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Parent Underestimation of Child Weight Status and Attitudes towards BMI Screening

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Abstract

Objective: In this study, we identify predictors of parental underestimation of child weight status and support for school-based BMI screening and reporting.

Methods: Parents of 3rd through 7th grade students (N = 1002) participating in *The Fit Study* completed mailed surveys assessing parent race/ethnicity, weight status, perception of child weight status, and preference for BMI screening and reporting.

Results: Only 33% and 6% of parents classified their overweight child as somewhat overweight and their obese child as very overweight, respectively. Support for BMI screening was stronger among Hispanic (OR = 2.3, p < .001), Asian (OR = 3.7, p < .001), and black (OR = 2.3, p = .04) parents than white parents and weaker among overweight versus normal-weight parents (OR = 0.6, p = .01). Compared to parents of 3rd grade students, parents of older children reported less support for BMI reporting (4th grade: OR = 0.4, p = .04; 6th grade: OR = 0.3, p = .02; 7th grade: OR = 0.3, p = .03).

Conclusions: Parent race/ethnicity, parent weight status, and child age are associated with support for BMI screening and reporting..

Keywords

body mass index (BMI); BMI screening; BMI reporting; childhood obesity; childhood overweight; weight status

Pediatric obesity has an estimated prevalence of 18.5% in the United States (US), and is a major public health concern.[1] Pediatric obesity has associations with negative health outcomes in childhood and adulthood.[2,3] The National Academy of Medicine recommends that schools assess students' body mass index (BMI), and send results to parents, who may

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Human Subjects Approval Statement

The University of California Berkeley's Committee for the Protection of Human Subjects approved this study (Protocol ID: 2012-07-4472).

Conflict of Interest Disclosure Statement

All authors of this article declare they have no conflicts of interest.

then take necessary corrective action.[4] Currently, 25 states require BMI screening in schools and 11 states require reporting results to parents.[5]

Most studies suggest that current BMI reports do not reduce pediatric obesity,[6] but null results may reflect a differential impact on parents based on baseline perceptions of child weight status. Parents of overweight and obese children who underestimate their child's weight status are expected to benefit from BMI reports more than parents of overweight and obese children who already correctly identify their child's weight status. Prior research indicates that underestimation of child overweight and obesity is prevalent among parents,[7,8] particularly when children are young and male.[9–11] However, evidence is conflicting about whether underestimation varies by parent weight status,[12–15] which is closely linked to child weight gain.[16–19] Additionally, prior studies examining the impact of parent race/ethnicity on underestimation have been mixed.[12,14] Understanding the association between parental characteristics (weight status and race/ethnicity) and underestimation of child weight status is important in determining the potential for BMI screening and reporting to impact health disparities.

BMI reporting also may have a differential impact on parents based on their views of schools as credible purveyors of child health information. According to established theories of persuasion, high source credibility is associated with a greater likelihood of attitude change, particularly among individuals who lack strong prior attitudes about the subject.[20] For this reason, parents who do not believe schools should be collecting and distributing child health information may be unlikely to act in response to a BMI report. Qualitative studies have raised concerns from parents about schools as appropriate entities to be collecting and distributing BMI information on children.[21,22] Quantitative studies have shown majority support from parents, but results are mixed by parent race,[23,24] and only one study examined differences in support by child age.[23] Additionally, prior studies have examined differences in preference for BMI reporting only by child BMI category, with conflicting results;[23,24] none has examined differences by parent weight status or parent perceptions of child weight status. Understanding how parent perceptions of BMI screening and reporting differ by child age and parent race, weight status, and perceived child weight status is important for understanding the potential efficacy of BMI screening and reporting in schools.

This paper uses baseline survey data from a large, ethnically-diverse group of parents to assess differences in underestimation of child overweight by parent weight status and race/ethnicity, as well as differences in parent support for BMI screening and reporting by child age and parent weight status, race/ethnicity, and perception of child weight status.

METHODS

Study Design

The current study presents cross-sectional data from a baseline parent survey administered during *The Fit Study*, a randomized controlled trial of BMI screening and reporting in schools. The design of *The Fit Study* has been described previously in detail.[25] Briefly, 79 elementary and middle schools from 5 school districts across California were randomly

assigned to one of 3 study conditions: BMI screening and reporting (Group 1); BMI screening only (Group 2); no BMI screening (Group 3).

