bullying peaks [13]. It is thus unknown if obese children have increased odds of being verbally bullied during their early school years.

No discussion of weight-based bullying among children is complete without consideration of racial/ethnic differences. Previous studies have suggested that standards of attractiveness and acceptable body size may vary across racial/ethnic groups [14]. For example, obesity may be considered less deviant among African American women than White women [15]; there is also a greater acceptance of childhood obesity in Hispanic culture, especially among Mexican-American parents [16, 17]. Similar levels of weight concern about children were found for Asian and White parents [18]. Although those cultural differences might affect the degree of weight stigmatization among racial/ethnic groups in general, the influence of race/ethnicity on obese children's vulnerability to bullying is unclear. As Puhl and Latner [19, p. 561] pointed out, "the lack of research examining the relationship between ethnicity and weight stigma in children makes it difficult to conclude whether meaningful differences exist." For this study, we are particularly interested in whether obese and overweight children from different racial/ethnic backgrounds are more or less likely to be verbally bullied by their peers in school. In terms of how race/ethnicity influences peer victimization apart from weight status, a meta-analysis utilizing data on nearly 700,000 children determined that Black, Indigenous, and Multiracial children are victimized more than White children, while White children are victimized more than Hispanic and Asian children, although all effect sizes were small [20].

Using data on second graders from a nationally representative sample, the present study examines how obese/overweight status and race/ethnicity relate to verbal bullying victimization, and then investigates if the relationship between obese/overweight status and verbal bullying victimization varies based on race/ethnicity. Since peer victimization is best understood holistically from an ecological perspective in which individual characteristics of children and environmental factors (including school characteristics) promote or discourage victimization [21], we applied an ecological framework [21] to control for other risk and protective factors known to influence verbal bullying among children, such as sex, age, disability status, academic performance, family socioeconomic status (SES), and school characteristics. Three hypotheses were tested using two hierarchical generalized logistic models (HGLM). *H1*: obese/overweight children are more likely to be verbally bullied by their peers than non-obese/overweight children; *H2*: White children are less likely to be bullied than Black, Indigenous, and Multiracial children, but more likely to be bullied than Hispanic and Asian children; *H3*: The relationship between children being obese/overweight and being verbally bullied varies by race/ethnicity. Due to the exploratory nature of H3, we do not offer specific hypotheses for each racial/ethnic group. H1 and H2 are tested via Model 1, which examines the effects of obesity/overweight status and race/ethnicity on the odds of verbal bullying. H3 is tested in Model 2, which examines the combined effects of obesity/overweight status and race/ethnicity on the odds of verbal bullying.

METHODS

Data Source

Data for this study come from the Early Childhood Longitudinal Study, Kindergarten Class of 2010–11 (ECLS-K:2011). Sponsored by the National Center for Education Statistics (NCES) within the Institute of Education Sciences, the ECLS-K:2011 follows a nationally representative sample of children from kindergarten through their elementary school years. We used data pertaining to second grade students, which were collected from direct academic assessment of the child, parents, teachers, and school administrators in fall 2012 and spring 2013. In total, our analysis included 18,130 second graders across 2,419 schools.

The ECLS-K:2011 employed a complex, probability-based sampling design, involving three stages, to originally sample kindergarteners in Fall of 2010. In the first stage, the US was divided into contiguous primary sampling units (PSUs), of which 90 were selected; second, public and private schools were sampled within each of the 90 PSUs; and, third, children enrolled in kindergarten programs in those schools were sampled [22]. This procedure was designed to produce nationally representative estimates of kindergarten-aged children in the US. The ECLS-K:2011 then follows this nationally representative sample of children from kindergarten through their elementary school years. Sampling weights were used to adjust for differential probabilities of selection for each sampling strata. For this study, the sampling weight, W6CS6P_6TA0 was used, as suggested by the ECLS-K:2011 User's Manual [22].

Measures

Table 1 provides descriptive statistics for each variable and reports comparisons of all independent variables by the status of the dependent variable (verbal bullying). In spring 2013, teachers were asked to report on peer victimization experiences of each second grade student. We used the question: “During this school year, have other children ever teased, made fun of, or called this child names?” to construct the dependent variable. We recoded the variable from five to two categories (0 = No; 1 = Yes) because more than half children had never experienced verbal bullying during the school year, and very few of them had been bullied very often. Among the 18,130 second graders, more than 40% students were verbally bullied by their peers during the school year. The independent variables were grouped into two categories: school-level variables and child-level variables.

School-level Independent Variables:

Type of School.: We recoded the ECLS-K:2011 composite school type variable (X6SCTYP) into two categories (each coded 0 = No or 1 = Yes): public school (91%) and private school (9%).

School Location.: The ECLS-K:2011 composite school locality variable (X6LOCALE) was used. It includes three categories: City (42%), Suburban (38%), Town or Rural (20%). We recoded each category as a separate variable (0 = No; 1 = Yes), and City was used as the reference group.

School Enrollment.: This is a composite variable from the ECLS-K:2011 (X6ENRLS) that indicates total school enrollment on October 1, 2012. Five ordered categories were included in the original data: 0–149 students (3%), 150–299 students (11%), 300–499 students (30%), 500–749 students (37%), and 750 or more students (19%). We treated this variable as continuous in Model 1 and Model 2.

Highest Grade at the School.: Based on the highest grade taught at the school, which is indicated by the ECLS-K:2011 composite variable, X6HIGGRD, we constructed a variable with two categories (0 = this school does not serve the twelfth grade; 1 = this school serves the twelfth grade). Among the 2,419 schools attended by our second graders, 19% also serve the twelfth grade.

School’s Racial/Ethnic Composition.: This is a composite variable from the ECLS-K:2011 (X6RCETH) that indicates the percentage of non-White students in each school. The original variable has four ordered categories: 0% to 24% (21%), 25% to 49% (19%), 50% to 74% (19%), and 75% to 100% (41%). We treated this variable as continuous in Model 1 and Model 2.

Child-level Independent Variables:

Sex.: We used the composite child sex variable from the ECLS-K:2011 (X CHSEX R). Females were coded as 1 and males were coded as 0; 51% were boys and 49% were girls.

Age.: The child's age in months (X6AGE) was calculated by comparing the exact date the child completed the ECLS-K:2011 spring 2013 direct academic assessment to the child's date of birth.

The calculation of age in months uses the number of days in each month and is adjusted for leap years. The average age of our sample was about 97 months (8 years).

Race/Ethnicity.: The composite variable indicating child's race/ethnicity in the ECLS-K: 2011 file (X RACETH R) was used. This variable was created by using the parent interview data from spring 2013 [22]. The cell sizes for Native Hawaiian/other Pacific Islander and American Indian/Alaska Native were too small to analyze separately, so we recoded them into one group (Indigenous). In Model 1, we examined six mutually exclusive categories (each coded 0 = No or 1 = Yes): Black (13%); Hispanic (25%); Asian (9%); Indigenous (2%); Multiracial (5%); and White (46%), which is used as the reference group in Model 1.

Obesity/Overweight.: The definition of overweight and obesity is having excess body fat such that it presents a health risk, and the most commonly used measure used to derive obesity/overweight status is the body mass index (BMI) [38]. According to the US Center for Disease Control (CDC), obesity is defined as a BMI at or above the 95th percentile for children of the same age and sex; overweight is defined as a BMI at or above the 85th percentile and below the 95th percentile for children of the same age and sex [39]. ECLS-K: 2011 provided a composite BMI measure (X6BMI), which they calculated by multiplying the composite weight in pounds by 703.0696261393 and dividing by the square of the child's composite height in inches [23, 24, 25]. Height and weight measurements used were directly measured by ECLS staff in spring 2013. Using the CDC BMI-for-age growth charts [42], we constructed a dichotomous variable (0 = No or 1 = Yes) for children meeting the criteria for obese or overweight status. 'Not obese/overweight' was the reference group in Model 1. Among the 18,130 second graders in our sample, 32% were obese/overweight. Our use of directly assessed child's weight status represents an improvement on previous studies that relied on self-reported weight status data [25].