Participants and Procedures

Researchers recruited students in grades 3 through 7 to participate in *The Fit Study*; overall, 18,758 students enrolled in Year 1 and 9883 students enrolled in Year 2. In Year 1, researchers mailed a survey to the parents or caregivers (hereafter referred to as parents) of 60 randomly selected students from each Group 1 school and 30 randomly selected students from each Group 2 and Group 3 school. We stratified the sampling to obtain a 2:1 ratio of children with a BMI at or above the 85th percentile for sex and age versus children with a BMI below the 85th percentile in Groups 1 and 2. In Year 2, we selected additional parents through a randomization process. Excluding parents of students who moved after we mailed parent surveys, there were 2999 parents in Year 1 and 866 parents in Year 2 to whom we mailed baseline surveys.

Prior to mailing the baseline survey, researchers sent a pre-notification postcard to all selected parents. The postcard stated that a survey would arrive within one week and asked parents to complete the survey upon receipt. Parents received a paper survey the following week that included a pre-addressed, stamped return envelope and a one-dollar bill. The survey also provided a website that parents could use to complete the survey online if they preferred. Parents who did not return a completed survey within 3 weeks received another mailed survey. Pre-notification postcards, monetary incentives, and duplicate surveys significantly increase response rates in previous studies.[26] Parents received one survey in English and one survey in Spanish or Chinese, according to district policy. A one-page cover letter described the research process and explained that returning a completed survey implied informed consent.

Parent Survey

We collected independent variable data via the parent survey. The survey asked parents to self-report their race/ethnicity, as well as their height and weight, data used to determine their BMI category. The survey asked parents to classify their child's current weight status as *very underweight, somewhat underweight, about the right weight, somewhat overweight,* or *very overweight.* Researchers combined very underweight and somewhat underweight into a single underweight category. The survey also asked parents to report their relationship to the child and their highest level of education.

We also assessed the 2 dependent variables, parent underestimation of child weight status and parent views about schools as credible purveyors of child health information, via the parent survey. We compared parent responses to a question about their child's weight status to actual child BMI categories to identify cases of underestimation. To assess parent views regarding schools as purveyors of health information, the survey asked: "Do you think students should have their heights and weights measured at school?" Responses included: "No," "Yes, in younger grades," "Yes, in older grades," and "Yes, in all grades." In regression analyses, we combined affirmative responses to create a dichotomous variable indicating whether a parent thought BMI screening should occur at school in any grade. The

survey also asked: “If your child’s school measured his or her height and weight, would you want to receive a report with your child’s height and weight results?” Responses included: “Yes,” “No,” or “No opinion.” This question was only included on the Year 1 survey; 703 parents (70% of total sample) provided a response. For analyses, “No opinion” (N = 71) was recoded as missing.

Child BMI Data

School personnel conducted height and weight measurements for students in Groups 1 and 2 during the spring of each year using research-grade equipment and following a previously described protocol.[25] We used height, weight, age, and sex to calculate a BMI for each child and a BMI category according to US Centers for Disease Control and Prevention (CDC) definitions[27] using the zanthro package in Stata: underweight (BMI < 5th percentile), normal weight (BMI ^{3} 5th-<85th percentile), overweight (BMI ^{3} 85th-< 95th percentile), or obese (BMI ≥ 95th percentile).

Data Analysis

We examined parent underestimation of child weight status in 2 ways. Among overweight or obese children, a binary ‘2-level’ underestimation variable flagged instances when parents classified their child as: “underweight” or “about the right weight” when the child was overweight; and “underweight,” “about the right weight,” or “somewhat overweight” when the child was obese. Given that only 20% of overweight children have an elevated body fatness compared to 77% of obese children,[28] a second approach was used to identify the most problematic cases of parent underestimation. Among obese children, a single-level underestimation variable flagged parents who classified their child as “underweight” or “about the right weight.” Mixed-effects logistic regression models assessed the association between parent support for BMI screening and parent race/ethnicity, parent weight status, parent perception of child weight status, and child grade. Models included a random effect for school and adjusted for parent and child sex. Similar mixed-effects logistic regression models assessed the association between parental characteristics and the 2 types of underestimation of child weight status. We used Stata SE (version 15.1) for all analyses.