Race Ethnicity by Weight Status.: Based on children's obesity/overweight status and race/ethnicity, we created 11 dichotomous variables (0 = No or 1 = Yes) to be included in Model 2. The focal variables are: Black obese/overweight (4%), Hispanic obese/overweight (11%), Asian obese/overweight (2%), Indigenous obese/overweight (1%), and Multiracial obese/overweight (1%). White non-obese/overweight (34%), Black non-obese/overweight (7%), Hispanic non-obese/overweight (16%), Asian non-obese/overweight (7%), Indigenous non-obese/overweight (1%), and Multiracial non-obese/overweight (3%) are included as control variables. White obese/overweight children are used as the reference group.

Disability Status.: A composite variable (X6DISABL2) based on the parent interview indicates whether or not a child had a disability diagnosed by a professional. We recoded the variable into two categories (0 = No or 1 = Yes). In our sample, 17% children were diagnosed with a disability.

Academic Performance.: This measure was developed using the theta scores of children's knowledge and skills ascertained through direct assessments in reading (X6RTHETK2), mathematics (X6MTHETK2), and science (X6STHETK2) by trained professionals. Theta scores range from -6 (low ability) to 6 (high ability) and are normally distributed [22]. We calculated a composite academic performance measure by summing the three standardized theta scores and then recoding that additive measure into two variables: bottom ten percent for academic performance among all the children in the sample (0 = No or 1 = Yes); and top ten percent for academic performance among all the children in the sample (0 = No or 1 = Yes). The middle 80 percent was the reference group.

Free or Reduced Lunch.: The variable was constructed from a parent interview question: "Does your child receive complete school lunches for free or reduced price at school?" with two categories (0 = No or 1 = Yes). This measure is used to represent economic deprivation, because the eligibility of free or reduced priced lunch is determined based on the number of people sharing a home with the child and the household income. A student's family must be at or below 185% of the poverty line to qualify for this assistance. Overall, 46% of children in our sample received free or reduced priced lunch at school.

Statistical Analysis

First, we conducted a bivariate analysis for each independent variable by the status of verbal bullying to examine associations between verbal bullying victimization and the independent variables. Chi-square testing was conducted for categorical variables, and a t-test was conducted for the continuous variable. Then we used hierarchical generalized logistic modeling (HGLM) to test the three hypotheses. Since the dependent variable was binary (0 or 1), we specifically chose the Bernoulli model. HGLM is the most appropriate statistical technique to use when analyzing multi-level data to predict a binary outcome [26], because when examining effects at multiple levels, traditional regression techniques may result in inaccurate parameter estimates [27]. HGLM is appropriate for this study because our data had a multi-level structure, with 18,130 children at level 1 nested within 2,419 schools at level 2.

We estimated two models. The dependent variable in each model was "if other children ever teased this child" (Yes or No). In Model 1, we assessed the effects of obesity/overweight status and race/ethnicity on verbal bullying in school to evaluate H1 and H2. For Model 2, we investigated H3 by including the 12 dichotomous variables for each combination of obesity/overweight status and race/ethnicity [40]. Each model adjusts for school effects on verbal bullying through the inclusion of school-level variables and a random intercept. Before modeling, the continuous independent variable at the child level (*age*) was standardized using group mean centering, and the two continuous variables at the school level (*enrollment and percent non-White students*) were standardized using grand mean centering.