RESULTS

Overall, 1002 parents (26%) returned mailed surveys during their child’s baseline year of participation in *The Fit Study*. Response rates did not differ significantly by study group or child sex. Response rates did differ by child BMI category (underweight: 26%; normal weight: 29%; overweight: 27%; obese: 23%; p = .01) and grade level (3rd grade: 26%; 4th grade: 24%; 5th grade: 25%; 6th grade: 30%; 7th grade: 30%; p = .04). Table 1 presents parent and child demographics. Most respondents were mothers (80%), identified as non-white (75%), and were overweight or obese based on self-reported height and weight (58%). Forty percent had completed college or graduate school.

Data in Table 2 compare parent perceptions of their child’s weight status to CDC BMI categories. Among children classified as underweight by their parents, 15% were underweight per CDC categories, 74% were normal weight, and 11% were overweight or

obese. Among children classified as about the right weight, 59% were normal weight per CDC categories and 40% were overweight or obese. Among children classified as somewhat overweight, 29% were overweight, and 70% were obese. All children classified as very overweight were either overweight (14%) or obese (86%) according to CDC BMI categories.

Using the 2-level underestimation variable, 67% of parents underestimated the weight status of their overweight child and 95% of parents underestimated the weight status of their obese child (Table 3). Using the single-level underestimation variable, only 27% of parents underestimated their child's weight status. Table 4 presents adjusted odds ratios for parent underestimation of child overweight or obese weight status. Underestimation of child weight status did not differ significantly by parent race/ethnicity or weight status.

Most respondents (69%) supported BMI screening measurements in schools: 50% of parents thought schools should measure height and weight in all grades, 13% supported the practice in younger grades, and 6% supported the practice in older grades. Table 5 presents data demonstrating support for BMI screening and reporting based on parental characteristics and child grade. In adjusted models, parent preference for BMI screening differed by parent race/ethnicity and weight status (Table 5). Hispanic (OR = 2.3, $p < .001$), Asian (OR = 3.7, $p < .001$), and black parents (OR = 2.3, $p = .04$) were more likely to support BMI screening than white parents. Overweight and obese parents (BMI ≥ 25 kg/m^2) were less likely to support BMI screening than normal-weight parents (OR = 0.6, $p = .01$). Associations with child grade, perceived child weight status, child sex, and parent sex were not significant in adjusted models.

The vast majority of parents who supported BMI screening also supported BMI reporting (94%). Even among parents who did not support BMI screening, 72% wanted a report if BMI was assessed. Parent preference for BMI reporting differed by parent race/ethnicity and child grade (Table 5). Hispanic parents were significantly more likely to support BMI reporting than white parents (OR = 3.6, $p < .001$). Compared to parents of 3rd grade children, parents of older children were less likely to support for BMI reporting (4th grade: OR = 0.4, $p = .04$; 5th grade: OR = 0.4, $p = .07$; 6th grade: OR = 0.3, $p = .02$; 7th grade: OR = 0.3, $p = .03$). Associations with parent BMI category, perceived child weight status, child sex, and parent sex were not significant in adjusted models.

DISCUSSION

This study is the first to assess perceptions of school-based BMI screening and reporting for a diverse, statewide sample of parents of elementary and middle school youth. Findings demonstrate parental support for BMI screening and reporting in schools, but suggest that support differs by parent race/ethnicity, parent weight status, and child grade. Results also confirm frequent underestimation of child weight status by parents but indicate that underestimation does not differ by parent weight status or race/ethnicity.

Almost all parents (94.5%) of obese children failed to classify their children as very overweight. Of even greater concern, more than one in 4 parents do not recognize an obese

child as even somewhat overweight. This suggests that parents of obese children, most of whom have elevated body fatness,[28] often do not view their child's weight as deviating greatly from normal levels. Therefore, BMI reports could have an important opportunity to draw parent attention to the health risks associated with their child's obese weight status and the importance of taking corrective measures.