We used multiple imputation (MI) to impute the missing values of all analysis variables before estimating the HGLMs. MI addresses potential bias associated with missing data in statistical analysis, and involves creating multiple sets of values for missing observations

using a regression-based approach. MI is used to avoid the bias that can occur when values are not missing completely at random [41] and is appropriate for self-reported survey data [28]. Specifically, eleven child-level variables were used in the estimation process. They are children's age, gender, race/ethnicity, BMI, reading scores, math scores, science scores, physical bullying, relational bullying, disability status, and free lunch status. When imputing the missing values, for each iteration, the fully conditional specification (FCS) method was used. The method fits a univariate (single dependent variable) model using all other variables in the model as predictors, then imputes missing values for the variable being fit. The method continues until the maximum number of iterations (i.e., 200) is reached, and the imputed values at the maximum iteration were saved to the imputed dataset [28, 29]. After the imputing process, ten complete sets of data were created, based on possible values for missing data (the imputed dataset). Then the ten datasets were used to run HGLMs, and separate model results for each of the ten imputed data sets were combined into pooled model results.

Sensitivity Analyses

We conducted two sensitivity analyses. First, in order to assess whether results of Model 2 are sensitive to alternative modeling specifications, we estimated Model 1 using two separate subgroup models: one for obese/overweight children and a second for non-obese/overweight children. Second, we estimated Models 1 and 2 excluding children with any missing data ($N=9,231$) to examine whether results are sensitive to the MI approach.

RESULTS

Results from a bivariate analysis for each independent variable by the status of verbal bullying are presented in Table 1 for descriptive purposes. Table 2 presents results from the two HGLM models. According to Model 1, obese/overweight children had 32% greater chance of being verbally bullied ($p < 0.001$) than non-obese/overweight children. Compared to White children, Black children were 29% more likely to be verbally bullied ($p = 0.011$) and Hispanic and Asian children were 21% and 23% less likely to be verbally bullied ($p = 0.002$, $p = 0.038$). There were no significant differences for the Indigenous or Multiracial groups relative to the White group. In terms of the control variables, females were 21% less likely to be verbally bullied compared to males ($p < 0.001$). Age did not have a significant influence on children's verbal bullying victimization. Disabled children, low academic performing children, and children who received free or reduced-price lunch from school were 44%, 25%, and 34% more likely to be verbally bullied, respectively ($p < 0.001$; $p = 0.021$; $p < 0.001$), while children with high academic performance were 26% less likely to be verbally bullied ($p < 0.001$). Among all significant dichotomous child-level predictors, disability, free/reduced-price lunch, and obese/overweight status were the three strongest predictors in Model 1. Among school-level variables, the only significant predictor was school location. Specifically, children attending suburban schools were 17% less likely ($p = 0.039$) to be verbally bullied compared to those attending city schools.

Results for the analysis of variation in the relationship between obesity/overweight status and verbal bullying victimization based on race/ethnicity are presented in Table 2. Results

indicate that Hispanic obese/overweight children were 36% less likely to be verbally bullied ($p < 0.001$) as compared to White obese/overweight children. We did not find significant differences for Black, Asian, Indigenous, or Multiracial obese/overweight children with White obese/overweight children, in terms of the likelihood of being verbally bullied at school.

Results of the two sensitivity analyses (tables not shown) are as follows. In a subgroup model corresponding with Model 1 that only includes obese/overweight children, Hispanic children were 35% less likely to be verbally bullied than White children ($p = 0.003$); in the other subgroup model including non-obese/overweight children, Hispanic ethnicity was not significantly associated with verbal bullying. Thus, results of this sensitivity analysis indicate that the protective effect of Hispanic ethnicity on verbal bullying victimization noted in Model 1 is driven by the significantly reduced odds of verbal bullying experienced specifically among obese/overweight Hispanic children (but not among non-obese/overweight Hispanic children).

A second sensitivity analysis revealed that results are not sensitive to the multiple imputation approach. Specifically, in models analyzing cases with no missing data (corresponding with Models 1 and 2), obese/overweight children had a 35% greater chance of being verbally bullied ($p < 0.001$) than non-obese/overweight children. Compared to White children, Black children were 30% more likely to be verbally bullied ($p = 0.014$), while Hispanic and Asian children were 21% and 30% less likely to be verbally bullied, respectively ($p = 0.004$, $p = 0.007$). Compared to White obese/overweight children, Hispanic obese/overweight children were 38% less likely to be verbally bullied ($p < 0.001$).