Parent race/ethnicity was not associated with underestimating child weight status. Similar to the present study, Boutelle et al found no relationship between race and underestimation among parents of middle and high school youth (N = 755).[12] Conversely, West et al found that African-American parents of 3-to-18-year-olds were more likely to underestimate than white parents (N = 1551 parents),[14] adjusting for parent weight status. In 2 studies that did not adjust for parent weight status, one nationally representative study found that Hispanic parents of 6-to-15-year-olds were more accurate than non-Hispanic white parents (N = 1445),[10] whereas the other found that Hispanic parents of 2-to-18-year-olds were less accurate (N = 290).[29] The differences across studies may reflect differences by child age and regionalism. However, taken together, the inconsistent findings across the present and prior studies suggest that race/ethnicity does not reliably predict parental underestimation of child weight status.

Parent weight status was not significantly associated with underestimating child weight status in the present study. Among primarily white populations (over 80% white), Hearst et al[15] found no association between parent weight status and underestimation in a sample of adolescents (N = 358) and West et al[14] found no association among children ages 3 to 18. In a more diverse population (48% white), Boutelle et al[12] found that overweight mothers were twice as likely to underestimate adolescent weight status as normal-weight mothers (N = 755).[12] Researchers in a large European study of school-aged youth (N = 6113) found that underestimation was greater among overweight or obese parents; parent race was not reported.[13] As with parent race, the mixed findings from these reasonably large studies suggest that parent weight status does not consistently predict underestimation of child weight status.

Most parents in our study supported BMI screening and reporting in schools, as has been demonstrated in 2 prior studies.[23,24] Our findings also corroborate Johnson et al's findings that non-white parents are more likely to support BMI screening and reporting than white parents.[24] Whereas Kubik et al[23] found no association between parent race and support for BMI screening, the study population was greater than 90% white, making it difficult to identify differences by race. Prior research also has documented a greater likelihood of making changes to a child's diet and physical activity among ethnic-minority parents compared to white parents subsequent to receiving a BMI report.[24] Therefore, examining the impact of BMI reporting by race/ethnicity will be important in understanding its potential to reduce childhood obesity.

Our findings indicate that parents who are overweight or obese themselves are less likely to support BMI screening than normal-weight parents. To our knowledge, this is the first study to report on differences in preference for BMI screening based on parent weight status. This finding may reflect greater sensitivity around weight-related screening as a result of personal

body dissatisfaction, which is higher among obese adults than normal-weight adults.[30] To the extent that parent action in response to BMI reports is contingent on support for BMI screening, this finding is concerning given that parental weight status is highly correlated with child weight status.[16–19] We found that parent preference for BMI screening did not differ by parent perceptions of child weight status, similar to a prior study using objectively-measured child weight status.[23]

Our findings indicate that parents support BMI reporting less as children age. Parents of children in grades 4-7 demonstrated significantly less support for BMI reporting than parents of 3rd grade children. In a sample of primarily white students, Kubik et al[23] similarly found that parents of older students were less likely to want BMI reports than parents of younger students. Parents may feel that they have greater influence over the dietary and physical activity behaviors of their child at a younger age, and thus BMI information is more helpful at that time.

This study has several limitations. First, although we selected parents randomly to receive the mailed survey, non-response bias is likely, such that parents who returned mailed surveys may not be representative of all parental perceptions and beliefs. Secondly, the survey did not assess parent age, number of children, marital status, or English proficiency, which could account for differences in outcomes by parent race. Thirdly, our sample of parents included a small percentage of African-American parents, making it difficult to test associations by race. Finally, parents self-reported their weight status, which is prone to inaccuracy and under-reporting.[31]

Support for school-based BMI screening and reporting is strongest among non-white parents, normal-weight parents, and parents of children in younger grades. Given that parent support for the practice may influence its effectiveness, BMI screening and reporting should be assessed among these subgroups to improve understanding of its impact on childhood obesity. Whereas reporting may be more effective among parents who underestimate their child's overweight or obese status, there do not appear to be reliable predictors of underestimation by which researchers can target those parents.

IMPLICATIONS FOR HEALTH BEHAVIOR OR POLICY

Our findings identify future research priorities related to school-based BMI screening and reporting, which is intended to advance the *Healthy People 2020* goals of reducing the proportion of children and adolescents who are obese and preventing inappropriate weight gain in youth and adults. The practice of school-based BMI screening is appealing because of its low-cost and broad reach. If effective among at-risk subgroups, the practice is advantageous because it has the ability to reach the vast majority of youth, including those who do not see a healthcare provider regularly. Understanding the conditions under which, and the populations for whom, the practice is effective, are essential pieces of knowledge to possess.