DISCUSSION

This study found that obese and overweight US second grade children were more likely to be verbally bullied as compared with their non-obese/overweight peers, independent of children's sex, age, race/ethnicity, academic performance, economic status, and school characteristics. This finding supports our first hypothesis and aligns with previous studies on children's weight status and stigmatization [13, 15, 19]. In terms of the significant direct effects of race/ethnicity on verbal bullying, Black children faced increased risk as compared to White children, while Hispanic and Asian children faced reduced risks. This supports our second hypothesis and aligns with previous studies [20, 30].

Although Model 1 results show that verbal bullying was a problem for overweight and obese second grade children nationwide regardless of their race/ethnicity, verbal bullying victimization experienced by obese/overweight children varied to some degree by race/ethnicity. Compared to White obese/overweight children, Hispanic obese/overweight children were significantly less likely to experience verbal bullying. Our sensitivity analysis revealed that the main effect of Hispanic ethnicity—which suggests protection against verbal bullying victimization—is driven largely by the significantly reduced odds of verbal bullying experienced specifically by obese/overweight Hispanic children (but not by non-obese/overweight Hispanic children). Black, Asian, Indigenous, and Multiracial obese/overweight children did not experience significantly different odds of verbal bullying

victimization as compared to White obese/overweight children. Thus, the findings for Hispanic obese/overweight children provide partial support to our third hypothesis.

Little is currently known about racial/ethnic differences in weight stigmatization and bullying in children. This study found that the relationship between children's obesity/overweight status and verbal bullying victimization varied to some degree based on their race/ethnicity. Interestingly, this relationship was not dependent on the racial/ethnic composition of the school (cross-level interaction results not shown). We initially thought, for example, that the protective effect of Hispanic ethnicity for obese/overweight children would be stronger in predominately Hispanic schools, but that was not the case. Instead, the protective effect experienced among Hispanic obese/overweight children in terms of reduced bullying victimization may relate more to the obese/overweight child's self-esteem and the confidence with which he/she carries her/himself. An obese or overweight child is embedded in a social context, within which he or she is provided cues about the acceptability of his or her weight status. Certain factors within this environment may protect the child from self-depreciating thoughts or may place the child at risk of such thoughts [31]. For example, how parents perceive the child's body shape and interact with the child will influence the child's self-image of their own body as well as their perception of others' bodies [32].

Compared to older children, it may be particularly important to consider the role of parents of young children as they may have more control over the cultural and social messages their children receive. Since childhood obesity is considered less deviant in Hispanic cultures [17], Hispanic parents may express fewer concerns about their children being overweight or obese and accept it to a greater degree than White parents. In fact, Hispanic women usually prefer a thin figure for themselves, but a plumper figure for their children; Hispanic mothers also report familial and cultural pressure to raise a "chubby" child [17, 33]. In a qualitative study, Mexican-American mothers described their obese or overweight children as active and happy, and they did not view their children's weight as a health problem [33]. White or Asian parents, in contrast, may express more concern about their child's weight status, sending children the message that their weight status is undesirable. These messages, when combined with being obese or overweight, may negatively impact a child's evolving sense of self [32, 34]. Based on this finding, we offer the hypotheses, which should be tested in future studies, that Hispanic obese/overweight children, compared to their White peers, may be relatively protected from negative self-perceptions and have more confidence; as a result, they may be less likely to be verbally bullied by fellow students. Previous studies have suggested greater acceptance of obesity among African American and Indigenous American populations [15], but we did not find evidence of protective effects for those groups in this study.

Other risk or protective factors for verbal bullying suggested by the ecological framework were also documented by this study. The finding that boys are more likely to be bullied than girls was well-supported by previous research [21]. Children's disability status and lower academic achievement have also been previously noted as predictors of peer victimization, as has lower socioeconomic status [21]. At the school level, others have also found that children attending suburban schools were less likely to be verbally bullied compared to children attending city schools [35, 36].

Limitations

Limitations are acknowledged. First, the study relied on cross-sectional rather than longitudinal data. While longitudinal data would be needed to establish causal pathways, the next wave of ECLS-K:2011 data have not been released and the bullying items were not asked on the kindergarten or first grade surveys. Also, our study focuses in one type of bullying; the effect of race/ethnicity on overweight/obese children's risk of other types of bullying should be investigated. Third, a consideration of the intersection between race/ethnicity and nativity (US vs. foreign birth) on experiences of bullying victimization could be included in future studies, given that research is limited in that area [37].

CONCLUSIONS

This study focused on the relationship between childhood obesity/overweight status, race/ethnicity, and experienced verbal bullying in school. We found that as early as age 7 to 9 years, obese/overweight children were more likely to be verbally bullied, as compared with their non-obese/overweight peers; the same was true for Black children as compared with White children. Our results generally align with prior knowledge regarding risk and protective factors of bullying, as suggested by the ecological framework. Hispanic ethnicity was found to be a protective factor for peer victimization among obese/overweight children, which represents a novel contribution to knowledge. We believe those findings not only could be used to develop effective ways to thwart early verbal bullying among second grade students in the US, but also can be used to reduce weight stigmatization among obese/overweight children. When raising parental awareness of childhood obesity, future researchers, health practitioners, and public health programs should not overlook the role of parental acceptance and support as an influence on their obese or overweight child's mental health and vulnerability to bullying at school. More constructive and blame-free strategies are needed to address child weight problems.

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Table 1.

Descriptive Statistics for Analysis Variables (Original Data)

Variable	Freq.	% ²	Mean	SD	Missing % ³	Comparison by verbal bullying status		<i>p</i> ¹
						No (N = 7135)	Yes (N = 5546)	
						Freq.	% ⁴	
						Freq.	% ⁴	
Dependent Variable								
During this school year, have other children ever teased, made fun of, or called this child names?	5546	44%	-	-	30%	-	-	-
Independent Variables								
<i>School-Level Variables</i>								
Public School	2044	91%	-	-	23%	6463	56%	0.111
School Location	889	42%	-	-		2075	53%	<0.001
City	833	38%	-	-	11%	2673	59%	<0.001
Suburban	432	20%	-	-		2204	57%	0.713
Town/Rural	83	3%	-	-		187	52%	
School Enro liment	233	11%	-	-		828	54%	
0–149 students	658	30%	-	-	8%	2189	57%	0.150
150–299 students	824	37%	-	-		2631	57%	
300–499 students	423	19%	-	-		1288	57%	
500–749 students	424	19%	-	-	9%	1218	53%	0.002
750 and above students	493	21%	-	-		2616	60%	
School Serves 12th Graders	415	19%	-	-	8%	1526	61%	<0.001
Yes	412	19%	-	-		1085	54%	
Percent of non-White	898	41%	-	-		1889	50%	
Students in School	9266	51%	-	-	0.2%	3384	52%	<0.001
50% to 74%	8826	49%	-	-		3741	60%	
75% to 100%	-	-	97.46	4.41	31%	-	-	0.341
<i>Child-Level Variables</i> Child's Sex								
Male	8466	46%	-	-		3641	59%	<0.001
Female	2395	13%	-	-		633	44%	<0.001
Child's Age (in months) ¹								
Child's								
Race/Ethnicity								
White								
Black								

Variable	Freq.	% ²	Mean	SD	Missing % ³	Comparison by verbal bullying status			
Hispanic	4579	25%	-	-	-	1872	56%	1474	44%
Asian	1539	9%	-	-	0.2%	616	64%	347	36%
Indigenous	284	2%	-	-	-	81	47%	91	53%
Multiracial	822	5%	-	-	-	288	54%	246	46%
Obesity/Overweight	4331	32%	-	-	25%	2058	52%	1911	48%
									<0.001

1. A chi-square test was used for categorical variables and a t-test was used for the continuous variable (child's age).

2. %² was calculated by dividing the frequency of each category (e.g., City) of a variables by the original total counts of the variable

3. %³Missing %³ was calculated by dividing the missing values of each variable by the original total counts of the variable.