These study findings suggest important BMI screening and reporting policy and research implications. First, schools that employ BMI screening and reporting should develop and

implement communications procedures to educate parents about BMI screening and reporting prior to mailing BMI reports home. Messaging should focus on reducing stigma around children being identified as overweight, encouraging parents to view BMI reports as an opportunity to make healthy changes, and identifying supports for parents who want to make changes. The purpose of these efforts would be to build support for the practice among all parents, but particularly parents who are overweight or obese and parents of older students. Communication methods could include emails to parents and signage displayed on the school campus.

Second, although studies to date suggest that BMI screening and reporting does not reduce pediatric obesity, future research studies should assess potential differences in impact by parent race/ethnicity, parent weight status, and child age. Findings from the present study suggest that support for BMI screening and reporting varies by these factors, and support for the practice may be necessary to compel parents to take action to reduce their child's weight. Assessing the impact of BMI screening and reporting on pediatric obesity among these subgroups of parents will be critical to understanding its utility.

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Table 1

Characteristics of Parents who Completed a Baseline Parent Survey during *The Fit Study* (N = 1002)

	Total (%)
Parent relation to child	
Mother/Stepmother	788 (80.5%)
Father/Stepfather	150 (15.3%)
Other	41 (4.2%)
Parent race/ethnicity	
Hispanic	461 (47.5%)
White	188 (19.4%)
Black	37 (3.8%)
Asian	240 (24.7%)
Other	44 (4.5%)
Parent BMI percentile[a]	
Underweight (BMI < 18.5 kg/m^2)	45 (4.8%)
Normal BMI	349 (36.9%)
Overweight or obese (BMI ≥ 25 kg/m^2)	551 (58.3%)
Parent highest level of education	
Didn't finish high school	127 (13.4%)
Finished high school or GED	163 (17.2%)
Some college or training	280 (29.6%)
Finished college	264 (27.9%)
Master's degree or doctorate	112 (11.8%)
Parent perception of child weight status	
Underweight	87 (8.7%)
About file right weight	611 (61.4%)
Somewhat overweight	280 (28.1%)
Very overweight	17 (1.7%)
Child BMI percentile[b]	
Underweight (<5th percentile)	14 (1.9%)
Normal weight (≥5th–<85th percentile)	314 (42.4%)
Overweight (≥85th–<95th percentile)	192 (25.9%)
Obese (≥95th percentile)	221 (29.8%)
Child sex	
Female	531 (53.0%)

	Total (%)
Male	471 (47.0%)
Child grade	
3rd grade	319 (31.8%)
4th grade	315 (31.4%)
5th grade	119 (11.9%)
6th grade	129 (12.9%)
7th grade	120 (12.0%)

Note.

a: Parent BMI calculated based on self-reported height and weight.

b: Child BMI data are provided for Group 1 and 2 children who had height and weight assessed at school.

Researchers used stratified random sampling to ensure that two-thirds of parents who received surveys had a child with BMI at or above the 85th percentile.

Numbers within each category may not equal 1002 due to prevalence of missing data.

Table 2

Distribution of Child BMI Percentiles Based on Parent-reported Child Weight Status (N = 737)

		Actual Child BMI Percentile[a]			
		Underweight	**Normal weight**	**Overweight**	**Obese**
Parent perception of child weight status	**Underweight (N = 65)**	10 (15.4%)	48 (73.9%)	1 (1.5%)	6 (9.2%)
	About the right weight (N = 445)	4 (0.9%)	262 (58.9%)	127 (28.5%)	52 (11.7%)
	Somewhat overweight (N = 213)	0 (0.0%)	4 (1.9%)	61 (28.6%)	148 (69.5%)
	Very overweight (N = 14)	0 (0.0%)	0 (0.0%)	2 (14.3%)	12 (85.7%)

Note.

a: Underweight: BMI < 5th percentile; Normal weight: BMI ≥ 8th - <85th percentile; Overweight: BMI ≥ 85th - <95th percentile; Obese: BMI ≥ 95th percentile.