4. Since children missing data for the verbal bullying variable and/or the independent variable were excluded from those analyses, the add to 100%.

Table 2:

HGLM results predicting verbal bullying among 18,130 second grade students attending 2,419 schools in the U.S.

Variables	Model 1			Model 2		
	Odds Ratio	95% Confidence Interval	p-value	Odds Ratio	95% Confidence Interval	p-value
<i><u>School-Level Variables:</u></i>						
Private School (<i>ref: Public</i>)	1.23	(0.87, 1.74)	0.236	1.23	(0.87, 1.74)	0.240
Suburban School (<i>Ref: City</i>)	0.83 *	(0.70, 0.99)	0.039	0.84 *	(0.70, 1.00)	0.044
Town/Rural School (<i>Ref: City</i>)	0.87	(0.72, 1.06)	0.156	0.87	(0.72, 1.05)	0.154
School Enrollment	1.01	(0.93, 1.09)	0.876	1.01	(0.93, 1.09)	0.876
School Serves 12 th Graders	1.07	(0.84, 1.36)	0.588	1.07	(0.84, 1.36)	0.607
Percent of non-White Students in School	1.07	(1.00, 1.16)	0.056	1.08 *	(1.00, 1.16)	0.046
<i><u>Child-Level Variables:</u></i>						
Female (<i>ref: Male</i>)	0.79 **	(0.72, 0.87)	<0.001	0.79 **	(0.72, 0.87)	<0.001
Child's Age	1.00	(0.99, 1.01)	0.992	1.00	(0.99, 1.01)	0.994
Black (<i>ref: White</i>)	1.29 *	(1.06, 1.57)	0.011	-	-	
Hispanic (<i>ref: White</i>)	0.79 *	(0.68, 0.92)	0.002	-	-	
Asian (<i>ref: White</i>)	0.77 *	(0.60, 0.99)	0.038	-	-	
Indigenous (<i>ref: White</i>)	1.15	(0.78, 1.72)	0.479	-	-	
Multiracial (<i>ref: White</i>)	1.14	(0.90, 1.43)	0.273	-	-	
Disability	1.44 **	(1.25, 1.66)	<0.001	1.44 **	(1.25, 1.66)	<0.001
Free/Reduced-price Lunch	1.34 **	(1.17, 1.52)	<0.001	1.33 **	(1.17, 1.52)	<0.001
Low Academic Performance (<i>ref: Mid-80%</i>)	1.25 *	(1.03, 1.51)	0.021	1.25 *	(1.03, 1.52)	0.019
High Academic Performance (<i>ref: Mid-80%</i>)	0.74 **	(0.64, 0.87)	<0.001	0.74 **	(0.64, 0.87)	<0.001
Obese/Overweight (<i>ref: Not Obese/Overweight</i>)	1.32 **	(1.19, 1.47)	<0.001	-	-	
<i><u>Interaction Variables: (ref: Obese/Overweight White Children)</u></i>						
Black Obese/Overweight Children	-	-	-	1.32	(0.98, 1.78)	0.069
Hispanic Obese/Overweight Children	-	-	-	0.64 **	(0.51, 0.80)	<0.001
Asian Obese/Overweight Children	-	-	-	0.92	(0.57, 1.47)	0.718
Indigenous Obese/Overweight Children	-	-	-	1.14	(0.64, 2.01)	0.659
Multiracial Obese/Overweight Children	-	-	-	1.28	(0.91, 1.82)	0.161

**
p<0.001

*
p<0.05

Model 2 also adjusts for White non-obese/overweight, Black non-obese/overweight, Hispanic non-obese/overweight.

Asian non-obese/overweight, Indigenous non-obese/overweight, and Multiracial non-obese/overweight.

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