Table 3

Parent Underestimation of Child Overweight and Obesity

Weight status underestimated by parent?	Actual Child BMI Percentile		
	2-level variable[a] (N = 409)		1-level variable[b] (N = 218)
	≥ 85th and < 95th percentile	≥ 95th percentile	≥ 95th percentile
No	63 (33.0%)	12 (5.5%)	160 (73.4%)
Yes	128 (67.0%)	206 (94.5%)	58 (26.6%)

Note.

a: Underestimation defined as parent classifying child as “underweight” or “about the right weight” when child’s BMI is between the 85th and 95th percentile or using any classification besides “very overweight” when child’s BMI is ≥ 95th percentile.

b: Underestimation defined as parent classifying child as “underweight” or “about the right weight” when child’s BMI is ≥ 95th percentile.

Table 4

Adjusted Odds Ratios of Parent Underestimation of Child Weight Status

	2-level variable[a]		1-level variable[b]	
	Odds Ratio	**95% Confidence Interval**	**Odds Ratio**	**95% Confidence Interval**
Parent race/ethnicity				
White (reference)	–	–	–	–
Hispanic	1.39	[0.68, 2.84]	0.52	[0.21, 1.28]
Asian	0.76	[0.29, 1.96]	1.57	[0.38, 6.45]
Black	3.82	[0.41, 35.53]	2.50	[0.56, 11.12]
Parent BMI category[c]				
Normal BMI (reference)	–	–	–	–
Underweight (BMI < 18.5 kg/m^2)	2.67	[0.29, 24.86]	–	–
Overweight or obese (BMI ≥ 25 kg/m^2)	0.72	[0.36, 1.43]	0.68	[0.28, 1.63]

*p < .05;

**p < .01;

***p < .001

Note.

a: Underestimation defined as parent classifying child as “underweight” or “about the right weight” when child’s BMI is between the 85th and 95th percentile or using any classification besides “very overweight” when child’s BMI is ≥ 95th percentile.

b: Underestimation defined as parent classifying child as “underweight” or “about the right weight” when child’s BMI is ≥ 95th percentile.

c: Parent BMI calculated based on self-reported height and weight.

d: There were no parents with a BMI < 18.5 kg/m^2 who underestimated their child’s weight status according to one-level variable criteria.

Table 5

Adjusted Odds Ratios of Parent Preference for School-based BMI Screening and Reporting

	BMI Screening[a]		BMI Reporting[b]	
	Odds Ratio	**95% Confidence Interval**	**Odds Ratio**	**95% Confidence Interval**
Parent race/ethnicity				
White (reference)	–	–	–	–
Hispanic	2.27	[1.58, 3.25]***	3.61	[1.86, 7.03]***
Asian	3.74	[2.25, 6.23]***	1.91	[0.86, 4.23]
Black	2.26	[1.04, 4.91]*	2.32	[0.58, 9.24]
Parent BMI category[a]				
Normal BMI (reference)	–	–	–	–
Underweight (BMI < 18.5 kg/m^2)	0.55	[0.27, 1.12]	0.60	[0.19, 1.90]
Overweight or obese (BMI ≥ 25 kg/m^2)	0.62	[0.44, 0.88]*	0.64	[0.34, 1.19]
Parent perception of child weight status				
About the right weight (reference)	–	–	–	–
Underweight	1.24	[0.72, 2.15]	1.85	[0.59, 5.75]
Somewhat overweight	0.86	[0.62, 1.19]	1.03	[0.58, 1.84]
Very overweight	3.57	[0.77, 16.56]	1.83	[0.21, 15.81]
Grade of parent's child				
3rd grade (reference)	–	–	–	–
4th grade	0.89	[0.62, 1.26]	0.42	[0.18, 0.97]*
5th grade	0.97	[0.59, 1.58]	0.42	[0.16, 1.12]
6th grade	1.33	[0.79, 2.22]	0.29	[0.11, 0.81]*
7th grade	1.12	[0.66, 1.88]	0.32	[0.12, 0.88]*

*p < .05;

** $p < .01$;

*** $p < .001$

Note.

[a:] Parent BMI calculated based on self-reported height and weight.

Models adjusted for parent sex and child sex.